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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 10, NUMBER 14
JULY 15, 1977

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 14
JULY 15, 1977

W77-06601 -- W77-07100

Secretary of the U.S. Department of the Interior has de-
ned that the publication of this periodical is necessary in the
action of the public business required by law of this Depart-
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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
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Washington, DC 20240

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CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

CLIMATOLOGY FOR GEOGRAPHERS,
California Univ., Los Angeles, Dept. of Geography.
For primary bibliographic entry see Field 2B.
W77-06659

MATHEMATICAL MODELS IN HYDROLOGY.
United Nations Educational, Scientific and Cultural Organization, Paris (France).
Proceedings of the Warsaw Symposium, Poland, July 1971, Volumes 1, 2, and 3. IAHS/Unesco, Paris, France, 1974. Vol 1--439 p, Vol 2--p 443-1110, Vol 3--p 1111-1351.

Descriptors: *Hydrology, *Mathematical models, *Research, *Methodology, *Optimization, *Water policy, *Operations research, Data collections, Structural analysis, Stochastic processes, Planning, Management, Water storage, Parametric hydrology, River systems, Lakes, Estuaries, Hydrodynamics, Constraints, Economics, Regional development, Systems analysis, Equations, *Water resources development, Reservoirs operation, *Simulation analysis.
Identifiers: Hydrologic sequences, Multi-dimensional processes, Conceptual catchment models, Objective functions, Cost minimization, Benefit maximization.

Volumes 1, 2, and 3 of this symposium contain some 140 articles, studies, reports, and discussions covering the comprehensive field of mathematical modeling in hydrology. This Proceedings belongs the Studies and Reports in Hydrology series which is aimed at recording collected data and the main results of hydrological studies undertaken within the framework of the International Hydrological Decade (1965-74), launched by the General Conference of Unesco. The Proceedings contains the compilation of data, discussions of hydrological research techniques and findings, and guidance material for future scientific investigations. Each volume is divided into sections, based on the Conference sessions, dealing with a particular hydrological problem. Found in Volume 1 are: structural analyses of hydrological sequences; multi-dimensional processes in hydrology; and stochastic analyses of water storage problems. Volume 2 presents: the fitting of conceptual catchment models; distributed parameter catchment models and input fields; hydrodynamic models of river systems, lakes and estuaries; objective functions and constraints in water resources systems; optimal operation of water resources systems; and planning of systems for regional development in water resources. Volume 3 is comprised of a general report and a discussion on each of the 18 Conference sessions. It is hoped that these volumes will furnish material of both practical and theoretical interest to hydrologists and governments concerned with problems of water in all countries. (See W77-06709 thru W77-06737) (Bell-Cornell)
W77-06708

ON THE APPLICATION OF OPTIMIZATION TECHNIQUES TO CONCEPTUAL CATCHMENT MODELS,
Technische Universitaet, Dresden (East Germany).
U. Grunewald, and S. Dyck.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 493-503. 7 fig, 1 tab, 23 ref.

Descriptors: *Parametric hydrology, *Optimization, *Reservoirs, *Channels, *Behavior, Storage, Statistical models, Mathematical models, Equations, Methodology, Systems analysis, Watershed management.
Identifiers: *Experimental system identification, Second-order regression polynomial, Ridge line analysis, Conceptual models.

The application of the parametric method of experimental system identification is described. In particular, first results of applying two optimization methods to three conceptual models of catchment behavior are discussed. Only linear time-invariant systems are considered. With model (1), the known conceptual model of identical linear reservoirs in series is termed with the constant storage coefficient k. Model (2) results from the conceptual model of a series of alternating linear channels and linear reservoirs. Model (3) consists of a linear channel and two linear reservoirs of different storage coefficients, k1 and k2, in series. The optimization methods used are: the method of the linearization of the normal-equations (method of LNE'); and statistical optimization ('ridge-line analysis'). Results show that neglect of the variation of the translation time over the catchment (model (1)) does not yield a conceptual model of wide applicability. In the special cases of 'flat' impulse response functions, a good fit is obtained for model (1), whereas models (2) and (3) seem to be the models of widest applicability. (See also W77-06708) (Bell-Cornell)
W77-06709

USE OF A PARAMETRIC MODEL AS A TOOL FOR HYDROMETRIC NETWORK PLANNING,
Waterloo Univ., (Ontario). Dept. of Civil Engineering.
S. I. Solomon, A. S. Qureshi, and U. Korngold.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 511-526. 6 fig, 1 tab, 9 ref.

Descriptors: *Networks, *Parametric hydrology, *Planning, Monthly, Flow, Regions, Hydrologic data, Methodology, Conjunctive use, Gaging stations, Meteorological data, Terrain analysis, Precipitation, Temperature, Evaluation, Constraints, Costs, Systems analysis, Mathematical models.
Identifiers: *Hydrometric networks, *Regional planning, *Data transfer, Network expansion, Budget allocation, Physiographical characteristics.

This paper discusses the potential of a parametric model, designed to generate monthly flows, as a tool for planning a regional hydrometric network. Development of the model and its use as a data transfer technique are described. Possible advantages over other techniques are emphasized. The methodology for applying the technique to hydrometric network design is outlined. (See also W77-06708) (Bell-Cornell)
W77-06710

INDICES OF WATER RESTRICTION AND WATER DEFICIENCY TOLERANCE,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W77-06711

COLLECTIVE UTILITY: A SYSTEMS APPROACH TO WATER PRICING POLICY,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 6C.
W77-06712

ON LARGE-SCALE SIMULATION OF GROUNDWATER FLOW SYSTEMS,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
For primary bibliographic entry see Field 4B.
W77-06713

THE CONJUNCTIVE USE OF A MULTI-RESERVOIR SYSTEM AND A DUAL-PURPOSE DESALTING PLANT,
Sahand Co., Tehran (Iran).
For primary bibliographic entry see Field 4B.
W77-06714

OPTIMAL OPERATIONS OF RESERVOIRS IN THE HARZ MOUNTAINS,
Technische Universitaet, Brunswick (West Germany). Leichtweiss Inst. for Water Research.
For primary bibliographic entry see Field 4A.
W77-06715

OPTIMIZATION MODEL OF A SYSTEM OF TWO OPEN-CHANNEL HYDROPLANTS,
Gdansk Technical Univ. (Poland). Inst. of Hydraulic Engineering.
For primary bibliographic entry see Field 4A.
W77-06716

METHODS FOR CONTROL OF THE REGIMES FOR WATER RESOURCES SYSTEMS,
Moskovskii Energeticheskii Institut (USSR). Dept. of Hydropower.
For primary bibliographic entry see Field 4A.
W77-06717

OPTIMAL COMPLEX USE OF CONTROLLED WATER RESOURCES OF A BASIN,
Akademiya Nauk SSSR, Moscow. Central Economic Mathematical Inst.
For primary bibliographic entry see Field 4A.
W77-06718

MATHEMATICAL MODEL OF WATER RESOURCES UTILIZATION IN A RIVER BASIN,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 4A.
W77-06719

OPTIMIZATION OF A THREE-RESERVOIR SYSTEM BY DYNAMIC PROGRAMMING,
Ministerio de Obras Publicas, Madrid (Spain). Geologico Servicio.
For primary bibliographic entry see Field 4A.
W77-06720

OPTIMAL DESIGN AND OPERATION OF RESERVOIR SYSTEMS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-06721

CONSTRUCTION AND ADJUSTMENT OF A TWO-LAYER MATHEMATICAL MODEL OF THE LLOBREGAT DELTA,
Ministerio de Obras Publicas, Barcelona (Spain). Computer Centre.
For primary bibliographic entry see Field 4A.
W77-06722

INTEGRATION OF AQUIFERS IN FLOOD CONTROL PROJECTS,
Technion - Israel Inst. of Tech. Haifa. Dept. of Agricultural Eng.
For primary bibliographic entry see Field 4A.
W77-06723

OPTIMAL SEASONAL AND SHORT-TERM OPERATION OF A RESERVOIR USED FOR FLOOD CONTROL AND WATER SUPPLY,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 4A.
W77-06724

STREAMFLOW REGULATION BY ARTIFICIAL RECHARGE FED FROM UPSTREAM SURFACE STORAGE: DERIVATION OF CONTROL RULES,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 4A.
W77-06725

THE METHODS OF DISTRIBUTION OF WATER RESOURCES IN RIVER DEVELOPMENT SYSTEMS,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 4A.
W77-06726

MODELE MATHEMATIQUE DE SIMULATION DU SYSTEME DES RESSOURCES HYDRAULIQUES SUPERFICIELLES DU LLOBREGAT,
Ministerio de Obras Publicas, Barcelona (Spain). Study and Experimental Centre.
For primary bibliographic entry see Field 4A.
W77-06727

CONJUNCTIVE USE OF THE TAJO-SEGURA AQUEDUCT SURFACE SYSTEM AND THE AQUIFERS OF THE LA MANCHA AREA,
Ministerio de Obras Publicas, Madrid (Spain). Geologico Servicio.
For primary bibliographic entry see Field 4B.
W77-06728

HYBRID COMPUTER ANALYSIS OF A COMBINED SURFACE WATER--GROUNDWATER SYSTEM,
City Univ., London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-06729

OPTIMAL PLANNING OF FLOWS IN MULTI-RESERVOIR HYDRO-POWER SYSTEMS,
Boeing Computer Services Inc., Seattle, Wash. Mathematical Analysis Unit.
For primary bibliographic entry see Field 4A.
W77-06730

A SECTOR MODEL FOR REGIONAL AND NATIONAL WATER RESOURCES PLANNING,
Harvard Univ., Cambridge, Mass. Center for Population Studies.
For primary bibliographic entry see Field 6A.
W77-06731

HYDROLOGICAL EVALUATION OF CHANGES IN RUNOFF CHARACTERISTICS,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W77-06732

GENERAL DESCRIPTION OF THE VISTULA RIVER PROJECT AND BASIC PLANNING DATA,
Bureau of Studies and Designs for Hydraulic Structures, Warsaw (Poland).
For primary bibliographic entry see Field 4A.
W77-06733

THE MULTI-STEP METHOD FOR SIMULATION AND OPTIMIZATION OF VISTULA RIVER PLANNING ALTERNATIVES,
Technical Univ., Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-06734

THE OUT-OF-KILTER ALGORITHM AS A SINGLE-STEP METHOD FOR SIMULATION AND OPTIMIZATION OF VISTULA RIVER PLANNING ALTERNATIVES,
Water Resources Engineers Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 4A.
W77-06735

LA SCIENCE DES SYSTEMES DANS LA PLANIFICATION DES RESSOURCES EN EAU,
Catania Univ. (Italy). Istituto di Idraulica Idrologia Gestione Acque (Italy).
For primary bibliographic entry see Field 6A.
W77-06736

A DYNAMIC MULTISECTOR PROGRAMMING APPROACH TO REGIONAL WATER RESOURCE MANAGEMENT,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
For primary bibliographic entry see Field 6A.
W77-06737

A MODEL FOR THE WATER REGIME OF A DECIDUOUS FOREST WITH SPECIAL CONSIDERATION OF THE FUNCTIONAL INTERRELATIONSHIPS AMONG METEOROLOGICAL FACTORS, SOIL WATER CONTENT AND EVAPOTRANSPIRATION, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
H. Item.
Eidg Anst Forstl Versuchwes Mitt 50(3), p 137-332, 1974.

Descriptors: *Mathematical models, *Water balance, *Deciduous forests, *Forests, Soil water, Soil moisture, Moisture content, Evapotranspiration.
Identifiers: Meterological factors.

A mathematical model describing the water regime of a forest depending on meterological conditions is proposed. In an application of the model, it should be possible to calculate the soil water content at any time during the vegetation period using that in spring and meteorological records. If soil moisture data are generated in this way, it should be possible to study the influence of drought on the mass increment of trees.--Copyright 1976, Biological Abstracts, Inc.
W77-06864

NUMERICAL MODELS OF WIND-DRIVEN CIRCULATION IN LAKES,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2H.
W77-06958

COMPREHENSIVE MONITORING OF METEOROLOGY, HYDRAULICS, AND THERMAL REGIME OF THE SAN DIEGO AQUEDUCT, CALIFORNIA,
Geological Survey, Bay St. Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 2D.
W77-06973

2B. Precipitation

COASTAL METEOROLOGICAL NETWORKS TO DETERMINE EFFECTS OF NUCLEAR PLANT COOLING SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
E. Ryznar, D. G. Baker, and H. Moses.
Bulletin of the American Meteorological Society, Vol. 57, No. 12, p 1441-1446, December 1976. 3 fig, 1 tab.

Descriptors: *Networks, *Instrumentation, *Nuclear powerplants, *Michigan, *Lake Michigan, On-site investigations, Cooling water, Cooling towers, Powerplants, Winds, Temperature, Air temperature, Water temperature, Humidity, Precipitation(Atmospheric), Rain gages, Fog, Solar radiation, Measurement, Lakes, Coasts, Meteorology, *Air pollution effects.
Identifiers: *Nuclear powerplant effects.

Twenty-five meteorological stations are in operation inland from two nuclear power plants located on the Lake Michigan shoreline in southwestern lower Michigan. Their purpose is to provide data to enable meteorological effects of mechanical-draft cooling towers at the Palisades Nuclear Plant and a once-through cooling system at the Donald C. Cook Nuclear Plant to be evaluated. Temperature, relative humidity, and precipitation are measured at all stations, total solar radiation and wind velocity at four, and visibility at three. The stations, equipment, and calibration methods were described, and examples of types of meteorological analyses were presented. (Sims-ISWS)
W77-06643

WEATHER MODIFICATION IN THE SOVIET UNION--1976,
Arizona Univ., Tucson. Inst. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W77-06644

ON THE STATUS OF HAIL SUPPRESSION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W77-06645

SIMPLE FORMULAE FOR THE ESTIMATION OF WET BULB TEMPERATURE AND PRECIPITABLE WATER,
Meteorological Office, Poona (India).
S. J. Reddy.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 27, No. 2, p 163-166, April 1976. 3 tab, 4 ref.

Descriptors: *Meteorological data, *Formulas, *Equations, Temperature, Air temperature, Humidity, Pressure, Atmospheric pressure, Water vapor, Weather data, Data processing, Correlation analysis, Regression analysis, Meteorology.
Identifiers: Precipitable water, Estimation equations, Wet bulb temperature.

A simple formula was developed for computing wet bulb temperature on electronic computers from dry bulb temperature, relative humidity, and pressure. The results obtained with the equation were compared with observed values and were found to be in good agreement. A simple relation was also derived between wet bulb temperature and precipitable water. The results obtained with this equation were compared with the observed values and were found to be in good agreement. (Sims-ISWS)
W77-06646

AREA-DEPTH RELATIONS FOR FREQUENCY VALUES OF RAINFALL,
Meteorological Office, New Delhi (India).
N. Tripathi.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 27, No. 2, p 173-176, April 1976. 2 fig, 2 tab, 5 ref.

Descriptors: *Rainfall, *Depth-area curves, *Depth-area-duration analysis, Precipitation(Atmospheric), Data processing, Networks, Rain gages, Foreign countries, Meteorological data, Weather data, Foreign research, Rainfall disposition, Weather patterns, Hydrologic data, Meteorology.
Identifiers: *India.

Based on rainfall data of 11 dense networks of rain gauges, area-depth curves for frequency values of rainfall for Indian regions were drawn and presented in this paper. The curves are for durations of 1, 3, 6, and 24 hours and for small basins up to 1000 sq km. An equation giving the area-depth relation for any duration was also worked out. (Sims-ISWS)
W77-06647

AN APPROXIMATING POLYNOMIAL FOR THE COMPUTATION OF SATURATION VAPOR PRESSURE,
Naval Environmental Prediction Research Facility, Monterey, Calif.
P. R. Lowe.
Journal of Applied Meteorology, Vol. 16, No. 1, p 100-103, January 1977. 1 fig, 1 tab, 7 ref.

Descriptors: *Saturation, *Vapor pressure, *Mathematical models, Numerical analysis, Atmosphere, Temperature, Thermodynamics, Moisture, Meteorological data, Algorithms.
Identifiers: *Polynomial procedure, Saturation vapor pressure, Atmospheric phenomenon.

A procedure for computing saturation vapor by means of a polynomial approximation was evaluated against other methods then in use. The polynomial procedure consumes a minimal amount of time, without sacrificing acceptable accuracy with respect to the standard. A literature review showed eleven different procedures for computing vapor pressure. These 11 procedures were divided into 2 basic categories: those that require exponentiation, and those that take the form of a polynomial. The requirement for doing an exponentiation, whether the base is e or 10, violates the criterion of economy of computing time. Yet, polynomial-type procedures characteristically have been inaccurate. The polynomial procedure was demonstrated to be highly accurate and more economic of computational time requirements than other procedures. (Roberts-ISWS)
W77-06652

A NOTE ON TEMPERATURE AND HUMIDITY PROFILE MEASUREMENT OVER FORESTS USING DIODES,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 7B.
W77-06653

CLIMATOLOGY FOR GEOGRAPHERS,
California Univ., Los Angeles, Dept. of Geography.
W. H. Terjung.
Annals of the Association of American Geographers, Vol. 66, No. 2, p 199-222, June 1976. 9 fig, 120 ref.

Descriptors: *Climatology, *Reviews, *Methodology, Climates, Research priorities, Atmosphere, Evapotranspiration, Rainfall, Precipitation(Atmospheric), Water vapor, Humidity, Energy, Energy transfer, Geomorphology.
Identifiers: *Geography, Geographers, Physical geography.

Climatology was reviewed and redefined in terms of relevance to geography, and a programmatic statement for future research was presented. Instead of enumerating substantive areas, physical geography was defined and ranked according to five levels of methodology and attendant philosophy. The essence of geographical climatology is the analysis and description of process-response systems of importance to mankind occurring within the planetary boundary layer, interface, and substrates. The future of a climatology useful to geographers appears to lie in the numerical modeling of such systems. (Sims-ISWS)
W77-06659

AN ESTIMATE OF THE INPUT OF ATMOSPHERIC TRACE ELEMENTS INTO THE NORTH SEA AND THE CLYDE SEA (1972-3),
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 5B.
W77-06668

COMPRESSED AIR FOR SUPERCOOLED FOG DISPERSAL,
Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass. Meteorology Lab.
For primary bibliographic entry see Field 3B.
W77-06674

THE DISTRIBUTION OF NATURAL AND ANTHROPOGENIC ELEMENTS AND COMPOUNDS IN PRECIPITATION ACROSS THE U.S.; THEORY AND QUANTITATIVE MODELS,
North Carolina Univ., Chapel Hill. Dept. of Botany.
T. G. Wolaver.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 233, Price codes: A05 in paper copy, A01 in microfiche. EPA Report, NERC, Research Triangle Park, N.C., October 1972. 83 p, 36 fig, 8 tab, 28 ref. S-T2-WP-173-03, 04.

Descriptors: *Chemistry of precipitation, *Model studies, *Precipitation(Atmospheric), *Fallout, *Mathematical models, Rain, Rainwater, Weather, Rainfall, Rainfall intensity, Air pollution, Pollutants, Water quality, Chemical analysis, Chemical precipitation.
Identifiers: *Quantitative models, Wet fallout, Mineral constituents, Mineral nutrients.

In view of present concern over air pollution, spatial models and display of chemicals in rainwater become increasingly important. This publication attempted a contribution at three levels: (1) understanding the processes which are responsible for the negative exponential relationship between elemental concentration and precipitation, (2) attempting to quantify the negative exponential function for seven common elements and compounds, and (3) applying this information to produce computerized spatial displays (maps) of washout, rainout, and total wet fallout patterns in the United States for several chemicals. (Henley-ISWS)
W77-06675

INVESTIGATION OF THE EFFECTS OF NONHOMOGENEOUS (OR NONSTATIONARY) BEHAVIOR ON THE SPECTRA OF ATMOSPHERIC TURBULENCE,
Bolt Beranek and Newman, Inc., Cambridge, Mass.
W. D. Mark, and R. W. Fischer.
NASA Contract Report 2745, October 1976. 113 p, 26 fig, 1 tab, 19 ref, 8 append. NASA NAS1-13709.

Descriptors: *Turbulence, *Atmosphere, *Model studies, Mathematical models, Numerical analysis, Equations, Winds, Meteorology.
Identifiers: *Atmospheric turbulence, Power spectra, Nonhomogeneous turbulence.

This report examined the effects of nonhomogeneous or nonstationary envelope behavior on the power spectra of atmospheric turbulence records. The principal vehicle used in the study was a new series expansion of the instantaneous power spectrum that has for its first term the usual quasi-stationary spectrum approximation. The minimum duration of a burst of turbulence and the minimum rise-time of an abrupt onset of turbulence that will not give rise to changes in the spectrum due to the nonstationary behavior were determined. A general criterion for envelope behavior that will not give rise to changes in the spectrum was also determined. Spectra computed from recorded turbulence time histories were shown to be consistent with the theoretical predictions. (Sims-ISWS)
W77-06678

USE OF A PARAMETRIC MODEL AS A TOOL FOR HYDROMETRIC NETWORK PLANNING,
Waterloo Univ., (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-06710

INVESTIGATION OF PRECIPITATION WITHIN FOREST ECOSYSTEMS, (IN HUNGARIAN),
Lajos Kossuth Univ., Debrecen (Hungary). Dept. of Botany.
M. Szabo.
Acta Biol Debrecina 12, p 155-162, 1975.

Descriptors: *Rain, *Forests, *Stemflow, *Water balance, *Rainfall, *Investigations, Ecosystems, Hydrologic cycle, Nutrients, Throughfall, Interception, Oak trees, Precipitation(Atmospheric).
Identifiers: Climate, Hungary, *Rainwater measurement.

The nutrient cycle is strongly geared to the hydrologic cycle. Definitions of throughfall, stemflow, interception, etc. are given, and the design of investigations on the hydrologic cycle of a sessile oak forest (Quercetum petraecae-cerris) is described in the framework of the 'Sikfokut Project' within the UNESCO (United Nations Educational Scientific and Cultural Organization) research program 'Man and Biosphere'. The sample area (100 by 100 m basic quadrat) is situated in the Bukk Mountains (Hungary). In a 50 by 50 m plot, the climate and water budget are investigated. Fourteen troughs 20 cm wide and 1 m long are randomly distributed to measure the rainwater under the forest canopy. Stemflow of 14 mean diameter trees is measured using polyurethane collars at a height of 1.30 m. Incident precipitation will be estimated above the tree crowns at the top of a 24 m high tower erected within the same plot. Investigations on precipitation and analysis of the nutrient content of rainfall passing through the canopy started in 1974.--Copyright 1976, Biological Abstracts, Inc.
W77-06797

LAKE ST. CLAIR HYDROLOGIC TRANSFER FACTORS.
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W77-06879

A SINGLE FIELD OF VIEW METHOD FOR RETRIEVING TROPOSPHERIC TEMPERATURE PROFILES FROM CLOUD-CONTAMINATED RADIANCE DATA,
Texas A and M Univ., College Station. Center for Applied Geosciences.
D. B. Hodges.
NASA Contract Report 2726, August 1976. 103 p, 37 fig, 4 tab, 31 ref. NASA NAS8-26751.

Descriptors: *Remote sensing, *Air temperature, *Satellites(Artificial), Clouds, Model studies, Mathematical models, Data processing, Atmosphere, Cloud physics, Meteorological data, Meteorology.
Identifiers: *Temperature profiles, *NOAA-4.

Presented herein was a method of retrieving single field of view (FOV) tropospheric temperature profiles directly from cloud-contaminated radiance data through the use of auxiliary data such as observed shelter temperature and estimated cloud-top height. It was shown that a well-defined temperature profile may be calculated from the radiative transfer equation (RTE) for a partly cloudy atmosphere when the average fractional cloud amount and cloud-top height for the FOV are

known. A cloud model was formulated to calculate the fractional cloud amount from an estimated cloud-top height. The method was then examined through use of simulated radiance data calculated through vertical integration of the RTE for a partly cloudy atmosphere using known values of cloud-top height(s) and fractional cloud amount(s). Temperature profiles were retrieved from the simulated data, assuming various errors in the cloud parameters. Temperature profiles were retrieved from NOAA-4 satellite-measured radiance data obtained over an area dominated by an active cold front and with considerable cloud cover. Excellent radiosonde data for 11 stations participating in the Atmospheric Variability Experiment (AVE III) available for the area were used for comparison with temperature profiles retrieved from the NOAA-4 data. The effects of using various guessed profiles and the number of iterations were considered. (Sims-ISWS)
W77-06887

TIME-DISTRIBUTION OF STORM RAINFALL IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
R. L. Kerr, T. M. Rachford, B. M. Reich, B. H. Lee, and K. H. Plummer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 251, Price codes: A09 in paper copy, A01 in microfiche. June, 1974. 173 p, 33 fig, 33 tab, 27 ref, 3 append.

Descriptors: *Time, *Storm water, *Storms, *Rainfall, *Pennsylvania, Rain gages, Floods, Antecedent precipitation.

A sample of 1623 storms obtained from the rainfall charts of 46 recording rain gage stations throughout Pennsylvania were analyzed. Each storm was large enough to have produced a flood, given the proper antecedent conditions. Percentage rainfall occurring in successive 5%, 10%, 25%, and 33.3% time intervals of storm duration were calculated for each storm. Ten percent of duration was best for noticing possible trends. Techniques used to identify storms with similar patterns included calculating a median mass curve for storms in each group, calculating limit curves including 80% of the data points around this median line, and calculating statistics for the percentage rainfall in each interval of 10% duration. A sample of 405 antecedent precipitation events associated with flood-producing storms in Pennsylvania was also analyzed. Antecedent rainfalls associated with each storm were listed for seven sequential 24 hr periods immediately before the start of the storm. Antecedent precipitation distributions were somewhat different during the growing and dormant seasons. Regional variations across Pennsylvania were insignificant. The occurrences of antecedent rainfalls were nearly independent statistically from the ensuing flood-producing storms. (Snyder-FIRL)
W77-07022

2C. Snow, Ice, and Frost

SUPRAPERMAFROST WATER,
Alaska Univ., College. Inst. of Water Resources.
G. L. Guymon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 955, Price codes: A02 in paper copy, A01 in microfiche. Report No. IWR-53, June 1974, 11p. OWRT C-4049 (No. 9010)(3).

Descriptors: *Permafrost, Cold-regions, Soil mechanics, Moisture, *Hydraulic conductivity, *Soil water movement, Model studies, Heat balance, Soil moisture, Freezing, Thawing, Convection, Boundary processes.
Identifiers: *Suprapermafrost water, *Freezing soils, *Thawing soils.

The objective was to extend the quantitative knowledge of the soil-water regime of permafrost soils as it is related to hydrological analysis. Research indicated that the most dynamic and perhaps most important soil water behavior occurs during the winter. There is evidence that a significant amount of water is lost to the atmosphere from the frozen soil. Evidence also suggests that an appreciable amount of heat may be convected by moisture migration. In most instances, water is driven by hydraulic gradients produced by the freezing part of the soil profile. In addition, a one-dimensional, coupled heat and moisture transport model was developed for freezing and thawing soils. The most important result to come from the modeling effort was the conclusion that such modeling, when applied on a regional basis, is of little applied value unless means are perfected for determining accurately (1) the hydraulic conductivity parameter for freezing soils, (2) the ice-water ratio function, and (3) the boundary conditions at the soil surface for both moisture and thermal states. (Hartman-Alaska)
W77-06630

LABORATORY STUDY OF THE FLEXURAL STRENGTH AND ELASTIC MODULUS OF FRESHWATER AND SALINE ICE,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
J. C. Tatinclaux, and C. Y. Wu.
IIHR Report No 190, June 1976. 148 p, 53 fig, 32 tab, 9 ref, 2 append. Army DACA89-75-G-052.

Descriptors: *Ice, *Strength, *Elasticity(Mechanical), *Laboratory tests, Strength of materials, Ice loads, Freshwater, Saline water, Salinity, Crystals, Temperature, Equipment, Loads(Forces), Mechanics.
Identifiers: *Bending strength, *Elastic modulus.

Results are presented of a laboratory investigation of the bending strength and elastic modulus of seeded, freshwater and saline ice. Small freshwater ice beams with homogeneous temperature distribution were tested under concentrated load and pure bending applied either on the top or on the bottom surface of the specimens. Freshwater ice and saline ice beams were also tested under pure bending in a water bath. The significant difference in the values of sigma and E obtained with freshwater ice samples at homogeneous temperature, depending on whether the specimens were loaded on the top or bottom surface, was attributed to the variation in ice crystal size between the top and bottom surfaces of the ice sheet. No noticeable effect of loading rate on the flexural strength of bath freshwater and saline ice was found, while the elastic modulus appeared to increase slightly with increasing loading rate. Air temperature was found to have only a minor effect on strength and elastic modulus, at least in the range of temperature investigated. On the other hand, both the bending strength and the elastic modulus were found to be very rapidly decreasing functions of the square root of the brine volume. In view of the difficulties encountered during the experimental program and in the interpretation of the results, it was recommended that further investigation be carred out on the effect of specimen dimensions, testing methods, ice crystal size, and size and distribution of brine pockets on the flexural strength and elastic modulus of saline ice. (Sims-ISWS)
W77-06661

IDENTIFICATION, DOCUMENTATION, AND DELINEATION OF COASTAL MIGRATORY BIRD HABITAT IN ALASKA, AND THE DISTRIBUTION, ABUNDANCE AND FEEDING ECOLOGY OF BIRDS ASSOCIATED WITH PACK ICE,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-06805

AN ANNULAR FLOW ICE-WATER MODEL HEAT SINK,
Cold Regions Research and Engineering Lab., Hanover, N. H. Experimental Engineering Div.; and Cold Regions Research and Engineering Lab., Hanover, N. H. Northern Engineering Research Branch.
J. L. Brown, and W. F. Quinn.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-015 468, Price Codes: A04 in paper copy, A01 in microfiche. Special Report 236, September 1975. 71 p, 16 fig, 26 ref, 7 append.

Descriptors: *Powerplants, *Water cooling, *Ice, *Ice-water interfaces, Heat transfer, Melting, Nuclear powerplants, Nuclear reactors, Cooling water, Model studies, Computer models, Laboratory tests.
Identifiers: *Heat sinks, Reactor coolants.

An analytical and laboratory experimental study was conducted on a scale model annular flow ice-water heat sink. The study developed: (1) an understanding of the flow processes and melting patterns in such a sink, (2) a mathematical procedure for predicting relationships between coolant water and heat rejection rates, (3) a validation of the math procedure using a scaled experiment model, and (4) an assessment of the effect of some water inlet manifold configurations. Advantageous performance characteristics include provision for (1) maximum thermal efficiency during the early (probably most crucial) stages of use, and (2) a relatively constant outlet sink temperature to the power plant heat exchanger during the ice melting period. (Sims-ISWS)
W77-06889

DEVON ISLAND ICE CAP: CORE STRATIGRAPHY AND PALEOCLIMATE,
Department of Energy, Mines and Resources, Ottawa (Ontario). Polar Continental Shelf Project.
R. M. Koerner.
Science, Vol. 196, No. 4285, p 15-18, April 1, 1977. 4 fig, 1 tab, 21 ref.

Descriptors: *Ice, *Climatology, *Polar regions, *Canada, Freezing, Ablation, Melting, Melt water, Glaciers, Ice cover, Seasonal, Sea ice, Climates, Stratigraphy, Cores, Core logging, Cold regions.
Identifiers: *Ice caps, Devon Island ice cap(NWT).

Valuable paleoclimatic information can be gained by studying the distribution of melt layers in deep ice cores. A profile representing the percentage of ice in melt layers in a core drilled from the Devon Island ice cap plotted against both time and depth showed that the ice cap has experienced a period of very warm summers since 1925, following a period of colder summers between about 1600 anf 1925. The earlier period was coldest between 1680 and 1730. There is a high correlation between the melt-layer ice percentage and the mass balance of the ice cap. The relation between them suggests that the ice cap mass balance was zero (accumulation equaled ablation) during the colder period but is negative in the present warmer one. There is no firm evidence of a present cooling trend in the summer conditions on the ice cap. A comparison with the melt-layer ice percentage in cores from the other major Canadian Arctic ice caps shows that the variation of summer conditions found for the Devon Island ice cap is representative for all the large ice caps for about 90% of the time. There is also a good correlation between melt-layer percentage and summer sea-ice conditions in the archipelago. This suggests that the search for the northwest passage was influenced by changing climate, with the 19th-century peak of the often tragic exploration coinciding with a period of very cold summers. (Sims-ISWS)
W77-06890

RIVER BASIN SNOW MAPPING AT THE NATIONAL ENVIRONMENTAL SATELLITE SERVICE,
National Environmental Satellite Service, Washington, D.C.
S. R. Schneider, D. R. Wiesnet, and M. C. McMillan.
NOAA Technical Memorandum NESS 83, November 1976. 19 p, 8 fig, 1 tab, 17 ref.

Descriptors: *River basins, *Snow surveys, *Mapping, Satellites(Artificial), Snowfall, Snow cover, Meteorology, Meteorological data, Flood forecasting, Data collections.
Identifiers: *National Environmental Satellite Service(NESS), Photo-interpretative techniques, Radiometers, Snow measurement.

The development of the operational river basin snow mapping program at the National Environmental Satellite Service was described. Satellite-derived areal snow cover measurements were provided for over 20 river basins to federal and state agencies around the United States. The snow maps were made, and results were disseminated within 24 hours of a satellite pass over a study basin. The satellite sensors used in snow mapping, the methodology, possible sources of error, and quality control techniques also were described. The key element in the application of snow mapping to hydrological forecasting was the decision to map snow distribution basin by basin. This decision made the data applicable to modeling and to the buildup of data sets of climatic significance. Reliable snow cover data had never before been available to the climatologists and hydrologists. The statistical analysis of such data sets should be a powerful new tool that can be applied to river forecasting in local basins as well as to continental climatic studies. (Roberts-ISWS)
W77-06915

ANNOTATED BIBLIOGRAPHY ON NORTHERN ENVIRONMENTAL ENGINEERING 1974-75,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5D.
W77-06948

2D. Evaporation and Transpiration

AN APPROXIMATING POLYNOMIAL FOR THE COMPUTATION OF SATURATION VAPOR PRESSURE,
Naval Environmental Prediction Research Facility, Monterey, Calif.
For primary bibliographic entry see Field 2B.
W77-06652

A NOTE ON TEMPERATURE AND HUMIDITY PROFILE MEASUREMENT OVER FORESTS USING DIODES,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 7B.
W77-06653

EVAPORATION AND ADVECTION II: EVAPORATION DOWNWIND OF A BOUNDARY SEPARATING REGIONS HAVING DIFFERENT SURFACE RESISTANCES AND AVAILABLE ENERGIES,
Department of Scientific and Industrial Research, Lincoln (New Zealand). Crop Research Div.
K. G. McNaughton.
Quarterly Journal of the Royal Meteorological Society, Vol. 102, No. 431, p 193-202, January 1976. 1 fig, 6 ref, 1 append.

Descriptors: *Evaporation, *Advection, *Surfaces, *Energy, Homogeneity, Latent heat, Vapor pressure, Heat transfer, Heat resistance, Model studies, Equations, Mathematical studies.
Identifiers: *Surface resistance, Bowen ratio, Sensible heat, Moisture transfer, Heat flux, Net radiation, Psychrometric constant.

Using the model and methods developed in Part I of this study, it was shown that steady-state evaporation, downwind of a sharp boundary separating uniform regions with constant but different surface resistances and available energies, can be written as LE = (s/(s + gamma)) (Rn -G) + (s/(s + gamma)) (1/r(r'(Rn' -G') -r(Rn -G)) Phi, where Phi is a dimensionless 'exchange function' that decreases from unity to zero as distance increases downwind of the boundary. The symbols have their conventional meanings, and the primes signify upwind values. The form of Phi depends (1) on the profiles of wind speed and effective diffusivity, and (2) on the downwind surface resistance and temperature via the parameter (gamma) r/l(s + gamma). Empirical expressions for Phi were obtained (1) from a known solution of the atmospheric diffusion equations, assuming power law forms of the wind speed and effective diffusivity profiles, and (2) from a simple model assuming perfect vertical mixing and constant wind speed beneath an impermeable inversion base. These may give some indication of the form and magnitude of Phi at small and at large distances respectively. (Jones-ISWS)
W77-06897

PROFILES AND EVAPORATION,
Rothamsted Experimental Station, Harpenden (England).
H. L. Penman, and I. F. Long.
Quarterly Journal of the Royal Meteorological Society, Vol. 102, No. 434, p 841-855, October 1976. 10 fig, 1 tab, 3 ref.

Descriptors: *Evaporation, *Stability, *Profiles, *Equations, Humidity, Temperature, Weight, Winds, Transportation, Shear stress, Crops.
Identifiers: Weighting factors, Lapse rate, Kale.

In all conditions of stability, either of two slightly different profile equations could be used, both carrying built-in stability weighing factors for use in transport equations. Profiles of wind, temperature, and humidity, above and within two large plots of kale (one irrigated), were studied in detail for short periods of strong lapse and strong inversion. The objectives of the study were to show the high quality in anemometry needed to exploit the profile equation, to demonstrate a way of correcting for zero errors in the thermometry, and to show that above the crop, the profiles of wind and water vapor pressure have the same shape. Within the crop, in both lapse and inversion, the top of the crop is the source or sink for sensible heat transfer. In a humidity inversion, the top is also the sink for latent heat transfer. But in a lapse, the source is at, or close to, the virtual sink momentum. (Roberts-ISWS)
W77-06898

COMPREHENSIVE MONITORING OF METEOROLOGY, HYDRAULICS, AND THERMAL REGIME OF THE SAN DIEGO AQUEDUCT, CALIFORNIA,
Geological Survey, Bay St. Louis, Miss. Water Resources Div.
H. E. Jobson, and A. M. Sturrock, Jr.
Open-file report 76-628, August 1976. 102 p, 31 fig, 6 tab, 5 ref.

Descriptors: *Energy budget, *Hydrologic cycle, *Aqueduct, *California, *Evaporation, Canals, Data collections, Methodology, Water temperature, Meteorological data, Wind velocity, Solar radiation, Vapor pressure, Flow rates, Evaluation, Forecasting, *Monitoring.
Identifiers: *San Diego Aqueduct(Calif), Concrete-lined canal, Atmospheric radiation, Hydraulic variables.

Water temperature, as well as meteorologic and hydraulic variables which influence the energy budget of the San Diego Aqueduct in southern California, were continuously monitored for a 1-year period beginning July 24, 1973. Incoming solar and atmospheric radiation, windspeed and direction, water temperature, and wet- and dry-bulb air temperatures were recorded at 10-minute intervals at each end of the 26-km concrete-lined canal, while flow rates and stages were determined at hourly intervals for five locations. Although only daily averaged values are presented in this report, all information necessary for the use and interpretation of these data are presented. Windspeeds were minimum during the early morning hours and maximum during the late afternoon; however, they were variable spatially. On the other hand, incoming radiation and absolute vapor pressure varied little from point to point. (Woodard-USGS)
W77-06973

2E. Streamflow and Runoff

EVALUATION OF THE ENVIRONMENTAL IMPACT TO APPALACHIAN PENNSYLVANIA WATERS OF THE 1972 FLOOD AND SUBSEQUENT STREAM CHANNELIZATION WITH FUTURE POLICY RECOMMENDATIONS.
Baker (Michael), Jr., Inc., Beaver, Pa.
For primary bibliographic entry see Field 4A.
W77-06676

MATHEMATICAL MODELS IN HYDROLOGY.
United Nations Educational, Scientific and Cultural Organization, Paris (France).
For primary bibliographic entry see Field 2A.
W77-06708

FORECASTING FLOODS IN HAWAII (EXCLUDING HAWAII ISLAND),
National Weather Service, Honolulu, Hawaii. Pacific Region.
For primary bibliographic entry see Field 4A.
W77-06873

LAKE ST. CLAIR HYDROLOGIC TRANSFER FACTORS.
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W77-06879

SURFACE WATER NETWORK DESIGN BY REGRESSION ANALYSIS SIMULATION,
Geological Survey, Reston, Va. Water Resources Div.
M. E. Moss, and M. R. Karlinger.
Water Resources Research, Vol 10, No 3, p 427-433, June 1974. 7 fig, 1 tab, 5 ref.

Descriptors: *Network design, *Surface waters, *Streamflow, *Regression analysis, Methodology, Synthetic hydrology, Stochastic processes, Flow rates, Average flow, Regional analysis, *Simulation analysis.

The statistical characteristics of the accuracy of regression analyses as used in surface water regionalization are investigated by simulating logarithmic regressions of the streamflow parameters, mean and standard deviation, derived from synthetic streamflow sequences. Accuracy is measured in terms of equivalent years of at-site record. A procedure for the design of surface water data networks that accounts for the statistical nature of the estimates of parameter accuracy is presented. (Woodard-USGS)
W77-06963

DELAWARE RIVER: EVIDENCE FOR ITS FORMER EXTENSION TO WILMINGTON SUBMARINE CANYON,
Geological Survey, Woods Hole, Mass. Geologic Div.
D. C. Twichell, H. J. Knebel, and D. W. Folger.
Science, Vol 195, No 4277, p 483-485, February 1977. 2 fig, 10 ref.

Descriptors: *Delaware River, *History, *Pleistocene epoch, *River flow, *Seismic studies, Geology, Sedimentology, Valleys, Delaware, Maryland.
Identifiers: *Ancestral channels, Directional flow.

During times of lowered sea level, the rivers along the east coast of the United States flowed across the subaerially exposed continental shelf. The ancestral channels of these rivers were subsequently buried or partially obliterated by erosion during sea-level transgressions. As a result, only a few channels have been traced across the shelf. Seismic-reflection profiles indicate that during the Pleistocene the Delaware River flowed across the continental shelf east of Delaware Bay and emptied into Wilmington Submarine Canyon. The ancestral valley (width, 3 to 8 kilometers; relief, 10 to 30 meters) is buried, is not reflected in the surface topography, and probably predates the formation of the present canyon head. (Woodard-USGS)
W77-06966

FLOODS IN LOUISIANA, MAGNITUDE AND FREQUENCY, THIRD EDITION,
Geological Survey, Baton Rouge, La. Water Resources Div.
B. L. Neely, Jr.
Louisiana Department of Highways, Baton Rouge, 1976. 340 p, 16 fig, 1 tab, 17 ref.

Descriptors: *Floods, *Louisiana, *Historic floods, *Frequency analysis, *Flood data, Flood forecasting, Regression analysis, Equations, Maximum probable flood, Peak discharge, Rainfall-runoff relationships, Hydrologic data, Gaging stations, Drainage area, Natural flow, Flood recurrence interval, Flood control.

Techniques are presented for estimating the magnitude and frequency of peak discharges on streams in Louisiana. A comprehensive analysis was made in which physical and climatic characteristics of river basins are related to flood characteristics at gaging stations. Equations derived from the analysis make it possible to estimate the magnitude of peak discharges with recurrence intervals of 2 to 100 years on streams that have drainage areas less than 3,000 square miles if the drainage-area size, main-channel slope, and mean annual precipitation are known. The equations should not be used where regulation by man appreciably affects flood runoff. Data from 170 gaging stations with 9 or more years of record were used in the analysis. Flood frequency at each gaging station was computed by fitting a log-Pearson Type III distribution to gaging-station data. Flood records for all gaging stations in Louisiana are tabulated. Graphical relations of maximum floods of record to drainage area at gaging stations are shown to provide a guide to maximum probable floods. A method is described for estimating the magnitude and frequency of peak discharges on streams for urban areas in Louisiana. (Woodard-USGS)
W77-06979

TIME-DISTRIBUTION OF STORM RAINFALL IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2B.
W77-07022

2F. Groundwater

LAND FORMING SYSTEMS TO IMPROVE WATER USE EFFICIENCY,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-06761

FURTHER DEVELOPMENT AND TESTING OF A STREAM-AQUIFER SYSTEM MODEL,
Kansas Water Resources Research Inst., Lawrence.
E. C. Pogge, and W. L. Chiang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 016, Price Code: A09 in paper copy, A01 in microfiche. KWRRI Contribution No. 185, January 1977. 185 p, 41 fig, 4 tab, 112 ref, 5 append. OWRT A-055-Kan(2).

Descriptors: *Groundwater, *Alluvial aquifers, Model studies, *Mathematical models, *Simulation analysis, *Kansas, Computer programs, Base flow, Flood routing, Channel flow, *Aquifer testing.
Identifiers: *Stream-aquifer models, *Channel routing, Bank seepage, *Walnut Creek Basin(Kan).

A mathematical model was developed from theoretical models, presently available, for simulating the response of an alluvial aquifer to the passage of a flood wave through a stream channel. The model consists of a procedure for routing the flood wave through the channel system, a groundwater flow model, and a method for coupling the stream channel system to the alluvial aquifer. The model was programmed for solution on a digital computer. The primary objective was to test the model on a natural system using historic data. In the testing, the model was applied to a reach of channel in Walnut Creek Basin located in west-central Kansas. Several modifications of the model were necessary to adapt it to the existing physical system. The test program both verified the applicability of the model to a natural physical system and also revealed the type of field data required for the proper application of the model.
W77-06762

PRELIMINARY BIBLIOGRAPHY ON GROUNDWATER IN DEVELOPING COUNTRIES,
Association of Geoscientists for International Development, St. John's (Newfoundland).
D. A. V. Stow, J. Skidmore, and A. R. Berger.
The Geosciences in International Development, Report No. 4, November, 1976. 305 p, 3 append.

Descriptors: *Bibliographies, *Publications, *Groundwater, Subsurface waters, Water resources, Data storage and retrieval, Aquifers, Foreign countries, Karst, Exploration, Water chemistry, Water quality, Management, Planning, Model studies, Surveys, Groundwater resources, Water wells.
Identifiers: *Developing countries(Groundwater).

This bibliography provides a guide to recent work on the subsurface water resources of developing countries. It lists 1,574 reference items, each dealing at least in part with groundwater and related directly to developing countries, published in 1970 or later. There are indexes by country and by subject. The references were collected primarily from nine computerized data bases, but use was made of published bibliographies not specifically dealing with developing countries and of personal compilations contributed by a number of hydrogeologists with international interests and experience. The sources are listed in the appendices together with a number of additional bibliographies not consulted directly. This bibliography is the most complete listing known on the subject of ground water in developing countries. (Heiss-NWWA)
W77-06852

PERFORMANCE OF A RECHARGE AND RECOVERY SYSTEM IN AN AQUIFER WITH UNIFORM FLOW,
Technische Hogeschool, Delft (Netherlands). Geophysical Lab.
P. A. Vermeer, and C. van den Akker.
Hydrological Sciences Bulletin, Vol 21, No 3, p 387-396, September 1976. 8 fig, 2 ref.

Descriptors: *Potential flow, *Wells, *Theis equation, *Water supply development, *Groundwater recharge, *Recharge wells, Recharge, Groundwater, Analysis, Discharge(Water), Conjunctive use, Steady flow, Unsteady flow, Water storage, Well spacing.
Identifiers: Two-dimensional flow.

Flow from an injection well to a pumping well was considered in an aquifer with an initial uniform flow. Since the capacities of the wells were taken to be equal, it was believed that the wells disturb the uniform flow only locally. However, it was found that downstream from the wells the natural groundwater is replaced by injected water. A formula for this (steady) exchange was derived, assuming an abrupt interface between the two fluids and a constant pumping rate. The additional (unsteady) exchange due to a non-constant rate of injection was computed for the case when the pumping well is placed exactly downstream from the injection well. Under this special condition the steady exchange is equal to zero. (Adams-ISWS)
W77-06905

TABLES AND TYPE CURVES FOR ANALYSIS OF PUMP TESTS IN LEAKY PARALLEL-CHANNEL AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 4B.
W77-06941

COMPARISON OF ITERATIVE METHODS OF SOLVING TWO-DIMENSIONAL GROUNDWATER FLOW EQUATIONS,
Geological Survey, Reston, Va. Water Resources Div.
P. C. Trescott, and S. P. Larson.
Water Resources Research, Vol 13, No 1, p 125-135, February 1977. 13 fig, 1 tab, 20 ref.

Descriptors: *Groundwater movement, *Subsurface flow, *Model studies, *Mathematical models, *Equations, Methodology, Evaluation, Correlation analysis, Aquifer characteristics, Hydrogeology.
Identifiers: *Finite-difference equations.

The efficiency of line successive overrelxation (LSOR) is compared with a two-dimensional correction procedure (2DC), the iterative, alternating direction implicity procedure (ADI), and the strongly implicit procedure (SIP) to solve finite-difference equations used to simulate several groundwater reservoirs. Three of the reservoirs are linear, two are isotropic areal problems, and the third is an anisotropic cross-section simulation. The fourth is a nonlinear water table aquifer with areas of thin saturation. SIP is generally the best method for the linear simulations and with the addition of another iteration parameter is the only method that gives an adequate rate of convergence for the water table problem. LSOR with 2DC is competitive with SIP on isotropic and anisotropic linear problems that are dominated by no-flow boundaries. ADI is generally more efficient than LSOR if a good set of iteration parameters are used, but this advantage is offset by the relative ease of finding the best acceleration parameter for LSOR. (Woodard-USGS)
W77-06965

ANALOG-MODEL SIMULATIONS FOR SECONDARY CANAL CONTROLS AND FOR-

WARD PUMPING WATER-MANAGEMENT SCHEMES IN SOUTHEAST FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06968

HYDROLOGIC INTERPRETATION OF GEOPHYSICAL DATA FROM THE SOUTHEASTERN HUECO BOLSON, EL PASO AND HUDSPETH COUNTIES, TEXAS,
Geological Survey, El Paso, Tex. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06970

GEOLOGY AND GROUND WATER IN DOOR COUNTY, WISCONSIN, WITH EMPHASIS ON CONTAMINATION POTENTIAL IN THE SILURIAN DOLOMITE,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06975

APPLICATION OF DIGITAL MODELLING TO THE PREDICTION OF RADIOISOTOPE MIGRATION IN GROUNDWATER,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06981

2G. Water In Soils

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, UMATILLA DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
J. A. Norgren, and G. H. Simonson.
Prepared for the Oregon State Water Resources, 1969, Appendix I-7. 73 p, 3 fig, 10 tab, 2 map.

Descriptors: *Soils, *Soil surveys, *Soil profiles, *Soil properties, *Soil types, *Runoff, *Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone.
Identifiers: *Umatilla River Basin(OR), *Available water-holding capacity(AWHC), *Shrink-swell potential, *Erosion hazard, *Temperature limitation.

Soil survey information of the National Cooperative Soil Survey program in Oregon was used to map, describe and interpret soils in the Umatilla River Basin in northern Oregon. Soils are interpreted with regard to water use and management. Soil series consist of soils essentially uniform in characteristics such as texture, structure, arrangement of horizons, etc. Poorly drained and alkali soils with hardpans impeding drainage are found mostly in Umatilla County, with some problems also in Morrow County. Both alkali and drainage conditons can be altered by man's activities. Twelve soil or land characteristics are used in a guide for placing soils in irrigation groups; these characteristics are rated excellent, good/fair, poor, very poor/nonirrigable. Athena, Palouse, Ritzville, Sagemoor (Warden) and Walla Walla soils have excellent irrigation suitability. A total of 36 soil series were found unsuited for irrigation because of stoniness or steep slopes. Soils subject to occasional flooding are Esquatzel, Hermiston, Onyx, Pedigo, Stanfield, Umapine, and Yakima. Soils with the highest potential for runoff are Bakeoven, Bakeoven-biscuit complex, Ephrata-shallow, Lickskillet, McKay, Rock Creek, Rock Creek-Waha complex, Rockland, and Starbuck. All soils are analyzed in terms of runoff, permeability, available water-holding capacity (AWHC), effective root zone, shrink-swell potential, workability, erosion hazard, and temperature limitations. Detailed descriptions are given of soil series and mapping units in the Umatilla Drainage Basin. (Gentry-NC)
W77-06602

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREA, GRANDE RONDE DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
H. M. Vance, M. G. Lindsay, and G. H. Simonson.
Prepared for the Oregon State Water Resources Board, 1969, Appendix I-8. 69 p, 2 fig, 11 tab, 2 map.

Descriptors: *Soils, *Soil surveys, *Soil profiles, *Soil properties, *Soil types, *Infiltration, *Runoff, *Irrigation, *Infiltration rates, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone.
Identifiers: *Grande Ronde Drainage Basin(OR), *Available water-holding capacity(AWHC), *Shrink-swell potential, *Erosion hazard, *Temperature limitation.

A general soil map and soil descriptions, interpretations and acreage figures are given for 3,180,000 acres of the Grande Ronde Drainage Basin in northeast Oregon, 550,000 acres of which are suited for crop and improved pasture land. Information used in this report is based on data collected by the National Cooperative Soil Survey program in Oregon. The basin has a wide variety of terrain reflecting uplift and deep dissection of lava plateaus, mountain glaciation, and deposition in structural valleys. Aeolian deposits of loess and volcanic ash are widespread. Poorly drained and sodic soils include Wilkins, Haines, Hoopal and Hot Lake Soils. Four irrigation suitability ratings are used for rating 12 soil/land characteristics for irrigability. Soils suitable for irrigation are Alicel, (By), Imbler and Palouse soils. A total of 20 soils are unsuited for irrigation due to slopes greater than 20% and due to stoniness, depth, extreme elevations and temperatures, or some combinations of these factors. Soils subject to occasional flooding are (By), Catherine, Haines, Hot Lake, (Ne), (Sl), Veazie and Wilkins. Soils with the highest potential for runoff are soils shallow to bedrock, claypan, hardpan, clayey soils or poorly drained soils; 9 soils are included in this group. Soils are analyzed in terms of runoff potential, infiltration, permeability, available water-holding capacity (AWHC), effective root zone, shrink-swell potential, workability, erosion hazard, temperature limitations. Soil interpretations relate to water use and management. Descriptions are given of the soil series and mapping units identified in the Basin and shown on the soil map. (Gentry-NC)
W77-06603

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, POWDER DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
M.G. Lindsay, and G. H. Simonson.
Prepared for the Oregon State Water Resources Board, 1969, Appendix I-9. 66 p, 2 fig, 10 tab, 2 map.

Descriptors: *Soils, *Soil surveys, *Soil profiles, *Soil properties, *Soil types, *Infiltration, *Infiltration rates, *Runoff, *Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone.
Identifiers: *Powder Drainage Basin(OR), *Available water-holding capacity(AWHC), *Shrink-swell potential, *Erosion hazard, *Temperature limitation.

A general soil map and soil descriptions, interpretations and acreage figures are presented for 2,048,500 acres of the Powder Drainage Basin in northeast Oregon, 400,000 acres of which are suitable for crops or improved pasture. Soil information presented is needed for general planning of resource development in the Power Basin, with soils being interpreted in terms of water use and management. Soils are analyzed in the Wallowa and Elkhorn Mountains, forested uplands, grassland uplands, and valley lands. Poorly drained and alkali soils are hershal, (Rb), Baldock, Haines, Stanfield and Umapine. Twelve soil/land characteristics are rated for irrigation suitability. Jett and Powder soils are excellently suited for irrigation. Thirty of the 48 soils described are poorly suited for irrigation due to stoniness, texture, depth or temperature, or due to excessive slope. Soils subject to occasional flooding are Baldock, Balm, Catherine, Goodrich, Haines, Hershal, Jett, Langrell, Powder, (Rb), Stanfield, Umapine and Wingville. Soils with greatest potential are soils which are very shallow to bedrock, clayey soils and poorly drained soils, and include Bakeoven, Halfway, Hershal, (Rb), Rock Creek, and rough mountainous land. Soils are analyzed according to runoff, infiltration, permeability, available water-holding capacity (AWHC), effective root zone, shrink-swell potential, workability, erosion hazard and temperature limitation. Descriptions are given of the soil series and land types identified in the Powder Basin and shown on the soil map. Soil information is based on the National Cooperative Soil Survey program in Oregon. (Gentry-NC)
W77-06604

OREGON'S LONG RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, MALHEUR RIVER DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
B. B. Lovell, M. G. Lindsay, J. A. Norgren, D. W. Anderson, and G. H. Simonson.
Prepared for the Oregon State Water Resources Board, 1969, Appendix I-10. 85 p, 3 fig, 10 tab, 2 map.

Descriptors: *Soils, *Soil surveys, *Soil profiles, *Soil properties, *Soil types, *Infiltration, Infiltration rates, *Runoff, *Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone.
Identifiers: *Malheur River Drainage Basin(OR), *Available water-holding capacity(AWHC), *Shrink-swell potential, *Erosion hazard, *Temperature limitation.

A general soil map and soil descriptions, interpretations and acreage figures are given for 2,879,400 acres of Malheur Drainage Basin located in southeastern Oregon. The Malheur Basin in predominantly hilly, strongly dissected terrain, underlain by old sediments and volcanic rock. Irrigated agriculture is concentrated on the broad terraces and flood plains bordering the Snake River and the lower reaches of the Malheur River and Willow Creek. Physiographic divisions include the low-elevation terraces and flood plains, grass-shrub uplands, small bottomland and basins at higher elevations, and forested uplands. Soils with poor drainage and alkali conditions are located primarily in Malheur and Harney counties, in the South Fork Malheur and Snake River sub-basins. Twelve soil or land characteristics are rated for irrigation suitability; the ratings used are excellent, good/fair, poor, very poor/nonirrigable. Twenty-four soils are unsuited for irrigation due to shallow and stony soils, or due to steep slopes. Soils subject to flooding are Bully, Barbutt, (Gi), Jett, (Ki), Powder, Riverwash, (Sm), Stanfield, Umapine, and Units 1, 3, 10, 15, and 43. Soils are analyzed according to runoff, permeability, available water-holding capacity (AWHC), effective root zone, shrink-swell potential, workability, erosion hazard, and temperature limitation. Soils are interpreted with regard to water use and manage-

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ment. Detailed descriptions are given of the soil series, reconnaissance classification units, and mapping units. The information is based on the National Cooperative Soil Survey Program in Oregon. (Gentry-NC)
W77-06605

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, OWYHEE DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
B. B. Lovell, M. G. Lindsay, J. A. Norgren, D. W. Anderson, and G. H. Simonson.
Prepared for the Oregon State Water Resources Board, 1969, Appendix I-11. 72 p, 3 fig, 10 tab, 2 map.

Descriptors: *Soils, *Soil surveys, *Soil profiles, *Soil properties, *Soil types, *Infiltration, *Infiltration rates, *Runoff, *Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone.
Identifiers: *Owyhee Drainage Basin(OR), *Workability, *Available water-holding capacity(AWHC), *Shrink-swell potential, *Erosion hazard, *Temperature limitation.

A general soil map and soil descriptions, interpretations and acreage figures are given for 3,775,000 acres of the Owyhee Drainage Basin in southeast Oregon, more than 1 million acres of which are suitable for crops and improved pasture. The Owyhee Basin is gently sloping and rolling lava plateau terrain with precipitation between 8 and 12 inches annually, with a short growing season. Elevations range from 2,100 to 7,000 feet. The main irrigated area is along the Snake and lower Owyhee Rivers. Physiographic areas include alluvial bottomlands, nearly level closed basins or bottomlands, grass-shrub covered lava plateau uplands, and canyonlands and mountainous uplands. General locations of poorly drained and alkali soils are given. A guide is presented for irrigation suitability of soils, with ratings given to 12 soil or land characteristics; the ratings are excellent, good/fair, poor, very poor/nonirrigable. Sixteen soils are unsuited for irrigation due to steep slopes or shallow, stony soils; soils subject to occasional flooding and ponding are listed. Soils are analyzed according to runoff, permeability, available water-holding capacity (AWHC), effective root zone, shrink-swell potential, workability, erosion hazard, and temperature limitations. Interpretations of soils are related to water use and management applicable to resource planning. Detailed descriptions of reconnaissance classification units, soil series and mapping units are given. The information used in the report is from the National Cooperative Soil Survey program in Oregon. (Gentry-NC)
W77-06606

SUPRAPERMAFROST WATER,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2C.
W77-06630

DEPTH AND SEASONAL FLUCTUATIONS IN THE CONDITION OF THE GROUNDWATER OF THE AREA AROUND THE CITY OF GHENT (BELGIUM), (IN DUTCH),
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Bodemfysische.
R. Hartmann.
Meded Fac Landbouwwet Rijksuniv Gent 38(2), p 281-293, 1973.

Descriptors: Seasonal, Depth, *Groundwater, *Sands, Rainfall, Evaporation, *Water table, *Water level fluctuations, *Soil texture, Water levels, Measurement.
Identifiers: *Belgium(City of Ghent).

The fluctuations of the ground water-table in sandy soils of this area as results of the interaction between rainfall and evaporation, were measured during a period of 5 yr. The measurements were carried out for 4 different drainage classes. For the sandy soils of Ghent the lowest mean annual level is higher and the highest mean annual level is lower in comparison with sandy soils of the Campine in the province Antwerp. The difference in the fluctuation is due to the finer texture of the sandy soil around Ghent. The average depths of the high and low water-levels, which an be deduced from morphological properties of the soil profile, correspond to the standards of the drainage classes derived from the watertable fluctuations observed during 5 consecutive years.
W77-06681

LAND FORMING SYSTEMS TO IMPROVE WATER USE EFFICIENCY,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-06761

SMOOTHING DATA WITH CUBIC SPLINES,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 7C.
W77-06831

A METHOD OF EVALUATING A FIELD WATER CAPACITY USING PF-3, (IN FRENCH),
Institut National de la Recherche Agronomique, Toulouse (France). Station d'Agronomie.
C. Dancette, and C. Maertens.
Bull Assoc Fr Etude Soil 3, p 165-172, 1974.

Descriptors: *Field capacity, *Retention, *Moisture content, *Soil moisture, Agriculture, Alluvium, Methodology.

A method allowing the approximate determination of field capacity, using only the determination of water retention of pF (a measure of soil humidity)=3, is described. In alluvial soils, the accuracy of this method appears sufficient to satisfy the current needs of agriculture.--Copyright 1976, Biological Abstracts, Inc.
W77-06844

POTASSIUM IN AN ARID LOESSIAL SOIL: CHANGES IN AVAILABILITY AS RELATED TO CROPPING AND FERTILIZATION,
Utah State Univ., Logan. Dept. of Soil and Meteorology.
For primary bibliographic entry see Field 3F.
W77-06870

BONDING OF CALCIUM AND POTASSIUM BY VERMICULITE AND KAOLINITE CLAYS AS AFFECTED BY H-CLAY ADDITION,
Ohio State Univ., Columbus. Dept. of Agronomy.
A. S. Baweja, and E. O. McLean.
Soil Science Society of America Proceedings, Vol. 39, No. 1, p 48-50, January-February 1975. 2 fig, 1 tab, 16 ref.

Descriptors: *Kaolinite, *Calcium, *Potassium, Soils, Soil investigations, *Clays, *Bonding.
Identifiers: *Vermiculite.

The less than 2 micro-m fraction of Libby vermiculite and Peerless kaolinite was separated and H-saturated by resin treatment. The H-clay suspensions were immediately saturated with either Ca or K by addition of the respective hydroxides. Six reciprocal Ca-K saturations of each clay were prepared by mixing the Ca- and K-clays in appropriate amounts. Increments of H-clay were added to lower the base saturation and thereby inactivate the pH-dependent charges. Radioisotopes, 45Ca and 86Rb, were used as tracers for Ca and K, respectively. Two-phase Donnan-type systems were prepared and equilibrated for 23 days. Radioactivity in both phases was then assayed and the amounts of Ca and K retained in the suspension phases of the two clay systems computed. The pH-dependent fraction of the total CEC was 6.9 and 18.0% for vermiculite and kaolinite, respectively. Additions of H-clay increased the bonding of both Ca and K as indicated by greater clay-phase retention. However, maximum retention of the cations at all Ca-K saturation ratios did not occur when the amounts of H-clay added equaled the pH-dependent charge fraction of the clay as had occurred with bentonite and illite. (Skogerboe-Colo St)
W77-06872

FATE OF NITROGEN AND PHOSPHORUS IN SOILS UNDER SEPTIC TANK WASTE DISPOSAL FIELDS,
Agricultural Research Service, Beltsville, Md. Biological Waste Management Lab.; Agricultural Research Service, Beltsville, Md. Soil Nitrogen Lab.; and Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W77-06914

ACCUMULATION OF HEAVY METALS IN SOILS FROM EXTENDED WASTE WATER IRRIGATION,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-07049

PHOSPHATES IN SOILS TREATED WITH SEWAGE WATER: I. GENERAL INFORMATION ON SEWAGE FARM, SOIL, AND TREATMENT RESULTS,
Agricultural Univ., Wageningen (Netherlands).
For primary bibliographic entry see Field 5G.
W77-07052

PHOSPHATES IN SOILS TREATED WITH SEWAGE WATER: II. FRACTIONATION OF ACCUMULATED PHOSPHATES,
Agricultural Univ., Wageningen (Netherlands).
For primary bibliographic entry see Field 5B.
W77-07053

SOLUBILITY AND PLANT UPTAKE OF CADMIUM IN SOILS AMENDED WITH CADMIUM AND SEWAGE SLUDGE,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-07055

UNDERFLOW FROM SLUDGE-IRRIGATED CROPLAND,
Springfield Sanitary District, Ill.
For primary bibliographic entry see Field 5B.
W77-07056

2H. Lakes

MIXING AND CIRCULATION OF LAKES AND RESERVOIRS WITH AIR PLUMES,
New Hampshire Univ. Durham. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W77-06633

MIXING IN UPPER LAYER OF A LAKE DURING HEATING CYCLE,
Institute of Oceanographic Sciences, Wormley (England).

S. A. Thorpe, and A. J. Hall.
Nature, Vol. 265, No. 5596, p 719-722, February 24, 1977. 5 fig, 5 ref.

Descriptors: *Mixing, *Lakes, *Water temperature, Waves(Water), Winds, On-site investigations, Measurement, Surveys, Instrumentation, Data processing, Stratification, Stability, Heat, Heat transfer, Heating, Temperature, Currents(Water), Internal waves, Freshwater, Limnology.
Identifiers: Billows.

Little is yet known about the structure of the upper 'mixing' layer of the ocean below the zone of direct surface wave influence. Some measurements were reported of the temperature field in the mixing layer of a freshwater lake during the heating cycle. The measurements demonstrate some of the processes which may be important. The temperature field is found to be isotropic at scales less than about 60 cm, but the effect of stratification becomes important at larger scales, reducing the vertical correlations in comparison with the horizontal. The spatial evolution of structures is dominated by the shear, as appropriate in the low Richardson number region. Examination of the stability of the mean velocity and density profiles showed that Kelvin-Helmholtz instability may be expected, leading to billows with wavelengths of about 60 m, and corresponding to fluctuation scales observed in the temperature records. Similar fluctuations were seen in the nocturnal atmospheric boundary layer. (Sims-ISWS)
W77-06649

THE OBSERVED WINTER CIRCULATION OF LAKE ONTARIO,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
R. L. Pickett.
Journal of Physical Oceanography, Vol. 7, No. 1, p 152-156, January 1977. 7 fig, 1 tab, 8 ref.

Descriptors: *Lake Ontario, *Great Lakes, *Winter, *Circulation, Bathymetry, Lakes, Mathematical models, Currents, Temperature, Numerical analysis.
Identifiers: *Lake circulation, *Winter circulation, Lake currents, Gyre pattern, Whole-lake studies.

Lake Ontario's winter circulation had not been observed prior to 1972 because harsh weather and lake ice discouraged the extension of observations past autumn. Previous whole-lake studies were made via surface drift bottles or moored current meters. Hydraulic circulation from inflow-outflow is always small, and thermally driven flow in nearly isothermal water must be small. Therefore, winter currents should be wind driven. Previous wind-driven patterns for Lake Ontario's winter circulation were based on homogeneous, vertically integrated numerical models. The models included both friction and the earth's rotation in transport for a given wind. Another steady-state model predicted 2 counter-rotating gyres induced by the bowl-shaped bathymetry. Transport was with the wind nearshore, and against the wind offshore. A third time-dependent model showed only a one-gyre pattern rotating in the direction of the applied wind curl. Other researchers felt that the dominant pattern depended on the relative strength of the bathymetric-wind curl effects. During the International Field Year for the Great Lakes in 1972-73, the winter circulation of Lake Ontario was finally observed. Data suggested that currents and temperatures are nearly constant with depth, and that the lake-wide mean circulation pattern consists of either one counterclockwise or two counter-rotating gyres. (Roberts-ISWS)
W77-06655

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF EUTROPHICATION IN SAGINAW BAY,
Bendix Aerospace Systems Div. Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W77-06665

MEASUREMENTS OF PLANKTONIC BIOMASS IN A RESERVOIR,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W77-06679

LIMNOLOGICAL AND PLANKTONIC STUDIES IN THE WATERTON LAKES, ALBERTA,
Canadian Wildlife Service, Edmonton (Alberta).
For primary bibliographic entry see Field 5C.
W77-06680

MEANS FOR PROTECTING THE DRINKING WATER QUALITY OF LAKE GEORGE, NEW YORK,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5G.
W77-06682

STRATIFICATION OF KINETIC ORIGIN AND ITS BIOLOGICAL CONSEQUENCES IN A NEOTROPICAL MAN-MADE LAKE,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
Z. M. Gliwicz.
Ekologia Polska, Vol. 24, No. 2, p. 197-209, 1976. 6 fig., 1 tab., 22 ref.

Descriptors: *Thermal stratification, *Reservoirs, *Subtropic, *Cycling nutrients, *Thermocline, Productivity, Metalimnion, Oxygen sag, Lakes.
Identifiers: *Madden Lake(Panama Canal Zone).

In subtropical Maddel Lake in the Panama Canal Zone the density gradient prevents a substantial portions of the nutrients from cycling within the reservoir. The concentration of nutrients in the euphotic zone induces a steady-state high standing crop and phytoplankton production, with only the more difficult oxidizable organic matter falling to the deeper layers where it is quickly carried away by the colder Rio Chagres water. Madden Lake has a strong thermal stratification of up to 5C differentiation between surface and bottom layers which results from the cool river influents filling the bottom layers of the lake. The steep gradients of water density in the metalimnion correspond to a negative retrograde minima in oxygen depth profiles. Both the steepness and the depth of the density gradient depend on the reach of vertical mixing as well as on the temperature and volume of river influents. Oxygen-saturated river water moving slowly below the metalimnion along the former river beds reduces oxygen deficiency in the hypolimnion; and when the density gradient is sufficiently steep, sinking of organic matter is slowed in the metalimnion producing oxygen minima due to the high respiration intensity of the entire plankton community in the thermocline layer. (Auen-Wisconsin).
W77-06683

A GENERAL MODEL OF MICROBIAL GROWTH AND DECOMPOSITION IN AQUATIC ECOSYSTEMS,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5C.
W77-06684

DYNAMICS OF PHYTOPLANKTON BIOMASS IN TWO LAKES OF DIFFERENT LIMNOLOGICAL CHARACTER,
Instytut Przyrodniczych Podstaw, Lubin (Poland). Produkeji Roslinnej AR.
For primary bibliographic entry see Field 5C.
W77-06685

NUTRIENT REMOVAL AND SLUDGE DISPOSAL WITHIN SEPTIC SYSTEMS-PHASE III,
Rensselaer Polytechnic Inst., Troy, N. Y. Fresh Water Inst.
For primary bibliographic entry see Field 5D.
W77-06686

LAKE CURRENTS AND TEMPERATURES NEAR THE WESTERN SHORE OF LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
G. K. Sato, and C. H. Mortimer.
Special Report No. 22, March 1975. 322 p, 218 fig, 6 tab, 56 ref. AEC AT(11-1)-2158.

Descriptors: *Lake Michigan, *Currents(Water), Winds, *Water temperature, Temperature, Water circulation, Current meters, On-site data collections, Instrumentation, *Thermal pollution, Powerplants, Data processing, Internal waves, Upwelling, Stratification, Lakes, Limnology, *Path of pollutants.

The objective was a description of the variability of nearshore current regimes and temperature fields in the neighborhood of the Wisconsin Electric Company's fossil-fueled, lake-cooled power plant at Oak Creek, Wisconsin. Attention was paid, not to plume geometry and behavior in the near field (except for a study of sinking plumes in winter), but to the ambient lake motions into which the plumes are being discharged. An array of recording current meters and thermographs wasmoored in an area of approximately 15 km alongshore, and the same distance offshore, to provide 10-minute readings of current speed, current direction, and temperature. The currents in the coastal region proved to be mainly responsive to the direction of the wind. Vector frequency diagrams and progressive vector diagrams for monthly or shorter intervals confirmed the predominantly shore-parallel current patterns with greater flow tendancy towards SSE. Current speeds were variable, monthly means were commonly as low as 5 cm/sec, but such means included episodes of very weak currents (less than 4 cm/sec), which in total may have occupied half the month. The current speeds in the other half ranged from 4 to over 30 cm/sec. Before stratification had become established in June, temperature records showed steady increases and no large variations, but after stratification, the effects of upwelling and downwelling events became apparent, associated with north-going and south-going currents, respectively. The onset of upwelling and downwelling was signalled by a respective drop or rise in temperature, often sudden and common-associated with a reversal in current flow. (See also W75-11190) (Sims-ISWS)
W77-06687

THE MINING FAUNA IN FOUR MACROPHYTE SPECIES IN MIKOLAJSKIE LAKE,
Polish Academy of Sciences, Warsaw. Lab. of Ecological Bioenergetics.
For primary bibliographic entry see Field 5C.
W77-06688

LAKE RESTORATION BY BOTTOM WATER SIPHONING (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland). Marine Research Lab.
For primary bibliographic entry see Field 5G.
W77-06689

THE SHARE OF ALGAE WITH DIFFERENT DIMENSIONS IN THE PLANKTON OF TWO LAKES OF DIFFERENT TROPHIC CHARACTER IN THE ANNUAL CYCLE,
Instytut Przyrodniczych Podstaw, Lubin (Poland). Produkeji Roslinnej AR.

For primary bibliographic entry see Field 5C.
W77-06692

PRESENTING TRENDS IN LAKE EUTROPHICATION,
CBA Engineering Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5C.
W77-06693

A STUDY ON THE ROLE OF HERBIVOROUS ZOOPLANKTON COMMUNITY AS PRIMARY CONSUMERS OF PHYTOPLANKTON IN DUTCH LAKES,
For primary bibliographic entry see Field 5C.
W77-06695

SOME EFFECTS ON INTEGRAL PHOTOSYNTHESIS OF ARTIFICIAL CIRCULATION OF PHYTOPLANKTON THROUGH LIGHT GRADIENTS,
For primary bibliographic entry see Field 5C.
W77-06696

THE USE OF REMOTE SENSING TO DETECT HOW WIND INFLUENCES PLANKTONIC BLUE-GREEN ALGAL DISTRIBUTION,
For primary bibliographic entry see Field 5C.
W77-06697

THE HISTORIC AND PRESENT RELATIONSHIPS BETWEEN PHYTOPLANKTON, LIMITING NUTRIENTS, AND SEDIMENT-WATER GEOCHEMICAL PROCESSES IN SELECTED MAINE LAKES,
Maine Univ. at Orono. Land and Water Resources Inst.
For primary bibliographic entry see Field 5C.
W77-06741

THE INFLUENCE OF EFFLUENT HEATED WATERS ON THE BOTTOM FAUNA OF LAKES IN THE VICINITY OF KONIN I. QUANTITATIVE RELATIONS AND QUALITATIVE COMPOSITION OF THE BOTTOM FAUNA OF THE KONIN LAKES COMPLEX, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
For primary bibliographic entry see Field 5C.
W77-06749

THE INFLUENCE OF EFFLUENT HEATED WATERS ON THE BOTTOM FAUNA OF LAKES IN THE VICINITY OF KONIN II. CHANGES IN TIME OF BOTTOM FAUNA, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
For primary bibliographic entry see Field 5C.
W77-06750

THE INFLUENCE OF EFFLUENT HEATED WATERS ON THE BOTTOM FAUNA OF LAKES IN THE VICINITY OF KONIN III. AN EFFORT TO EXPLAIN THE CAUSES AND RESULTS OF CHANGES IN THE BOTTOM FAUNA OF LAKES AS INFLUENCED BY THE INFLOW OF HEATED WATERS, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
For primary bibliographic entry see Field 5C.
W77-06751

PRIMARY AND SECONDARY PRODUCTION OF PLANKTON IN HEATED LAKES, (IN POLISH),
Polish Academy of Sciences, Warsaw. Inst. of Ecology; and Polish Academy of Sciences, Warsaw, Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W77-06752

THE INFLUENCE OF HEATED EFFLUENT WATERS ON THE WATER CHEMISM OF KONIN LAKES, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
For primary bibliographic entry see Field 5C.
W77-06753

OCCURRENCE AND GROWTH OF DREISSENA POLYMORPHA PALL. IN LAKES INCLUDED IN A COOLING SYSTEM, (IN POLISH),
Polish Academy of Sciences, Warsaw. Inst. of Ecology; and Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W77-06754

LONG-TERM CHANGES OF THE PELAGIC PRIMARY PRODUCTION IN HEATED LAKES, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
For primary bibliographic entry see Field 5C.
W77-06755

THE INFLUENCE OF HEATED EFFLUENT WATERS ON THE THERMAL-OXYGEN RELATIONS AND WATER TRANSPARENCY IN THE KONIN LAKES COMPLEX, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
For primary bibliographic entry see Field 5C.
W77-06756

CHANGES IN THE STRUCTURE OF PHYTOPLANKTON DURING THE FIRST YEARS OF EXISTENCE OF THE DERDAP STORAGE RESERVOIR, (IN SERBO-CROATIAN),
Institute for Biological Research, Belgrade (Yugoslavia).
D. Milovanovic.
Arh Biol Nauka 15(1/2), p 75-84, 1973.

Descriptors: *Phytoplankton, *Reservoirs, Habitats, *Environmental effects, Hydroelectric plants, Diatoms, Chlorophyta.
Identifiers: Microcystis aeruginosa, *Yugoslavia(Derdap Reservoir).

The qualitative and quantitative changes in the structure of phytoplankton in a water medium modified morphometrically and hydrologically by the construction of the Derdap water power system (Yugoslavia) were analyzed in detail. The phytoplankton has retained its original autochthonous biocenotic composition of a Diatomeae-Chlorophyceae type along the longitudinal profile of the reservoir. New components of the phytoplankton community were registered during 2 summers. An ecologically and trophically characteristic species Microcystic aeruginosa, was abundant.--Copyright 1976, Biological Abstracts, Inc.
W77-06786

EXPERIMENT WITH A MULTIPOINT SYSTEM FOR JUDGING CARP FATTENING PONDS, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
G. I. Shpet, and N. N. Nharitonova.
Gidrobiol Zh 11(2), p 51-59, 1975.

Descriptors: *Productivity, *Carp, *Ponds, *Freshwater fish, Dimensions, Flow, Depth, Hydrogeology, Water chemistry, Climatic zones, Fish.
Identifiers: Productivity indexes, Water exchange, Ukrainian-SSR, USSR.

A multipoint system is suggested for determination of natural fish productivity from 18 indices taking into account the pond dimensions, water exchange, depths, ground conditions, hydrochemistry and other factors. Dekpending on the optimum, medium or minimum value of each index, the respective percentage is added to or subtracted from the initial value. This yields a value of natural fish productivity. The results of this method of examination in 17 ponds in 3 climatic zones of the Ukrainian S.S.R. (USSR) are presented.--Copyright 1976, Biological Abstracts, Inc.
W77-06798

LAKE ST. CLAIR HYDROLOGIC TRANSFER FACTORS.
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
F. H. Quinn.
NOAA Technical Memorandum ERL GLERL-10, July 1976. 19 p, 1 fig, 16 tab, 3 ref.

Descriptors: Hydrology, *Lakes, Water resources, *Precipitation(Atmospheric), *Evaporation, *Runoff, *Storage, Rainfall-runoff relationships.
Identifiers: *Lake St. Clair, *Transfer factors(Hydrologic).

Monthly hydrologic transfer factors were developed for Lake St. Clair for the period 1950-1974 to aid in the comparison and coordination of St. Clair and Detroit River monthly flows. The transfer factor is defined as the sum of the monthly precipitation and runoff minus the evaporation and change in storage. Each of the hydrologic constitutents were determined independently from available data. (NOAA)
W77-06879

LAKE ONTARIO ATLAS: SURFACE WAVES,
New York Sea Grant Inst., Albany.
G. E. Myer.
New York Sea Grant Institute Lake Ontario Atlas Monograph No. NYSSGP-OA-77-004, 1977. 109 p, 56 fig, 64 ref.

Descriptors: *Lake Ontario, *Lakes, *Water levels, Seiches, Gravity waves, Wind tides, Surges, Tides, Data collection.
Identifiers: Atlases, Surface waves, Astronomical tides.

An analysis of gravity waves, seiche, wind tides, and long-term variations in lake level is provided. A computerized analysis details the dynamics of each effect. Specific storm effects are analyzed and an example of hindcasting of wind velocity v. wave height is explained. Although records of water levels through 1974 indicate that the average lake surface elevation has varied as much as 2 m, locally the variations in water level have been greater than this. Some of the changes have been aperiodic, others have followed a long period, and many were somewhat periodic but with short periods. This monograph has been written as a summary of much of what is now known about these locally observed time dependent water level variations in Lake Ontario. (NOAA)
W77-06884

IRON-RICH RHYTHMICALLY LAMINATED SEDIMENTS IN LAKE OF THE CLOUDS, NORTHEASTERN MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 2J.
W77-06901

A DEVICE FOR MEASURING SEEPAGE FLUX IN LAKES AND ESTUARIES,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.

For primary bibliographic entry see Field 7B.
W77-06903

HYDRAULICS OF SHEET FLOW IN WETLANDS,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-06929

IDENTITY, ORIGIN AND DEVELOPMENT OF OFF-FLAVORS IN GREAT LAKES ANADROMOUS FISH,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 5A.
W77-06931

NUMERICAL MODELS OF WIND-DRIVEN CIRCULATION IN LAKES,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. T. Cheng, T. M. Powell, and T. M. Dillon.
Applied Mathematical Modelling, Vol 1, p 141-159, December 1976. 11 fig, 1 tab, 99 ref.

Descriptors: *Lakes, *Water circulation, *Winds, *Mathematical models, Numerical analysis, Equations, Finite element analysis, Analytical techniques, Hydrodynamics, Turbulence, Mixing, Shallow water, Gravity waves, Evaluation.
Identifiers: *Three-dimensional models, *Ekman-type models.

The state-of-the-art of numerical modelling of large-scale wind-driven circulation in lakes is presented. The governing equations which describe this motion are discussed along with the appropriate numerical techniques necessary to solve them in lakes. The numerical models are categorized into three large primary groups: the layered models, the Ekman-type models, and the other three-dimensional models. Discussions and comparison of models are given and future research directions are suggested. (Woodard-USGS)
W77-06958

HYDROCHEMISTRY OF THE LAKE MAGADI BASIN, KENYA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-06967

MONROE RESERVOIR, INDIANA, PART I: HYDROLOGIC CIRCULATION, SEDIMENTATION, AND WATER CHEMISTRY PART II: NUTRIENT RELATIONS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W77-06982

2I. Water In Plants

INFLUENCE OF GRADIENT ON THE DISTRIBUTION OF FISHES IN CONOWINGO CREEK, MARYLAND AND PENNSYLVANIA,
Ichthyological Associates, Inc., Durmore, Pa.
C. H. Hocutt, and J. R. Stauffer.
Chesapeake Science, Vol. 16, No. 1, p. 143-147, 1975. 2 tab, 3 fig, 17 ref.

Descriptors: *Streams, *Gradients(Streams), Flow, *Gradation, *Distribution, *Distribution patterns, *Spatial distribution, *Fish, *Environmental effects, Freshwater fish, Analytical techniques, Sampling, Stream fisheries, Suckers, Minnows.
Identifiers: *Conowingo Creek(Md-Pa), Rhinichthys atratulus, Notropis cornutus, Catostomus commersoni, Exoglossum maxillingua.

Twenty-seven fish species were collected from Conowingo Creek at eleven stations during the summer, 1970. Species most abundant were Rhinichthys atratulus, Notropis cornutus, Exoglossum maxillingua, Semotilus atromaculatus and Catostomus commersoni. A Spearman's rank correlation coefficient matrix was calculated for biological and physical parameters. Distribution of fishes appeared related to width and depth of the stream, but was most influenced by gradient. (Katz)
W77-06635

SOME SIGNIFICANT REGULARITIES IN PLANT HYDROADAPTATION, (IN RUSSIAN),
For primary bibliographic entry see Field 3B.
W77-06774

ECOLOGICAL DATA ON CONTINENTAL AQUATIC VEGETATION, (IN SPANISH),
Universidad Complutense de Madrid (Spain). Dept. of Botany and Plant Physiology.
S. Rivas-Martinez.
An Inst Bot A J Cavanilles 32(1), p 199-205, 1975.

Descriptors: *Ecotypes, *Aquatic habitats, *Aquatic plants, *Vegetation, *Aquatic environment, Habitats, Surface waters, Bodies of water, Environment, Lakes, Rivers, Ponds.
Identifiers: Limnobiocenoses, Plant associations.

The phytosociological groups of motile and fixed vegetation which inhabit the limnobiocenoses of lakes, rivers, ponds and other continental aquatic environments are reviewed. Understanding these associations is considered important to their preservation.--Copyright 1976, Biological Abstracts, Inc.
W77-06784

FOAM AND FILM OF FRESH WATERS AS AN ECOLOGICAL NICHE OF AQUATIC HYPHOMYCETES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
I. A. Dudka, and V. I. Beregovaya.
Gidrobiol Zh 11(4), p 80-86, 1975.

Descriptors: *Freshwater, *Aquatic fungi, *Organic compounds, *Dissolved solids, *Suspended solids, *Productivity, Ecology, Proteins, *Films, Foaming.
Identifiers: Conidia, Organic detritus, *Foam, *Hyphomycetes.

The natural foam and film of freshwaters, which are composed of a concentration of surfaceactive organic substances and contain solid mineral particles, and dissolved suspended organic compounds, form a complex 3-phase system. The presence in them of high concentrations of protein substances, sources of C, phosphates, Nitrates, Nitrites, and a vast quantity of organic animal and vegetable detritus, creates conditions which preserve the viability of Conidia of aquatic hyphomycetes and permit their growth on appropriate substrates (fragments of the leaves of trees and shrubs). The surface foam and film enable the conidia to be spread by waterfowl, wind and water current. The foam and film are regarded as an ecological niche of aquatic hyphomycetes.--Copyright 1976, Biological Abstracts, Inc.
W77-06787

INDICATOR VALUES OF VASCULAR PLANTS IN CENTRAL EUROPE, (IN GERMAN),
Goettingen Univ. (West Germany). Systematisch-Geobotanisches Institut.
H. Ellenberg.
Scr Geobot 9, p 1-97, 1974.

Descriptors: *Bioindicators, *Climates, Light, Temperature, Distribution, Soil moisture, Nitrogen, Acidity, *Soil chemical properties, Salinity, Heavy metals, *Ecology, Plant physiology, *Europe.
Identifiers: *Vascular plants.

A comprehensive synopsis of the indicator values of about 200 spp. (or microspecies) of vascular plants in west central Europe is given. The so-called ecological behavior of the plants is briefly expressed by figures representing 9 degrees of behavior with regard to the main environment factors. Three figures relate to climatic factors, light, temperature and continentality of the distribution range. The following 3 figures relate to soil factors, moisture, acidity and N supply. Salinity and concentration of heavy metals are discussed. In addition to the ecological behavior, morphological, anatomical and phytosociological information is given.--Copyright 1976, Biological Abstracts, Inc.
W77-06803

DEPENDENCE OF WATER ABSORPTION BY THE CELL WALLS OF PLANT LEAVES ON THE VOLUME OF THE FREE SPACE, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
L. A. Shishkina, and A. M. Alekseev.
Fiziol Biokhim Kul'T Rsat 7(3), p 323-325, 1975.

Descriptors: *Absorption, *Cytological studies, Plant morphology, *Beans, *Wheat, Leaves.
Identifiers: *Millet, *Leaf mesophyll.

The rate of water movement into the cell walls of the leaf mesophyll, during the exclusion of transpiration, was studied in beans, spring wheat, and millet. This index was directly dependent ($r = +0.97$) on the volume of cellular free space, and was greatest in spring wheat and least in beans. This confirms the role of the free space in the regulation of water metabolism in plants, and thus the existence of a unified hydrostatic system.
W77-06827

2J. Erosion and Sedimentation

PARTICLE CHARACTERISTICS AND DISPERSAL PATTERNS OF SUGAR CANE WASTES IN SELECTED RIVERS AND ESTUARIES OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W77-06632

NILE CONE: LATE QUATERNARY STRATIGRAPHY AND SEDIMENT DISPERSAL,
Smithsonian Institution, Washington, D. C. Div. of Sedimentology.
For primary bibliographic entry see Field 2L.
W77-06650

MONITORING THE MARINE ENVIRONMENT THROUGH SEDIMENTATION,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-06651

SEDIMENT YIELD PREDICTION BASED ON WATERSHED HYDROLOGY,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 4D.
W77-06656

CURRENT METHODS USED IN THE SOIL CONSERVATION SERVICE TO ESTIMATE SEDIMENT YIELD,
Soil Conservation Service, Fort Worth, Tex.

For primary bibliographic entry see Field 4D.
W77-06657

COMPUTING EOLIAN SAND TRANSPORT FROM ROUTINE WEATHER DATA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.; and Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
For primary bibliographic entry see Field 2L.
W77-06669

AN EXECUTIVE SUMMARY OF THREE EPA DEMONSTRATION PROGRAMS IN EROSION AND SEDIMENT CONTROL,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W77-06671

DEBRIS BASINS FOR CONTROL OF SURFACE MINE SEDIMENTATION,
Kentucky Dept. for Natural Resources and Conservation, Frankfort. Office of Planning and Research.
For primary bibliographic entry see Field 5G.
W77-06672

THE HISTORIC AND PRESENT RELATIONSHIPS BETWEEN PHYTOPLANKTON, LIMITING NUTRIENTS, AND SEDIMENT-WATER GEOCHEMICAL PROCESSES IN SELECTED MAINE LAKES,
Maine Univ. at Orono. Land and Water Resources Inst.
For primary bibliographic entry see Field 5C.
W77-06741

PARTIAL EXTRACTION OF METALS FROM AQUATIC SEDIMENTS,
Geological Survey, Albany, N.Y. Central Lab.
For primary bibliographic entry see Field 5A.
W77-06781

A SELF-CONTAINED FACILITY FOR ANALYZING NEAR-BOTTOM FLOW AND ASSOCIATED SEDIMENT TRANSPORT,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2L.
W77-06874

A TEST PARTICLE DISPERSION STUDY IN MASSACHUSETTS BAY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 2L.
W77-06880

LITTORAL DRIFT ESTIMATES ALONG THE COASTLINE OF FLORIDA,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W77-06882

EFFECTS OF ENGINEERING ACTIVITIES ON THE ECOLOGY OF PISMO CLAMS,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W77-06886

INTERSTITIAL WATER CHEMISTRY OF ANOXIC LONG ISLAND SOUND SEDIMENTS. 1. DISSOLVED GASES,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W77-06900

IRON-RICH RHYTHMICALLY LAMINATED SEDIMENTS IN LAKE OF THE CLOUDS, NORTHEASTERN MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
R. S. Anthony.
Limnology and Oceanography, Vol 22, No 1, p 45-54, January 1977. 6 fig, 4 tab, 21 ref. NSF GB-7163.

Descriptors: *Sediments, *Lakes, *Varves, *Minnesota, Surveys, On-site investigations, Laboratory tests, Chemical analysis, Chemicals, Iron, Iron oxides, Manganese, Core logging, Cores, Annual, Annual turnover, Limnology.
Identifiers: *Laminated sediments, *Lake in the Clouds(Minn).

Sediments from the deepest part of Lake of the Clouds (31 m) are rhythmically laminated throughout all but the basal part of the column. The laminations can be correlated with events in the lake during the annual cycle. Ferrous iron (maximum 620 ppm) accumulates in a layer of water about 2 m thick in the deepest part of the lake. The laminations form in the sediments only where overlain by this stagnat iron-rich water. The light-colored portion of the couplet presumably forms from iron oxides precipitated from partially oxygenated bottom water during fall and spring overturns, and the dark layer seems to form from organic remains that settle out during summer. Chemical analysis and electron-microprobe studies revealed a much higher concentration of iron and manganese in the light layers than in the dark. Vivianite and probably limonite occur extensively in nodules throughout the core. Siderite was identified by X-ray diffraction. Numerous orange spherical aggregates occur in the light layers. An iron and manganese profile of the sediment column suggests that the most distinct laminae are found where the iron content of the sediment is at least 4%. (Sims-ISWS)
W77-06901

PARTICULATE TRANSPORT OF RADIONUCLIDES 14C AND 55FE TO DEEP WATERS IN THE PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5B.
W77-06902

INCIPIENT SEDIMENT MOTION IN ENTRANCES WITH SHELL BEDS,
Florida Univ., Gainesville. Dept. of Civil Engineering; and Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W77-06930

CHARACTERISTICS OF WATER FLOW AT THE NORTH END OF THE WASSAW BARRIER ISLAND COMPLEX. WASSAW ISLAND EROSION STUDY, PART II,
Georgia Marine Science Center, Savannah.
G. F. Oertel.
Georgia Marine Science Center Sea Grant Technical Report Series No. 77-2, (1977) 14 p, 7 fig, 3 ref. SG-04-5-158-4.

Descriptors: *Inlets(Waterways), *Sediment transport, *Erosion, *Sedimentation, Georgia, Barrier islands, Ocean currents, Water transfer.
Identifiers: Water currents, Sea Grant Program.

This report supplements an earlier report on the 'Sedimentary framework of a channel margin shoal of an ebb delta, Wassaw Sound, Georgia'. The purpose of this report is to produce an overview of water currents that may affect the sediment carpet described in the earlier report. Water flow recorded at four different stations around the marginal shoal. At each station, data was recorded for two tidal cycles (approximately 25 hours) at six minute intervals. In all, approximately 2,000 data points were collected.
W77-06939

SAND STABILIZATION ON THE DUNES, BEACH AND SHOREFACE OF A HISTORICALLY ERODING BARRIER ISLAND. WASSAW ISLAND EROSION STUDY, PART III,
Georgia Marine Science Center, Savannah.
For primary bibliographic entry see Field 8G.
W77-06940

CHANGING NEEDS AND OPPORTUNITIES IN THE SEDIMENT FIELD,
Geological Survey, Baltimore, Md. Water Resources Div.
M. G. Wolman.
Water Resources Research, Vol 13, No 1, p 50-54, February 1977. 21 ref.

Descriptors: *Sedimentation, *Erosion, *Sediment transport, *Sediment yield, Reviews, Evaluation, Model studies, Hydrologic properties, Hydrologic data, Environmental effects.

Information on the processes of erosion and sedimentation, while sometimes sufficient for gross estimates of yield, remains inadequate for modern environmental management. Little is known about sequential processes involved in the systems of erosion and sedimentation, and practice and theory require attention to unsteady or discontinuous erosion and transportation as sediments move from source through channel systems with intermittent periods of storage. While climatic and hydrologic variations markedly affect yield, transport and deposition thresholds of erosion of cohesive materials and sequences of such effects remain unclear. The highly variable temporal and spatial character of erosion and sedimentation processes must be emphasized in the predictive exercise of environmental impact assessment. Validation or testing of the predictive capacity of our current knowldge can only be achieved by field observation. This does not imply massive data collection programs but rather an integration of model building, laboratory study, and continuity of study in carefully selected field areas. (Woodard-USGS)
W77-06964

DELAWARE RIVER: EVIDENCE FOR ITS FORMER EXTENSION TO WILMINGTON SUBMARINE CANYON,
Geological Survey, Woods Hole, Mass. Geologic Div.
For primary bibliographic entry see Field 2E.
W77-06966

SEDIMENT DISCHARGE FROM AN AREA OF HIGHWAY CONSTRUCTION, APPLEMANS RUN BASIN, COLUMBIA COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-06969

DIMINUTION RATIOS FOR PLANNING CONSTRUCTION-AREA SEDIMENT CONTROLS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4D.
W77-06980

MONROE RESERVOIR, INDIANA, PART I: HYDROLOGIC CIRCULATION, SEDIMENTATION, AND WATER CHEMISTRY PART II: NUTRIENT RELATIONS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W77-06982

SEDIMENTS AND WATER QUALITY OF URBAN STORM WATER,
Middlesex Polytechnic, London (England).
For primary bibliographic entry see Field 5B.
W77-06984

2K. Chemical Processes

MINERAL CONTENT OF SELECTED GEOTHERMAL WATERS,
Nevada Univ. System, Las Vegas. Water Resources Center.
For primary bibliographic entry see Field 3E.
W77-06667

THE DISTRIBUTION OF NATURAL AND ANTHROPOGENIC ELEMENTS AND COMPOUNDS IN PRECIPITATION ACROSS THE U.S.; THEORY AND QUANTITATIVE MODELS,
North Carolina Univ., Chapel Hill. Dept. of Botany.
For primary bibliographic entry see Field 2B.
W77-06675

METHANE-DERIVED CARBONATE CEMENTS IN BARRIER AND BEACH SANDS OF A SUB-TROPICAL DELTA COMPLEX,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W77-06677

WATER CHEMISTRY AND WATER QUALITY,
Uppsala Univ. (Sweden). Dept. of Physical Geography; and Uppsala Univ. (Sweden). Div. of Hydrology.
For primary bibliographic entry see Field 5A.
W77-06778

PARTIAL EXTRACTION OF METALS FROM AQUATIC SEDIMENTS,
Geological Survey, Albany, N.Y. Central Lab.
For primary bibliographic entry see Field 5A.
W77-06781

BONDING OF CALCIUM AND POTASSIUM BY VERMICULITE AND KAOLINITE CLAYS AS AFFECTED BY H-CLAY ADDITION,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-06872

HYDROCHEMISTRY OF THE LAKE MAGADI BASIN, KENYA,
Geological Survey, Reston, Va. Water Resources Div.
B. F. Jones, H. P. Eugster, and S. L. Rettig.
Geochimica et Cosmochimica Acta, Vol 41, p 53-72, 1977. 7 fig, 4 tab, 24 ref.

Descriptors: *Water chemistry, *Lakes, *Brines, *Inflow, *Africa, Surface-groundwater relationships, Sampling, Boreholes, Evaporation, Alkaline water, Adsorption, Chemical precipitation, Salts, Springs, Chemical reactions, Pollutant identification.
Identifiers: *Kenya(Rift Valley), *Lake Magadi basin(Kenya).

Water samples from the Lake Magadi area, Kenya, range from dilute inflow (<0.1 g/kg dissolved solids) to very concentrated brines (>300 g/kg dissolved solids). Five distinct hydrologic stages can be recognized in the evolution of the water compositions: dilute streamflow, dilute ground water, saline ground water (or hot spring reservoir), saturated brines, and residual brines. Based on the assumption that chlorode is conserved in the waters during evaporative concentration, these stages are related to each other by the concentration factors of about 1:28:870:7600:16,800. Budget calculations show that only bromide is conserved as completely as chloride. Sodium follows chloride closely until trona precipitation, whereas silica and sulfate are largely lost during the very first concentration step (dilute streamflow-dilute ground water). Seasonal runoff, principally from the valley floor north of Lake Magadi, is the principal recharge to the Magadi ground water system. Evaporative concentration is the overall process responsible for the chemical evolution of the brines. Data were obtained for borehole brines from as deep as 297 m. They show the existence of two distinct brine bodies below the present lake, one shallow, coexistent with bedded salts, and highly concentrated (260 g/kg average dissolved solids), and the other deeper in lacustrine sediments or fractured lavas, and only half as concentrated. (Woodard-USGS)
W77-06967

2L. Estuaries

EVALUATION OF POTENTIAL INDICATORS OF SUB-LETHAL TOXIC STRESS ON MARINE ZOOPLANKTON (FEEDING, FECUNDITY, RESPIRATION AND EXCRETION): CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 5A.
W77-06617

PARTICLE CHARACTERISTICS AND DISPERSAL PATTERNS OF SUGAR CANE WASTES IN SELECTED RIVERS AND ESTUARIES OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W77-06632

CHLORINE REACTIONS WITH SEAWATER CONSTITUENTS AND THE INHIBITION OF PHOTOSYNTHESIS OF NATURAL MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W77-06637

THE FAUNA OF THE POLLUTED RIVER TEES ESTUARY,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5C.
W77-06638

AN OFFSHORE BIOMONITORING SYSTEM FOR CHLORINATED HYDROCARBONS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W77-06641

EFFECTS OF PRESSURE, TEMPERATURE AND OXYGEN ON THE OXYGEN-CONSUMPTION RATE OF THE MIDWATER COPEPOD GAUSSIA PRINCEPS,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5C.
W77-06642

A STUDY TO FORECAST THE WAVES AT DIGHA,
River Research Inst., Calcutta (India).
S. K. Das Kaviraj, and S. K. Sarkar.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 27, No. 2, p 177-184, April 1976. 5 fig, 3 tab, 9 ref, 1 append.

Descriptors: *Waves(Water), *Ocean waves, *Winds, Coasts, Wind tides, Shore protection, Shores, Foreign countries, Foreign research, Measurement, On-site investigations, Model studies, Mathematical models, Frequency, Velocity, Height, Oceanography.
Identifiers: *India, *Digha(India).

Instrumental records of waves and wind speeds at Digha have been utilized to forecast wave characteristics, namely, the wave period and wave height. The spectrum of waves as devised by Neumann, has been used to establish an empirical relationship between the wind speed and the period of maximum wave height, also this has been used to derive a relationship between the wind speed and the optimum value of wave frequency. Co-cumulative power spectra have been to study the distribution of energy, and the significant range of periods of the sea waves at different wind speeds. From the observed records, values of maximum wave heights at corresponding wind speeds were determined. An empirical relationship between the maximum wave height in deep sea, and the speed of the generating wind is established. Significant wave heights at corresponding wind speeds were also calculated, and a formula relating significant wave height to the wind speed was provided. (Sims-ISWS)
W77-06648

NILE CONE: LATE QUATERNARY STRATIGRAPHY AND SEDIMENT DISPERSAL,
Smithsonian Institution, Washington, D. C. Div. of Sedimentology.
D. J. Stanley, and A. Maldonado.
Nature, Vol. 266, No. 5598, p 129-135, March 10, 1977. 4 fig, 1 tab, 37 ref.

Descriptors: *Sedimentation, *Quaternary period, *Stratigraphy, Sediments, Deposition(Sediments), Cores, Core logging, Stratification, Carbon radioisotopes, Dams, Rivers, Deltas, Sedimentology.
Identifiers: *Mediterranean Sea, *Nile River, *Aswan Dam, *Nile Cone.

The cyclic nature of Late Quaternary Nile Cone sediments is a response to major climate oscillations, including marked changes in sea level, Nile river discharge and sediment influx, and water mass stratification. Deposits have accumulated most rapidly northwest of the Nile Rosetta Branch since the Early Wurm. A broad area of low sedimentation on the Cone, initiated during the Holocene sea level rise, is predicted to increase in size as a result of the Aswan High Dam and modification of Nile River flow. (Sims-ISWS)
W77-06650

MONITORING THE MARINE ENVIRONMENT THROUGH SEDIMENTATION,
Scripps Institution of Oceanography, La Jolla, Calif.
A. Soutar, S. A. Kling, P. A. Crill, E. Duffrin, and K. W. Bruland.
Nature, Vol. 266, No. 5598, p 136-139, March 10, 1977. 2 fig, 2 tab, 23 ref.

Descriptors: *Sedimentation, *Coasts, *Oceans, *California, Water pollution, Environment, Aquatic environment, Sediments, Deposition(Sediments), Bottom sediments, On-site investigations, Fish, Biology, Pollutants, Surveys, *Monitoring, Sedimentology.

The argument was advanced that the interception of particles settling within the water column provides a means of monitoring and understanding basic ocean processes. Geochemical and biological measurements on precisely dated bottom sediments and on preliminary recoveries from particle interceptor-traps provided supporting evidence. (Sims-ISWS)
W77-06651

EXCHANGE THROUGH A BARRIER ISLAND INLET: ADDITIONAL EVIDENCE OF UPWELLING OFF THE NORTHEAST COAST OF NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Geosciences; and North Carolina State Univ., Raleigh. Center for Marine and Coastal Studies.
C. E. Knowles, and J. J. Singer.
Journal of Physical Oceanography, Vol. 7, No. 1, p 146-152, January 1977. 7 fig, 1 tab, 10 ref. NOAA 04-3-158-40.

Descriptors: *Upwelling, *Temperature, *Barrier islands, *North Carolina, Coastal engineering, Hydrographs, Salinity, Water temperature, Tidal effects, Wind tides, Current meters, Continental shelf, Inlets(Waterways).
Identifiers: *Oregon Inlet(NC), Tidal periodicity, Tidal fluctuations, Thermographs, Current velocity, Time-history record.

Hydrographic data were collected at Oregon Inlet, North Carolina, during the period June 20-July 2, 1973. Examination of the water temperature time-history record at three stations in and near the inlet showed: (1) that in 2 periods with predominately southerly winds, the temperature fluctuated in the range from 13.7 to 27.5 C, with an apparent tidal periodicity; (2) that for nearly 48 hours between these 2 periods and with northeasterly winds, a nearly constant temperature of 22.0 to 22.5 C was maintained in spite of normal tidal fluctuations; and (3) that this constant temperature period was bracketed by two 25 hour transitional periods that were initiated almost coincidently with wind directional changes. It appears that the sequence and relationship of these wind and water temperature data could be explained by (as well as provide additional evidence and documentation of) wind-induced upwelling along the northeastern North Carolina coast. An important conclusion drawn from this sequence and relationship of data was that temperature, salinity, and current velocity records in and near a barrier island inlet could furnish much information about the exchange and mixing processes on the adjacent continental shelf, especially when there are large differences in temperature and salinity between the sound and shelf waters. (Roberts-ISWS)
W77-06654

PETROLEUM HYDROCARBONS FROM EFFLUENTS: DETECTION IN MARINE ENVIRONMENT,
Hunter Coll., New York. Dept. of Environmental Health Sciences.
For primary bibliographic entry see Field 5A.
W77-06660

AN ESTIMATE OF THE INPUT OF ATMOSPHERIC TRACE ELEMENTS INTO THE NORTH SEA AND THE CLYDE SEA (1972-3),
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 5B.
W77-06668

COMPUTING EOLIAN SAND TRANSPORT FROM ROUTINE WEATHER DATA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.; and Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
S. A. Hsu.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A010 899, Price codes: A02 in paper copy, A01 in microfiche. In: Proceedings 14th Coastal Engineering Conference; June 1974, Copenhagen, Denmark: American Society of Civil Engineers, New York, p 1619-1626. 5 fig, 8 ref. NR 388 002, ONR N00014-69-A-0211-0003.

Descriptors: *Wind erosion, *Analytical techniques, *Aeolian soils, Equations, Winds, Velocity, Profiles, Sands, Movement, Weather data, Deserts, Coasts, Dunes, Erosion.

Extensive wind profile measurements were made over beaches, tidal flats, and small dune fields in Barbados, Ecuador, Florida, Texas, and on Alaskan Arctic coasts during the past several years. The linear relationship between shear and wind velocities was verified by these measurements, in conjunction with Bagnold's data (1941) from experiments in a Libyan desert. From the measurements, a simple method was developed for computing eolian transport of the most common sand particle sizes which occur on coasts and deserts by using routinely available wind observations from nearby weather stations. (Humphreys-ISWS)
W77-06669

METHANE-DERIVED CARBONATE CEMENTS IN BARRIER AND BEACH SANDS OF A SUBTROPICAL DELTA COMPLEX,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
H. H. Roberts, and T. Whelan, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 162, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 199, Reprint from Geochimica et Cosmochimica Acta, Vol 39, p 1085-1089, December 1975. 2 fig, 1 tab, 25 ref. NR 388 002, ONR N00014-69-A-0211-0003.

Descriptors: *Sands, *Mississippi River, *Chemistry, Louisiana, *Cements, Beaches, Barrier islands, Coasts, Carbon, Methane, Carbonates, Sediments, Chemical analysis, Analytical techniques, Sampling.
Identifiers: *Mississippi Delta, *Chandeleur Islands(La), Cementation, Beach sands, Carbonate cements.

Highly negative delta C13 values, -18 to -40 parts per thousand, for carbonate cements found in Recent barrier and beach sands of the Mississippi River Delta complex strongly suggest that considerable carbon is furnished to the CaCO3 cements by either chemical or biological oxidation of CH4. These cemented sands are commonly found on beaches of the Chandeleur barrier island chain and other sites along the Louisiana coast where Holocene sands are rapidly transgressing over highly organic marsh deposits. Generation of CH4 from underlying anoxic marsh sediment, followed by vertical migration and oxidation to CO2 in the porous overlying sand, appears to be the unique set of conditions regulating this process of carbonate cementation. (Sims-ISWS)
W77-06677

NOTES ON THE NESTING SUCCESS AND FECUNDITY OF THE ANEMONEFISH AMPHIPRION CLARKII AT MIYAKE-JIMA, JAPAN,
Tatsuo Tanaka Memorial Biological Station, Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W77-06763

ENVIRONMENTAL FACTORS AFFECTING SURVIVAL AND GROWTH OF VIBRIO PARAHAEMOLYTICUS. A REVIEW,
Georgia Univ., Experiment. Div. of Food Science.
For primary bibliographic entry see Field 5C.
W77-06765

TEMPERATURE RELATIONS OF PUGET SOUND THAIDS IN REFERENCE TO THEIR INTERTIDAL DISTRIBUTION,
Western Washington State Coll., Bellingham. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-06767

EFFECT OF SALINITY ON SPORE GERMINATION OF TERRESTRIAL AND MARINE FUNGI,
Portsmouth Polytechnic (England) Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-06772

LONG-TERM LEAD ACCUMULATION IN ABALONE (HALIOTIS SPP.) FED ON LEAD-TREATED BROWN ALGAE (EGREGIA LAEVIGATA),
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5C.
W77-06776

HEAVY METAL CONCENTRATIONS IN WATER, SEDIMENTS, AND FISH FROM MEDITERRANEAN COASTAL AREA, ISRAEL,
Israel Oceanographic and Limnological Research Ltd., Haifa. Haifa Labs.
For primary bibliographic entry see Field 5C.
W77-06782

CORRELATION COEFFICIENTS AND CONCENTRATION FACTORS OF COPPER AND LEAD IN SEAWATER AND BENTHIC ALGAE,
Rutgers. The State Univ., New Brunswick, N. J. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-06783

A PRELIMINARY SURVEY OF MERCURY IN FISH FROM BOMBAY AND THANA ENVIRONMENT,
Institute of Science, Bombay (India). Inorganic and Nuclear Chemistry Lab.
For primary bibliographic entry see Field 5C.
W77-06785

HEAVY METALS IN MACROINVERTEBRATES AND FISH FROM THE LOWER MEDWAY ESTUARY, KENT,
Sir John Cass Coll., London (England). School of Sciences and Technology.
For primary bibliographic entry see Field 5C.
W77-06790

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. PRINCIPAL INVESTIGATORS' REPORTS JULY-SEPTEMBER 1976. VOLUME I: MARINE MAMMALS, MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-06793

IDENTIFICATION, DOCUMENTATION AND DELINEATION OF COASTAL MIGRATORY BIRD HABITAT IN ALASKA,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-06804

IDENTIFICATION, DOCUMENTATION, AND DELINEATION OF COASTAL MIGRATORY BIRD HABITAT IN ALASKA, AND THE DISTRIBUTION, ABUNDANCE AND FEEDING ECOLOGY OF BIRDS ASSOCIATED WITH PACK ICE,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-06805

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. PRINCIPAL

INVESTIGATORS' REPORTS JULY-SEPTEMBER 1976. VOLUME 2: FISH, PLANKTON, BENTHOS, LITTORAL.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-06825

PELAGIC AND DEMERSAL FISH ASSESSMENT IN THE LOWER COOK INLET ESTUARY SYSTEM,
Alaska Dept. of Fish and Game, Kodiak.
For primary bibliographic entry see Field 6G.
W77-06829

BEAUFORT SEA ESTUARINE FISHERY STUDY,
Alaska Dept. of Fish and Game, Fairbanks. Div. of Sport Fish.
For primary bibliographic entry see Field 6G.
W77-06840

ASSESSMENT OF PELAGIC AND NEARSHORE FISH IN THREE BAYS ON SOUTHEAST KODIAK ISLAND,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 6G.
W77-06846

DEMERSAL FISH AND SHELLFISH ASSESSMENT IN SELECTED ESTUARY SYSTEMS OF KODIAK ISLAND,
Alaska Dept. of Fish and Game, Kodiak.
For primary bibliographic entry see Field 6G.
W77-06847

THE DISTRIBUTION, ABUNDANCE AND DIVERSITY OF THE EPIFAUNAL BENTHIC ORGANISMS IN TWO (ALITAK AND UGAK) BAYS OF KODIAK ISLAND, ALASKA,
Alaska Univ., College Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-06849

A COMPREHENSIVE PLAN FOR THE GLOBAL INVESTIGATION OF POLLUTION IN THE MARINE ENVIRONMENT AND BASELINE STUDY GUIDELINES.
United Nations Educational Scientific and Cultural Organization, Paris (France).
For primary bibliographic entry see Field 5A.
W77-06850

A SELF-CONTAINED FACILITY FOR ANALYZING NEAR-BOTTOM FLOW AND ASSOCIATED SEDIMENT TRANSPORT,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
B. Lesht, R. V. White, and R. L. Miller.
NOAA Technical Memorandum ERL MESA-9, October 1976. 41 p., 11 fig, 1 tab, 11 ref, 4 photos.

Descriptors: *Sediment transport, New York, Flow characteristics, Facilities, Oceanographic equipment, Instrumentation.
Identifiers: Ocean floor, *New York Bight.

The field system described in this report was designed to monitor several aspects of the near bottom environment. The system can measure and record horizontal velocities at several levels within one meter of the ocean floor. Simultaneous measurements of wave pressure, mean current direction and turbidity can also be recorded. The recorded information is stored in digital format facilitating later analysis. The system is relatively inexpensive, flexible, and can be easily transported by small truck to the field location. Several experiments have been conducted with success in the New York Bight between May 1974 and October 1975. These are summarized. Field operations are illustrated by a series of photographs. Preliminary analysis indicates that in the shallower experimental areas surface wave activity may have a significant effect on the flow field near the bottom even in slight seas. (NOAA)
W77-06874

A PILOT STUDY ON THE DESIGN OF A PETROLEUM HYDROCARBON BASELINE INVESTIGATION FOR NORTHERN PUGET SOUND AND STRAIT OF JUAN DE FUCA,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5C.
W77-06875

THE NEW YORK BIGHT PROJECT - 1975; STONY BROOK, LONG ISLAND, NEW YORK.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5G.
W77-06876

IMPACT OF OIL SPILLAGE FROM WORLD WAR II TANKER SINKINGS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5C.
W77-06877

PROGRAM DEVELOPMENT PLAN. ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 6G.
W77-06878

A TEST PARTICLE DISPERSION STUDY IN MASSACHUSETTS BAY.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
NOAA Technical Report ERL 374-MESA 6, September 1976. 52 p, 13 fig, 2 tab, 10 ref, 10 append. Edited by R. H. Wing, Pacific Marine Environmental Laboratory, Seattle, Wash. NOAA-TR-ERL 374-MESA 6.

Descriptors: *Massachusetts, *Dispersion, *Sediment transport, *Meteorological data, *Resources development, *Baseline studies, Bays, *Mathematical models, *Forecasting.
Identifiers: *Oceanographic data, Particle dispersion, *Massachusetts Bay.

The goal of this study was to develop a predictive model to estimate, in advance of dredging operations, where the fines of a dredge plume would travel. On June 11, 1973, 2700 kg (3 tons) of small particles were released into the water column in Massachusetts Bay. Their movement was tracked for 10 days. Also, oceanographic data were collected and analyzed and a dispersion model was formulated. Final data show the plume movement to be westward toward Boston Harbor, eastward toward Stellwagen Bank and southward along the coast into Cape Cod Bay where a counterclockwise gyre is suggested. (NOAA)
W77-06880

INVESTIGATION OF FLUSHING TIME IN THE LAFAYETTE RIVER, NORFOLK, VIRGINIA,
Old Dominion Univ., Norfolk, Va. Dept. of Civil Engineering.
C. H. Blair, J. H. Cox, and C. Y. Kuo.
Technical Report No. 76-C4, December 1976. 60 p, 22 fig, 6 tab, 16 ref.

Descriptors: *Virginia, *Estuaries, *Dyes, *Tracers, Monitoring, Water pollution, Path of pollutants.
Identifiers: *Flushing, Lafayette River estuary(Va).

Two consecutive dye tracer experiments were conducted in the Lafayette River during the period July 14 to August 29, 1976 in order to determine the flushing time of the estuary. Slug released of Rhodamine WT fluorescent dye in the north branch (km 8) and at the mouth of the main branch (k, 1.5) produced concentration fields which were periodically monitored. Additional parameters measured during these experiments included rainfall, salinity, and tidal height. Dye mass and center of dye mass in the estuary were determined. After tracer release at km 8 in dry summer conditions maximum dye concentration dropped 50% in about one day; about 1.5 days were required to flush 50% of the dye mass out of the north branch, while 9.5 days were required to flush a similar amount out of the mouth of the Lafayette River. When release occurred at km 1.5, about four days were required for maximum concentration to drop by 50%, while 5.5 days were required to flush 50% of the dye mass from the estuary. (NOAA)
W77-06881

LITTORAL DRIFT ESTIMATES ALONG THE COASTLINE OF FLORIDA,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
T. L. Walton, Jr.
Sea Grant Report No. 13, August, 1976. 128 p, 13 fig, 17 ref, 3 append.

Descriptors: *Sediment transport, *Florida, *Littoral drift, *Data collections, Coasts, Erosion, Beaches, Engineers estimates, Design data.

Littoral drift roses are computed on a monthly averaged basis for possible use in feeder beach design and groin system design where a knowledge of seasonal sand movement is important, and in design of jetties where a knowledge of the monthly buildup of sand adjacent to the structure is of beneficial use in planning the construction phase of a project. The more important aspects of the data source and the computational results with a geomorphological interpretation of a section of coastline using the results. Additionally, heuristic comparisons of monthly littoral drift rates are presented where such comparisons can be made and a summary of the results of this study with implications for use of the data is given. Additionally, along with the monthly littoral drift roses, the annually averaged littoral drift roses have been included with new scales superimposed for ease of interpolating results. (NOAA)
W77-06882

EFFECTS OF ENGINEERING ACTIVITIES ON THE ECOLOGY OF PISMO CLAMS,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W77-06886

CONTINENTAL SHELF WAVES AND ALONGSHORE VARIATIONS IN BOTTOM TOPOGRAPHY AND COASTLINE,
Oregon State Univ., Corvallis, School of Oceanography.
J. S. Allen.
Journal of Physical Oceanography, Vol. 6, No. 6, p 864-878, November 1976. 5 fig, 1 tab, 21 ref, 1 append. NSF DES75-15202, IDO 71-04211, OCE76-00596.

Descriptors: *Ocean waves, *Continental shelf, *Coasts, Waves(Water), Topography, Model studies, Mathematical models, Oceans, Shores, Equations, Continental slope, Winds, Oceanography.

The effects of alongshore variations in bottom topography and coastline on the wind-stress-forced barotropic motion over a continental shelf and slope were studied. Perturbation methods were used to obtain solutions for forced and free continental shelf waves on an idealized continental shelf and slope with small-amplitude alongshore variations in topography. The relevant alongshore scales, set by the wind stress and by the bottom and coastline topography, were assumed to be greater than the shelf-slope width. This enables the resulting motion to be treated in the long-wave nondispersive limit. As a result, the alongshore and time-dependent behavior of the perturbation flow is governed by a forced, first order wave equation, with terms from the interaction of the basic, lowest order flow with the bottom and coastline topography acting as the forcing function. To clarify the effects of topography alone, problems were considered where a uniform wind stress forces a basic unperturbed flow which is independent of the alongshore coordinate. In one example, a steady, alongshore-independent basic flow was established impulsively by a delta function application of the wind stress. The perturbation flow adjusts to the alongshore variations in topography through the propagation of disturbances as free continental shelf waves. There is an eventual establishment in the region of variable topography of a steady-state motion which follows contours of constant depth. (Sims-ISWS)
W77-06891

AN ANALYSIS OF INERTIAL OSCILLATIONS OBSERVED NEAR OREGON COAST,
Oregon State Univ., Corvallis. School of Oceanography.
P. K. Kundu.
Journal of Physical Oceanography, Vol. 6, No. 6, p 879-893, November 1976. 13 fig, 2 tab, 37 ref. NSF IDO 71-04211, OCE76-00596.

Descriptors: *Ocean currents, *Internal waves, *Continental shelf, *Oregon, *Pacific Ocean, On-site investigations, Model studies, Mathematical models, Waves(Water), Coasts, Currents(Water), Current meters, Measurement, Analytical echniques, Data processing, Oceans, Oceanography.
Identifiers: *Inertial oscillations.

Nearly two months of current meter data taken during the summer of 1973 at eleven depths at a station off the coast of Oregon in 100 m of water were analyzed. The spectra showed an 8% increase in the frequency of the inertial peak (omega about = 0.064 cph) above the local f (= 0.59 cph). Because of the proximity of the tidal frequencies to the local f, a sharp bandpass filter centered at omega = 0.064 cph was used to isolate the inertial motions. The results showed that the amplitude of the inertial oscillations decayed slowly with depth, but the decay within about 10 m of the bottom was more rapid. A lagged correlation of the inertial currents clearly showed an upward propagation of phases throughout the water column at a speed of about 0.1 cm/s within the depth range 20-60 m. The inertial currents were found to turn clockwise (looking down) with depth, which corresponds to an upward phase and downward energy propagation; and the vertical phase speeds implied by the rates of turning agreed remarkably well with the lagged correlation calculations. The vertical wavelength was found to be of the order of the water depth. The vertical flux of energy into the bottom boundary layer during the occurrence of inertial bursts was estimated to be of the same order as the rate of turbulence production within the boundary layer, signifying that the inertial bursts can cause appreciable boundary layer stirring. (Sims-ISWS)
W77-06892

CIRCULATION AND HYDROGRAPHIC STRUCTURE OVER THE GHANA CONTINENTAL SHELF DURING THE 1974 UPWELLING,
Ghana Univ., Accra. Dept. of Physics.
R. W. Houghton.
Journal of Physical Oceanography, Vol. 6, No. 6, p 909-924, November 1976. 18 fig, 2 tab, 25 ref.

Descriptors: *Upwelling, *Continental shelf, *Atlantic Ocean, *Africa, Currents(Water), Ocean currents, Winds, Temperature, Water temperature, Salinity, Foreign countries, Current meters, Data processing, On-site investigations, Circulation, Ocean circulation, Coasts, Oceans, Hydrography, Oceanography.
Identifiers: *Ghana.

The changes in the circulation and hydrographic structure over the continental shelf south of Tema, Ghana, during the 1974 upwelling were described. For the first time in this region, an Aanderaa current meter mooring provided a continuous record of currents at three levels. During the onset of the upwelling, there was evidence of a vertical flow of 0.00008 m/s and an offshore flow at the surface of 0.07 m/s. A large vertical shear, which is a permanent feature throughout most of the year, vanished during the upwelling. Sea level changes were predominantly steric in origin. The upwelling event and the subsequent changes in the hydrography and circulation do not correlate with changes in the coastal wind. There were important differences between Ghana regime and that observed in other coastal upwelling areas. No simple driving mechanism was apparent. As a result, existing theoretical models may not be applicable. The possibility that waves of oceanic origin play an important role in the evolution of the coastal hydrography was discussed. (Sims-ISWS)
W77-06893

THE INFLUENCE OF WIND ON THE SURFACE LAYER OF A STRATIFIED INLET: PART I. OBSERVATIONS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
D. M. Farmer, and T. R. Osborn.
Journal of Physical Oceanography, Vol. 6, No. 6, p 931-940, November 1976. 10 fig, 1 tab, 12 ref.

Descriptors: *Inlets(Waterways), *Estuaries, *Canada, *On-site investigations, Flow, Salinity, Winds, Instrumentation, Current meters, Data processing, Analytical techniques, Saline water-freshwater interfaces, Circulation, Water circulation, Currents(Water), Coasts, Oceanography.
Identifiers: *Alberni Inlet(British Columbia), British Columbia, *Vancouver Island.

Observations were reported of an experiment undertaken to determine the response of a stratified inlet to changing conditions of wind, tide, and runoff. Time series of conductivity profiles taken in Alberni Inlet, British Columbia, showed marked fluctuations in surface layer thickness that appear to be related to strong winds. The effect of an upinlet wind is to produce a rapid thickening of the freshwater layer at the inlet head which may persist for several days. Strong winds were also associated with significant changes in the intensity of stratification. (See also W77-06895) (Sims-ISWS)
W77-06894

THE INFLUENCE OF WIND ON THE SURFACE LAYER OF A STRATIFIED INLET: PART II. ANALYSIS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
D. M. Farmer.
Journal of Physical Oceanography, Vol. 6, No. 6, p 941-952, November 1976. 13 fig, 1 tab, 6 ref, 1 append.

Descriptors: *Inlets(Waterways), *Estuaries, *Canada, *Data processing, Analytical techniques, Circulation, Water circulation, Winds, Tides, Diurnal, Model studies, Mathematical models, Saline water-freshwater interfaces, Currents(Water), On-site investigations, Oceanography.
Identifiers: *Alberni Inlet(British Columbia), *British Columbia, *Vancouver Island.

Analysis of the wind and current data for Alberni Inlet demonstrated the strongly wind-dependent nature of the surface currents, especially at the diurnal frequency. In contrast, the response of the surface layer thickness is mainly restricted to lower than diurnal frequencies. A linear two-layer model with allowance for friction was used to show that frictional damping can account for the poor coupling at high frequencies. In fact, the friction is sufficiently large to cause free modes to be critically damped (i.e., non-oscillatory). The model results compared favorably with the observations, using a frictional coefficient estimated from the decay of the internal tide. (See also W77-06894) (Sims-ISWS)
W77-06895

OBSERVATIONS OF WIND-GENERATED WAVES ON VARIABLE CURRENT,
National Aeronautics and Space Administration, Wallops Island, Va. Wallops Flight Center.
S. R. Long, and N. E. Huang.
Journal of Physical Oceanography, Vol. 6, No. 6, p 962-968, November 1976. 10 fig, 1 tab, 18 ref. NASA NAS6-2617.

Descriptors: *Waves(Water), *Winds, *Model studies, Hydraulic models, Currents(Water), Laboratory tests, Data processing, Analytical techniques, Ocean currents, Oceans, Oceanography.
Identifiers: *Wind-generated waves.

Laboratory measurements utilizing a laser probe were made for the slopes of wind waves generated on both positive and negative currents at different values of fetch. The data were then processed electronically to yield an average wave-slope spectrum in frequency space with 128 degrees of freedom. These spectra were used to obtain the growth of the spectral components at various frequency bands for increasing wind and different values of fetch and current. The results indicated that the growth of the spectral components is not monotonic with the frictional wind speed U sub *, but, rather, exhibits an 'overshoot' phenomena at lower values of U sub *. In addition, the growth of the spectral components displays a significant effect due to current. The peak location and spectral intensity of the spectra also show strong influence by the current condition, resulting in the rms surface slope value increasing with negative current and decreasing with positive current. The results agreed qualitatively with some theoretical predictions. The potential use of the current-induced effects as a means for remote sensing of ocean current was also briefly discussed. (Sims-ISWS)
W77-06896

MICROBIAL METHANE CONSUMPTION REACTIONS AND THEIR EFFECT ON METHANE DISTRIBUTIONS IN FRESHWATER AND MARINE ENVIRONMENTS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-06899

INTERSTITIAL WATER CHEMISTRY OF ANOXIC LONG ISLAND SOUND SEDIMENTS. 1. DISSOLVED GASES,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W77-06900

PARTICULATE TRANSPORT OF RADIONUCLIDES 14C AND 55FE TO DEEP WATERS IN THE PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5B.
W77-06902

A DEVICE FOR MEASURING SEEPAGE FLUX IN LAKES AND ESTUARIES,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 7B.
W77-06903

EVIDENCE FOR STRONG CURRENTS AND TURBULENCE IN A DEEP CORAL REEF GROOVE,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
H. H. Roberts, S. P. Murray, and J. N. Suhayda.
Limnology and Oceanography, Vol 22, No 1, p 152-156, January 1977. 3 fig, 16 ref.

Descriptors: *Currents(Water), *Turbulence, *Coral, *Reefs, Sea water, Dyes, Islands, Diffusion, Turbulent flow, Mathematical studies, Photography.
Identifiers: *Diffusion coefficient, *Coral reef groove, Ambient current, Reef roughness elements, Coral heads, Island shelves, Sea floor, Coral-covered spurs.

High levels of turbulence (turbulence intensity approximately equals 23 cm/ss, diffusion coefficient approximately equals 2.4 x 1000 sq cm/s) and strong currents (approximately equals 35 cm/s) were found in a deep coral reef groove (approximately equals 33 m). This unexpected turbulence probably is related to the ambient current acting on reef roughness elements, e.g., coral heads. Well-developed coral communities that commonly occur at the deep margins of island shelves may be, in part, associated with these unusual levels of turbulent diffusion. (Roberts-ISWS)
W77-06904

EFFECT OF THE NILE FLOOD ON THE ESTUARINE AND COASTAL CIRCULATION PATTERN ALONG THE MEDITERRANEAN EGYPTIAN COAST,
Alexandria Univ. (Egypt). Dept. of Oceanography.
S. H. Sharaf El Din.
Hydrological Sciences Bulletin, Vol 21, No 3, p 451-461, September 1976. 8 fig, 11 ref.

Descriptors: *Flooding, *Currents(Water), *Effects, *Circulation, Discharge(Water), Flood data, Dams, Flood flow, Temperature, Coastal engineering, Marine geology, Hydrographs, Estuaries, Sea water, Estuarine environment, Foreign countries.
Identifiers: *Aswan High Dam, *Nile River, *Egypt, *Mediterranean Sea, *Port Said, Offshore region, Temperature-salinity diagrams, Flood effects.

Before 1964, 60-180 million tons of sediments and 16 X 10 to the 9th power to 64 X 10 to the 9th power cu m of water were transported yearly to the Mediterranean Sea by the Nile. During the flood period, before the erection of the High Dam, the estuarine circulation pattern was a two-layered flow at the mouths of the two estuaries. In winter, the area was filled with sea water. The latter condition became persistent during most of the year after 1964. The effects of the Nile flood on the water masses before and after 1964 were shown on temperature-salinity diagrams. The velocities of the currents at the mouths of the branches of the River Nile reached more than four knots at the surface and less than half a knot at the bottom during the flood period before 1964. After 1964, this velocity dropped considerably. Hydrographic surveys before and after the closure of the High Dam indicated that the general oceanographic conditions in the offshore region did not change notably. The only difference between the pre-1964 and post-1964 conditions is that after 1964, no sediment was discharged from the Nile. This produced an imbalance in the near-coast sediment budget, with possible increased erosion along the shore. (Roberts-ISWS)
W77-06907

NUTRIENTS, CHLOROPHYLL, AND INTERNAL TIDES IN THE ST. LAWRENCE ESTUARY,
Laval Univ., Quebec. Department de Biologie.
For primary bibliographic entry see Field 5B.
W77-06910

HIGH SEAS OIL POLLUTION: PARTICULATE PETROLEUM RESIDUES IN THE NORTH ATLANTIC,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5B.
W77-06911

DISPERSION OF LIQUID WASTE FROM A MOVING BARGE,
Alabama Univ., Tuscaloosa.
For primary bibliographic entry see Field 5B.
W77-06913

IN SITU ACOUSTIC MEASUREMENTS OF MICROBUBBLES AT SEA,
Naval Postgraduate School, Monterey, Calif. Dept. of Physics and Chemistry.
H. Medwin.
Journal of Geophysical Research, Vol. 82, No. 6, p 971-976, February 20, 1977. 7 fig, 11 ref.

Descriptors: *Oceans, *California, *Bubbles, *On-site investigations, Measurement, Surveys, Instrumentation, Hydrophones, Acoustics, Winds, Marine biology, Oceanography.
Identifiers: *Monterey Bay(Calif), Microbubbles.

Excess acoustic attenuations in the frequency range 5-160 kHz were used to deduce densities of bubbles of radius of 15-300 micron at depths of 3-36 m in water up to 1 km deep. The measurements were made over an acoustic path 1-5 m long. Correlations have shown dependence on season, sundown and sunrise, wind, and presence or absence of sea slicks and windrows. These inferred microbubbles are evidently of biological as well as physical origin. (Sims-ISWS)
W77-06916

INCIPIENT SEDIMENT MOTION IN ENTRANCES WITH SHELL BEDS,
Florida Univ., Gainesville. Dept. of Civil Engineering; and Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
A. J. Mehta, and B. A. Christensen.
Reprinted from: Proceedings of ASCE Symposium on Inland Waters for Navigation, Flood Control and Water Diversions, Colorado State University, August 10-12, 1976. p 960-977, 10 fig, 4 tab, 9 ref.

Descriptors: *Estuaries, *Coasts, *Sediment transport, Water resources, *Florida, Rivers, Sands, Stochastic processes, Shear stress, Gulf of Mexico.
Identifiers: Coastal zone, Shell beds, Stochastic models, Johns Pass(Fla), Blind Pass(Fla).

River and estuarine entrances are important components in reference to their contribution to the sand budget of the coastal zone. To test a stochastic model which predicts the critical bed shear stress for the incipient motion of coarse sediment grains at the point of bed erosion, given the grainsize and bed characteristics, data were obtained at two entrances - John's Pass and Blind Pass, on the Gulf Coast of Florida. The channel beds at these passes are laden with shells, and the transport of fine sand occurs over the shell bed. Results from the analysed data failed to agree with the well-known entrainment function relationshp of Shields for horizontal beds with uniform grains, but compared very well with the entrainment function derived from the stochastic model. It is noted that the discrepancy with Shields' relationship is due to the non-uniformity of the shell bed and the relatively large ratio of the equivalent sand roughness of the shell bed to the median sand grain diameter. (NOAA)
W77-06930

MISSISSIPPI SOUND TEMPORAL AND SPATIAL DISTRIBUTION OF NUTRIENTS,
Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss. Gulf Coast Research Lab.
For primary bibliographic entry see Field 5B.
W77-06932

STATE INFORMATION NEEDS RELATED TO ONSHORE AND NEARSHORE EFFECTS OF OCS PETROLEUM DEVELOPMENT,
For primary bibliographic entry see Field 6G.
W77-06934

WHO'S MINDING THE SHORE. A CITIZENS' GUIDE TO COASTAL MANAGEMENT,
Natural Resources Defense Council, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W77-06935

COASTAL FACILITY GUIDELINES: A METHODOLOGY FOR DEVELOPMENT WITH ENVIRONMENTAL CASE STUDIES ON MARINAS AND POWER PLANTS,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
For primary bibliographic entry see Field 6G.
W77-06936

COASTAL ZONE MANAGEMENT, ANNOTATED BIBLIOGRAPHY,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
D. Laist.
January 1977. 477 p.

Descriptors: *Bibliographies, *Coasts, *Management, *Estuaries, Land use, Resources development, Coastal topographic features.
Identifiers: *Coastal zone management.

The Coastal Zone Management Annotated Bibliography is a reference source for locating information developed through Fedearl and state coastal management (CZM) efforts supported in part or completely by funds authorized under the Coastal Zone Management Act of 1972 (Public Law 92-583). It includes documents prepared by the Office of Coastal Zone Management (OCZM), as well as selected products of coastal zone management programs in the states and territories. In chronological order, by state, 422 annotations are included, all of which are documents published between February 1974 and October 1976. (NOAA)
W77-06937

BLANK AND SALINITY CORRECTIONS FOR AUTOMATED NUTRIENT ANALYSIS OF ESTUARINE AND SEA WATERS,
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 5A.
W77-06938

SAND STABILIZATION ON THE DUNES, BEACH AND SHOREFACE OF A HISTORICALLY ERODING BARRIER ISLAND. WASSAW ISLAND EROSION STUDY, PART III,
Georgia Marine Science Center, Savannah.
For primary bibliographic entry see Field 8G.
W77-06940

MEASUREMENT IN A MARINE ENVIRONMENT USING LOW COST SENSORS OF TEMPERATURE AND DISSOLVED OXYGEN,
National Oceanic and Atmospheric Administration, Washington, D.C. Environmental Data Service; and Geological Survey, Edgewater, Md. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-06960

DELAWARE RIVER: EVIDENCE FOR ITS FORMER EXTENSION TO WILMINGTON SUBMARINE CANYON,
Geological Survey, Woods Hole, Mass. Geologic Div.
For primary bibliographic entry see Field 2E.
W77-06966

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

THE CONJUNCTIVE USE OF A MULTI-RESERVOIR SYSTEM AND A DUAL-PURPOSE DESALTING PLANT,
Sahand Co., Tehran (Iran).
For primary bibliographic entry see Field 4B.
W77-06714

3B. Water Yield Improvement

WEATHER MODIFICATION IN THE SOVIET UNION--1976,
Arizona Univ., Tucson. Inst. of Atmospheric Physics.
L. J. Battan.
Bulletin of the American Meteorological Society, Vol. 58, No. 1, p 4-19, January 1977. 7 fig, 1 tab, 2 ref.

Descriptors: *Weather modification, *Cloud seeding, *Rainfall, *Hail, Silver iodide, Nucleation, Storms, Foreign research, Foreign countries, Convection, Thunderstorms, Radar, Precipitation(Atmospheric), Clouds, Cloud physics, Agriculture, Meteorology.
Identifiers: *USSR, *Hail suppression, Rockets.

The USSR has a large investment in weather modification research and operations. Major cloud physics experimental facilities exist at the Institute of Experimental Meteorology and at the Institute of Geophysics of the Georgian Academy of Sciences. Hail suppression operations are being carried out over about 5,000,000 ha of farmland. Although claims of success in these activities are more modest than they were in 1969, it is still reported that the benefits far exceed the costs. There is relatively little research and, at this time, apparently only one small-scale operational program dealing with precipitation augmentation. Research in the Ukraine over the last three years has led scientists there to conclude that ice nuclei seeding of cumulonimbus clouds, over a substantial area, caused rainfall increases of about 30%. It also was reported that snow from frontal clouds was increased. (Sims-ISWS)
W77-06644

ON THE STATUS OF HAIL SUPPRESSION,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr.
Bulletin of the American Meteorological Society, Vol. 58, No. 1, p 20-28, January 1977. 4 tab, 37 ref, 1 append. NSF ERP75-09980.

Descriptors: *Weather modification, *Cloud seeding, *Hail, Reviews, Silver iodide, Nucleation, Storms, Convection, Thunderstorms, Economics, Social impact, Surveys, Evaluation, Projects, Agriculture, Meteorology.
Identifiers: *Hail suppression, Opinion surveys.

A technology assessment of the future potential of hail suppression and all its possible ramifications in the United States in future years has included an attempt to define the current status of hail suppression. Hail suppression is at a stage in which the socioeconomic impacts of its use and the means to optimize its future utilization can be adequately treated. The estimation of a wide range of future suppression capabilities was based on the current status, which was defined after three sources of information: (1) results from preliminary evaluations of six recent projects, (2) findings on four published assessments of weather modification, and (3) results from two opinion surveys. This investigation indicates: (1) scientific beliefs about existing capabilities are widely different, with the majority of experts believing there is no capability; (2) the published reviews are optimistic but largely nondefinitive; and (3) the results of five of six recent suppression projects show suppression levels of 20-50%, but the results are largely not significant at the 5% level. This difference between average beliefs of experts and the results of recent projects suggests the need for an extensive investigation of the data and results of these recent projects. (Sims-ISWS)
W77-06645

COMPRESSED AIR FOR SUPERCOOLED FOG DISPERSAL,
Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass. Meteorology Lab.
A. I. Weinstein, and J. R. Hicks.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A019 409, Price codes: A03 in paper copy, A01 in microfiche. Report AFCRL-TR-75-0561, October 22, 1975. 32 p, 10 fig, 4 tab, 13 ref.

Descriptors: *Fog, *Airports, *Weather modification, Laboratory tests, On-site investigations, Cloud seeding, Crystals, Ice, Equipment, Evaluation, Measurement, Meteorology.
Identifiers: *Fog dispersal, Compressed air, Ice crystals, Supercooled fog, Airport runways.

Series of controlled and free environment tests were conducted to determine the technical feasibility of using the cooling resulting from the adiabatic expansion of compressed air to initiate ice crystal production in a supercooled fog. It was found that approximately 1000 cu cm of air, when compressed to 60 psig and released through a supersonic nozzle, will produce the same number of ice crystals as does the evaporation of 1 cu cm of liquid propane. an analysis was made of the Air Force locations in the U.S. and Europe where supercooled fog can be expected to most seriously restrict runway operations. The bases where such restrictions can be expected to be most acute are Elmendorf AFB, Fairchild AFB, Hahn AFB, Zweibrucken AB, and K.I. Sawyer AFB. The Air Force Air Weather Service is already conducting operational supercooled fog dispersal programs using liquid propane at the first three of these bases. Various methods of producing compressed air were described, and the operating cost advantage of using this technique in lieu of liquid propane was discussed. It is estimated that a compressed air system would consume approximately 1/17 as much fuel as would a system using liquid propane spray. In an average year, the estimated savings at Elmendorf AFB is projected to be over 34,000 gallons (129,000 liters) costing over $16,000. (Sims-ISWS)
W77-06674

SOME SIGNIFICANT REGULARITIES IN PLANT HYDROADAPTATION, (IN RUSSIAN),
Yu. S. Grigor'ev.
Izv Sib Otd Akad Nauk SSR SER Biol Nauk 2, p 82-89, 1976.

Descriptors: *Adaptation, *Dehydration, *Moisture content, *Drought resistance, *Drought tolerance, Xerophytes, Plant physiology, Water storage, Water conservation.
Identifiers: Hydroadaptation, Hydrophyllization, Poikilohydrous plants, Homoiohydrous plants, U.S.S.R.

Two types or pathways of plant adaptation against desiccation on land exist. The passive type is peculiar to poikilohydrous plants (mainly lower plants) which do not regulate their water content and can tolerate more or less prolonged desiccation. The active type of adaptation is specific to higher plants. The latter are homoiohydrous possessing a complex of hydroregulating adaptations and capable of conserving water in tissues under desiccation. Two trends within the hydroadaptive rearrangement of land homoiohydrous plants exist: xerophyllization and hydrophyllization. During the xerophyllization process there is a strong hydroregulation adaptations.--Copyright 1976, Biological Abstracts, Inc.
W77-06774

PLACE AND ROLE OF PLANT COVER IN OPTIMIZATION OF THE DONBAS NATURAL ENVIRONMENT, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki; and Akademiya Nauk URSR, Kiev. Dept. of Geobotany and Palebotany.
For primary bibliographic entry see Field 4C.
W77-06858

3C. Use Of Water Of Impaired Quality

IRRIGATION OF THE NEBIT-DAG PLANTINGS BY MINERALIZED GROUND WATER, (IN RUSSIAN),
Nebit-Dag Bur. Greening 'Turkmeneft' Assoc. (USSR).
N. A. Ataev.
Probl Osvo Pustyn' 4, p 93-94, 1975.

Descriptors: *Groundwater, *Mineralogy, Irrigation, *Irrigation practices, *Trees, Shrubs, Planting management.
Identifiers: *Nebit-Dag(Turkman SSR), USSR, *Mineralized groundwater.

Mineralized ground water (2.20-14.6 g/l mineralization rate) can be used to irrigate tree and shrub plantings in Nebit-Dagh (Turkmen SSR, USSR), the irrigation rate being 5000-6000 m3/ha.
W77-06691

SALINITY EFFECTS ON RICE AFTER THE BOOT STAGE,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
M. T. Kaddah, W. F. Lehman, B. D. Meek, and F. E. Robinson.
Agronomy Journal, Vol. 67, No. 3, p 436-439, May-June 1975. 1 fig, 1 tab, 17 ref.

Descriptors: *Rice, *Salinity, *Crop response, *Salt tolerance, Flood irrigation, Crop production.
Identifiers: *Rice paddy.

Effect of salinity on rice after the boot stage has been controversial in the literature. Some authors maintain that rice is sensitive to salt at flowering, whereas others have found no evidence to support these views. The present greenhouse study evaluates the interaction after the boot stage of salinity, soil texture, and rate of drainage on rice development. Soil and plant analyses showed that: (a)

Average salinities in the root zone were 2 to 4 times the salinities of the respective irrigation waters. In general, salinities increased with plant development and with decreasing rate of drainage. Salt components added to Colorado river water increased in both straw and grain without effect on yield. (b) Mature grain yield of S1 and S2 did not differ significantly; average grain yield of S3 and 84% of S1. More reduction in yield would be expected if rice was sensitive to salt after the boot stage. (Skogerboe-Color St)
W77-06871

THE IMPACT OF FERTILIZER USE AND CROP MANAGEMENT ON NITROGEN CONTENT OF SUBSURFACE WATER DRAINING FROM UPLAND AGRICULTURAL WATERSHEDS,
Agricultural Research Service, Coshocton, Ohio. North Appalachian Experimental Watershed.
For primary bibliographic entry see Field 5B.
W77-06909

WATER IN THE PALOUSE RIVER BASIN, WASHINGTON,
Geological Survey, Madison, Wis. Water Resources Div.; and Geological Survey Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06978

AGRICULTURAL DISPOSAL OF AEROBIC WASTEWATER SLUDGES IN AN URBAN COUNTY,
Clermont County Water and Sewer District, Batavia, Ohio.
For primary bibliographic entry see Field 5D.
W77-07057

LAND APPLICATION OF SEWAGE SLUDGE: IV. WHEAT GROWTH, N CONTENT, N FERTILIZER VALUE, AND N USE EFFICIENCY AS INFLUENCED BY SEWAGE SLUDGE AND WOOD WASTE MIXTURES,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W77-07079

3D. Conservation In Domestic and Municipal Use

DESIGN STUDY OF ENVIRONMENTAL AND HUMAN CULTURAL INFORMATION SYSTEM NEEDS IN URBAN WATER RESOURCE DEVELOPMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Architecture and Urban Studies.
For primary bibliographic entry see Field 6B.
W77-06634

OPEN SPACE AND URBAN WATER MANAGEMENT - PHASE II: CASE STUDIES AND FINDINGS,
North Carolina Univ. at Chapel. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6B.
W77-06917

URBANIZATION AND FLOODING IN SHADES CREEK BASIN, JEFFERSON COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-06977

INTRODUCTION TO URBAN STORM WATER RUNOFF MODELS,
Water Resources Engineers, Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-07071

SIMPLIFIED METHODS OF COMPUTING THE QUANTITY OF URBAN RUNOFF,
Water Resources Engineers, Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-07072

THE WRE STORM MODEL,
Water Resources Engineers, Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-07073

3E. Conservation In Industry

MINERAL CONTENT OF SELECTED GEOTHERMAL WATERS,
Nevada Univ. System, Las Vegas. Water Resources Center.
J. W. Sanders, and M. J. Miles.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 419, Price codes: A03 in paper copy, A01 in microfiche. BuMines OFR 14-75, May 1974. 43 p, 3 fig, 10 tab, 9 ref, 7 append. BuMines G0133051.

Descriptors: *Geothermal studies, *Chemical properties, *Thermal springs, *Mineral water, *Water quality, Geology, Salts, Springs, Water properties, Analysis, Dissolved solids, Chemical analysis, Water analysis, Analytical techniques, Thermal water, Thermal properties.
Identifiers: *Geothermal brines, *Mineral content, *Geothermal waters, *Mineral extraction, *Mineral quality, *Western United States, Metallurgy, Geothermal resources, Chemical composition, Geothermal wells, Dissolved mineral content, Mineral concentration, Hot springs.

Interest is being focused on geothermal resources for their potential with regard to alleviating water and power demands of the future. The possibility of extracting minerals from geothermal brines is attractive and could lead to reduced costs for development of the overall geothermal resource. However, analytical information on which to develop extraction processes is inadequate. The objective of this study is to determine concentrations of minerals in geothermal brines in order that mineral recovery systems can be formulated and evaluated. Sixty-six samples were collected from geothermal areas and each sample was analyzed for 34 to 39 individual constituents. Nearly 860 analyses from about 420 geothermal sources in the Western United States were incorporated into a computerized storage and retrieval system. These data can be selectively retrieved according to any specified combination of parameters in order to expedite calculations or other data handling required for development and evaluation of mineral recovery procedures. (Henley-ISWS)
W77-06667

WATER DECONTAMINATION IN NORTHERN REGIONS BY IMPULSE ELECTRIC CHARGES, (IN RUSSIAN),
Tomskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5D.
W77-06791

GUIDELINES FOR THE PREPARATION OF ENVIRONMENTAL REPORTS FOR FOSSIL-FUELED STEAM ELECTRIC GENERATING STATIONS,
United Engineers and Constructors, Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 6G.
W77-06918

STATE-OF-THE-ART REVIEW OF PROCESSES FOR TREATMENT AND REUSE OF POTATO WASTES,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.
W77-06949

PROCEEDINGS TECHNOLOGY TRANSFER SEMINAR ON WASTE HANDLING, DISPOSAL AND RECOVERY IN THE METAL FINISHING INDUSTRY, NOVEMBER 12-13, 1975, TORONTO, ONTARIO.
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.
W77-06950

ENERGY DEVELOPMENT: THE ENVIRONMENTAL TRADEOFFS. VOLUME 4: THE BACKGROUND PAPERS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 6G.
W77-06957

HYDROCARBON PRODUCTS MANUFACTURE--BY CARBONISATION OF COAL, SCRAP RUBBER OR PLASTIC OR DOMESTIC SEWAGE UNDER REDUCED PRESSURE.
For primary bibliographic entry see Field 5D.
W77-07000

MUNICIPAL WASTE WATER TREATMENT AS AN INDUSTRIAL OPERATION,
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W77-07025

3F. Conservation In Agriculture

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, UMATILLA DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06602

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREA, GRANDE RONDE DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06603

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, POWDER DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06604

OREGON'S LONG RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, MALHEUR RIVER DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06605

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, OWYHEE DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06606

CURRENT METHODS USED IN THE SOIL CONSERVATION SERVICE TO ESTIMATE SEDIMENT YIELD,
Soil Conservation Service, Fort Worth, Tex.
For primary bibliographic entry see Field 4D.
W77-06657

ECONOMIC ANALYSIS OF ALTERNATIVE GROUNDWATER WITHDRAWAL RATES IN CONJUNCTION WITH SURFACE WATER IRRIGATION,
Washington State Univ., Pullman. Coll. of Agriculture.
For primary bibliographic entry see Field 4B.
W77-06740

LAND FORMING SYSTEMS TO IMPROVE WATER USE EFFICIENCY,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
J. K. Koelliker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 021, Price Codes: A05 in paper copy, A01 in microfiche. Kansas Water Resources Research Institute, Manhattan, KWRRI Contribution No. 184, November 1976. 70 p, 14 fig, 11 tab, 44 ref, 3 append. OWRT A-068-KAN(2), 14-31-0001-5016.

Descriptors: *Land forming, *Terracing, Groundwater recharge, Rainfall, Recharge, *Soil moisture, *Kansas, Wheat, Grain sorghum, Fallowing, Model studies, *Water utilization, Demonstration watersheds, Crop production, Watershed management, Monitoring, Agricultural watersheds, Potential water supply.
Identifiers: Fallow efficiency.

Two years of operation of conservation bench terraces and level pans at Garden City, Kansas conclusive as to determining increased water use efficiency for crop production. Precipitation in both years was well below normal and little surface runoff occurred. Measurements of precipitation, watershed runoff and soil moisture in the top 2.3 m were monitored and used to calibrate a soil moisture budget simulation model for western Kansas. The model was calibrated with one year's data from a fallow watershed. Predicted total soil moisture content in the 2.1 m soil profile averaged within 2.4 percent of actual field values. The model was then used to estimate the potential for ground water recharge from conservation bench terraces over the period 1945-1974.
W77-06761

DEPENDENCE OF WATER ABSORPTION BY THE CELL WALLS OF PLANT LEAVES ON THE VOLUME OF THE FREE SPACE, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
For primary bibliographic entry see Field 2I.
W77-06827

SMOOTHING DATA WITH CUBIC SPLINES,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 7C.
W77-06831

THE SIGNIFICANCE OF REGULATING THE WATER REGIME OF AGRICULTURAL LANDS, (IN RUSSIAN),
E. P. Eihe.
Latv Psr Zinat Akad Vestis 7, p 3-8, 1975.

Descriptors: Control, *Water balance, *Cultivation, *Water requirements, *Soil moisture, *Crop production, Water resources, Management, Cultivated lands, Drainage effects, Perennial rye-grass, Corn(Field), Oats, Vetch, Water pollution, Irrigation practices, Sprinkler irrigation, Confined waters, *Regulation.
Identifiers: Latvian-SSR, U.S.S.R.

The problems and importance of maintaining an air-water balance in cultivated lands are discussed. A drainage network that fulfills only a drainage function cannot adequately supply crops with water during the period of maximum demand. In order to ensure high and resistant yields, bilateral regulation of the soil water regime is necessary. The significance of such measures for crop yields is illustrated by data on a perennial grass mixture, silage corn, an oat-vetch mixture with ryegrass and feed cabbage. The problems of limited water resources for irrigation in the Latvian SSR (USSR), intensified by water pollution and the inappropriateness (in terms of pH and temperature) of artesian well waters, are outlined. Surface water reservois, underground moistening of the root zone and increased soil moisture capacity should be developed. The advantages of deep (to 50-100 cm) plowing of drained lands, vertical drainage-based drying and moistening, and synchronous impulse sprinkler irrigation are also described.--Copyright 1976, Biological Abstracts, Inc.
W77-06837

A METHOD OF EVALUATING A FIELD WATER CAPACITY USING PF-3, (IN FRENCH),
Institut National de la Recherche Agronomique, Toulouse (France). Station d'Agronomie.
For primary bibliographic entry see Field 2G.
W77-06844

POTASSIUM IN AN ARID LOESSIAL SOIL: CHANGES IN AVAILABILITY AS RELATED TO CROPPING AND FERTILIZATION,
Utah State Univ., Logan. Dept. of Soil and Meteorology.
D. W. James, W. H. Weaver, S. Roberts, and A. H. Hunter.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1111-1115, November-December 1975. 8 fig, 2 tab, 7 ref.

Descriptors: *Potassium, *Fertilizers, *Fertilization, Nutrients, Crop production, Cultivation, *Washington, Arid lands, Loam, Loess.

Two K fertilizer experiments were initiated in 1961 in arid central Washington on a Shano silt loam soil site that had been leveled to accommodate irrigation. The experiments were continued for 3 years and utilized rates of K fertilizer up to 320 kg K/ha in a randomized complete block design. By 1964 there existed a wide range of Kst (soil test K) as a result of the fixed random K treatments and partial exposure of K-deficient subsoils. That year the experiments were altered to completely randomized designs using both Kst and K fertilizer rates as controlled variables. The experiments were continued through 1970, providing an evaluation of the effects of crop management and K fertilization on soil K reserves. At low levels of Kst soil mineral K (Km) had a dominating influence, strongly buffering Kst changes involved with K removal (cropping) and K addition (fertilization). Whereas Kst serves as a good first approximation of soil K supply potential, supplemental information is required to fully describe the intensity and capacity factors in the K-soil-plant system. At comparable levels of Kst, the Shano silt loam profile is essentially homogeneous in regard to K availability. Therefore, special efforts to sample subsoils need not be made in routine fertility diagnosis of this soil series. (Skogerboe-Colo St)
W77-06870

THE EFFECT OF DIFFERENT METHODS ON GROWTH, DEVELOPMENT AND YIELD OF COTTON, (IN GERMAN),
Giessen Univ. (West Germany). Tropeninstitut; and Giessen Univ. (West Germany). Sektion fuer Pflanzenbau und Pflanzenzuechtung.
N. Atanasiu, N. Oezcueruemez, and A. Westphal.
Z Acker-Pflanzenbau 142(1), p 20-31. 1976.

Descriptors: *Comparative productivity, *Irrigation systems, *Irrigation effects, *Cotton, *Crop response, Crop production, Investigations, Surface irrigation, Subsurface irrigation, Sprinkler irrigation, Semiarid climates.
Identifiers: *Turkey.

Comparative investigations were carried out to test the underground irrigation vs. different surface irrigation methods under semiarid conditions of W Turkey. The underground irrigation water was applied by means of plastic drainage pipes laid out at 4 depths (0.8, 1.0, 1.2 and 1.4 m) below the soil surface and plastic foils were placed under the pipes to avoid infiltration losses. This irrigation method was compared with border and furrow irrigation with 50, 70 or 90 mm water/application. Sprinkler irrigation and a control treatment (non-irrigated) were included. The applied quantities of water amounted to 270-280 mm within the irrigation period from the beginning of July to the end of Aug. There were no significant differences between the border and furrow irrigation. Treatments with 90 mm of water per application were superior to the other treatments. The underground irrigation at the depth of 0.8 m was superior as compared to the other depths (1.0-1.201.4 m). Lowest yield was obtained with sprinkler irrigation. The control showed absolutely lowest yields. There were characteristic differences between surface and underground irrigation in regard to the development of the cotton plant and growth of the vegetative and generative organs. With underground irrigation at 0.8 m depth the branches and buds were formed earlier, and the highest number of bolls (closed and open) was reached at an earlier date as compared with surface irrigation (furrow 90 mm). The maximum leaf number was obtained with underground irrigation. The furrow irrigation at 90 mm showed the highest yield in all 4 rounds followed by the underground irrigation in the yield range. The seed:lint ratio was closer with underground irrigation in favor of lint yield. The advantages of the underground irrigation system result from the constant distribution of the applied water in the root zone. Underground irrigation which results in an earlier and faster development of cotton plants as compared with the other methods, offers advantages to the growth of cotton plants especially in ecological semiarid regions like W Turkey, where the vegetative time is limited by temperature (germination temperature of 15C at the beginning of May) in spring and by the start of the winter precipitation in autumn (Oct).--Copyright 1976, Biological Abstracts, Inc.
W77-06962

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE GROWTH SHAPERS: THE LAND USE IMPACTS OF INFRASTRUCTURE INVESTMENTS.
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6D.
W77-06601

MIXING AND CIRCULATION OF LAKES AND RESERVOIRS WITH AIR PLUMES,
New Hampshire Univ. Durham. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W77-06633

A STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN,
Purdue Univ., Lafayette, Ind. Lab for Applications of Remote Sensing.
For primary bibliographic entry see Field 7B.
W77-06670

DEBRIS BASINS FOR CONTROL OF SURFACE MINE SEDIMENTATION,
Kentucky Dept. for Natural Resources and Conservation, Frankfort. Office of Planning and Research.
For primary bibliographic entry see Field 5G.
W77-06672

EVALUATION OF THE ENVIRONMENTAL IMPACT TO APPALACHIAN PENNSYLVANIA WATERS OF THE 1972 FLOOD AND SUBSEQUENT STREAM CHANNELIZATION WITH FUTURE POLICY RECOMMENDATIONS.
Baker (Michael), Jr., Inc., Beaver, Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 659, Price codes: A14 in paper copy, A01 in microfiche. Report ARC-73-185-2562, September 1975. 319 p, 74 fig, 29 tab, 45 ref, 6 append. ARC 73-185.

Descriptors: *Floods, *Channel improvement, *Ecology, *Pennsylvania, Watersheds(Basins), Hurricanes, Streams, Flood damage, Historic floods, Water quality, Effects, Fish, Freshwater fishes, Trout, Benthos, Algae, Mining, Hydrology, Biology.
Identifiers: *Hurricane Agnes, Pennsylvania streams.

Geologic, engineering, and biological investigations of six coldwater Pennsylvania streams were undertaken to determine the impact of Tropical Storm Agnes and both pre- and post-flood stream channelization. The primary focus of the study was the ecological changes brought about by channel modification. No long-term deleterious effects of stream channelization on water quality, attached algae, benthic fauna, or forage fish populations were found. Trout were found to be greater in numbers and weight in natural stream reaches than in channelized reaches. Destruction of habitat appears to be the primary cause. Stream channelization was found often to be performed with a lack of adequate planning and supervision. A comprehensive planning process, as well as other recommendations, was set forth. (Sims-ISWS)
W77-06676

TWO-GOAL REGIONAL ENVIRONMENTAL POLICY: THE CASE OF THE SANTA ANA RIVER BASIN,
Tel-Aviv Univ. (Israel). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-06707

MATHEMATICAL MODELS IN HYDROLOGY.
United Nations Educational, Scientific and Cultural Organization, Paris (France).
For primary bibliographic entry see Field 2A.
W77-06708

OPTIMAL OPERATIONS OF RESERVOIRS IN THE HARZ MOUNTAINS,
Technische Universitaet, Brunswick (West Germany). Leichtweiss Inst. for Water Research.
U. Maniak, and W. Trau.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 901-907. 10 fig, 2 tab.

Descriptors: *Reservoir operation, *Simulation analysis, *Reservoir storage, *Reservoir releases, Monthly, Inflow, Frequency analysis, Municipal water, Water supply, Water demand, Synthetic hydrology, Hydrologic data, Queueing theory, Winter, Summer, Monte Carlo methods, Mathematical models, Systems analysis.
Identifiers: *Harz Mountains(Federal Republic of Germany), Conjunctive operation, Release rules.

The conjunctive operation of reservoirs for better use of natural resources requires well adjusted plans for the individual reservoirs. The operation of single-storage reservoir systems in the Harz Mountains in northern Germany is investigated using a simulation procedure covering a period of 500 years. The technique is based on the Monte Carlo method. The storage model is based on the principle of queueing theory, and the storage volume is determined for each month according to a synthetic monthly inflow and a certain service function which is referred to as the release rule of the system. Synthetic values of monthly inflows are generated by the simulation, using the appropriate distribution function for the transformation of the random numbers generated in the interval (0,1). The synthetic monthly inflow is added to the storage volume at the end of the preceding month and the monthly outflow is determined by the release rule. It is concluded that the mode of operation is highly dependent upon the purpose of the reservoir determining the release rule and entails certain patterns of frequency distribution curves of monthly reservoir storage. (See also W77-06708) (Bell-Cornell)
W77-06715

OPTIMIZATION MODEL OF A SYSTEM OF TWO OPEN-CHANNEL HYDROPLANTS,
Gdansk Technical Univ. (Poland). Inst. of Hydraulic Engineering.
T. Biernacki, and T. Piwecki.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 908-914. 4 fig, 2 ref.

Descriptors: *Powerplants, *Optimization, *Open channels, *Efficiencies, Operations, Peak loads, Daily, Inflow, Time constraints, Economic efficiency, Computer models, Hydraulic models, Equations, Systems analysis.
Identifiers: *Hydroplants, Benefit maximization, Saint Venant equation, Load curve, System efficiency, Energy system cost, Energy cost function.

In an electrical grid system having power produced mainly by thermal plants, it seems that a small number of hydro-power plants by their nature should cover the peak of the load curve. However, this is not obvious when the system consists in part of a thermal plant now unable to meet peak demands and of low head hydroplants which are sensitive to the variation of head. Careful analysis is then required accounting for hydraulic phenomena and thereby guaranteeing the optimal usage of the hydroplants to meet the appropriate part of the daily load diagram. This paper presents a hydraulic, economic, computer optimization model for two (or more) hydro-power plants connected by an open channel without storage. The problem is stated as follows: locate the two hydropower plants in the load diagram so as to maximize the value of energy produced. Since the energy cost function illustrates the energy system costs resulting from participation of thermal power stations, the optimal time at which to operate the hydroplants is that giving the maximum value of energy produced by these hydroplants. Head losses and limited daily water inflow forces the hydroplants to cover different parts of the load diagram so as to optimize the operational cost. It is found that the computer model permits the energy output to be increased by several per cent, as compared with results obtained from hand computation. (See also W77-06708) (Bell-Cornell)
W77-06716

METHODS FOR CONTROL OF THE REGIMES FOR WATER RESOURCES SYSTEMS,
Moskovskii Energeticheskii Institut (USSR). Dept. of Hydropower.
A. Sh. Reznikovsky.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 915-918. 3 ref.

Descriptors: *Water resources, *Regulation, *Multiple purpose, Water storage, Behavior, Probability, Optimization, Equations, Mathematical models, Systems analysis, Reviews.
Identifiers: *Water systems, Hydroplants.

The definitions and characteristics of large multipurpose water systems are given in terms of system techniques. The basic problems and method for control of the regimes for water resources systems with water storage which are to regulate streamflow of different depths over the short seasonal and long-term period are considered. Special attention is given to the development of the hierarchy structure for control of the regimes for multi-purpose systems whose water storages have unequal regulating potentialities and time differences in water coming. Some problems on further development of water resource systems are posed. (See also W77-06708) (Bell-Cornell)
W77-06717

OPTIMAL COMPLEX USE OF CONTROLLED WATER RESOURCES OF A BASIN,
Akademiya Nauk SSSR, Moscow. Central Economic Mathematical Inst.
B. S. Verkhovskii.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 919-925. 3 ref.

Descriptors: *Water resources, *Control, *Lakes, *Water storage, *Markov processes, Regulation, Time, Effects, Optimization, Probability, Stochastic processes, Drainage, Volume, Constraints, Irrigation systems, Equations, Algorithms, Mathematical models, Operations research.
Identifiers: *Stochastic programming, Benefit maximization.

The paper presents a model for optimal complex use of the water resources of a basin with year-to-year regulation of drainage by lake storage. The optimized system is assumed to operate for an extended period. Since it operates in a stochastically varying environment, the optimum criterion is taken to be the maximum mathematical expectation of the total effect (e.g., of net income), accounting for the revaluation of the different time effects. Described is an algorithm for finding the uniform markovian control. Considered next is a different approach--not involving analysis of controlled stochastic process--which has particular application to the optimum use of water resources for irrigation. The approach, called stochastic programming, is quite efficient. (See also W77-06708) (Bell-Cornell)
W77-06718

MATHEMATICAL MODEL OF WATER RESOURCES UTILIZATION IN A RIVER BASIN,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
Yu. A. Arkhanguelsky, and L. V. Dounin-Barkovsky.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 926-935. 4 fig.

Descriptors: *Water resources, *Water management(Applied), *Simulation analysis, *Algorithms, *River basins, Reservoir operation, Reservoir releases, Reservoirs, Hydrologic cycle, Long-term planning, Design, Optimization, Constraints, Water demand, Streamflow forecasting, Water utilization, Inflow, Estimating, *Mathematical models, Systems analysis.
Identifiers: *Syrdarya River(Middle Asia), Simultaneous operation, Water volume.

Extensive water resources systems providing water for vast areas and different users are becoming so complex that their effective control is possible only by the use of the newest cybernetic methods. Mathematical methods, used in combination with streamflow forecasting, are the most effective tools for obtaining optimal control rules. Use of these methods for the Syrsarya River basin, which is subject to various constraints, both natural and those of water demand, enables water resources to be used effectively. Presented is a complicated system of algorithms worked out for the purpose of water resources management to be used for the simulation of water systems under longterm planning and design. The mathematical model covers the whole hydrological cycle of the Syrdarya basin, one of the largest rivers of central Asia. The basin is divided into the following independent elements: (1) flow formation in the mountainous part; (2) transformation, use, and return of flow in the middle reaches; and (3) flow use in the lower reaches and its removal to the Aral Sea. The purpose of the system of algorithms is to check on the model and work out a method of estimating the optimal regime of simultaneous operation of the system of reservoirs in the basin. From the simulation results, the following are calculated: tables of optimal regimes of water releases from reservoirs for a series of years; tables of corrected values of water consumption; and a table of water consumption probabilities. (See also W77-06708)
W77-06719

OPTIMIZATION OF A THREE-RESERVOIR SYSTEM BY DYNAMIC PROGRAMMING,
Ministerio de Obras Publicas, Madrid (Spain). Geologico Servicio.
L. L. Garcia.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 936-941. 2 fig, 7 ref.

Descriptors: *River systems, *Reservoirs, *Dynamic programming, *Water demand, *Hydrology, Economics, Reservoir operation, Monthly, Computer programs, Water supply, Synthetic hydrology, Probability, Hydrologic data, Benefits, Mathematical models, Systems analysis, Irrigation, Constraints, Monte Carlo method.
Identifiers: Benefit maximization, Spain.

A Y-shaped river system has one reservoir on each of the branches of the Y figure. Spills from reservoirs 1 and 2 feed reservoir 3. Reservoir 1 can feed reservoir 2 through a diversion canal. Each reservoir has an independent system of water users, including irrigation, municipal and industrial supply, flood control, power, and minimum streamflows. A dynamic programming algorithm optimizes the monthly operation of the system for a given input of hydrological data. Thus it is possible to run the program for several samples of synthetic hydrology. The set of results may be analyzed statistically and the optimal operating policy may be selected in terms of probability. The objective function is benefit maximization. The program may be used either for systems fitting into the configuration assumed or for complex systems which, when simplified, may be reduced to this pattern. (See also W77-06708) (Bell-Cornell)
W77-06720

OPTIMAL DESIGN AND OPERATION OF RESERVOIR SYSTEMS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
A. J. Askew, W. W-G. Yeh, and W. A. Hall.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 942-949. 1 fig, 6 ref. OWRT B-061-CALIF(14).

Descriptors: *Simulation analysis, *Reservoir operation, *Monte Carlo method, Streamflow forecasting, Hydrology, Reservoir design, Constraint, Optimization, Probability, Stochastic processes, Computer programs, Failures, Mathematical models, Systems analysis.
Identifiers: Release rules.

Many sophisticated analytical procedures produce output which is not related to any given probability of failure, and therefore they cannot be used with confidence in the design and operation of water resources systems. A simple procedure is proposed which involves the use of Monte Carlo techniques in deriving the optimum value for any particular parameter of a reservoir system. The purpose of the paper is to demonstrate the ease and simplicity of the simulation approach and to indicate how great a quantity of information regarding the response of a system can be derived from such an analysis. Herein, the constraints are imposed by setting maximum permissible probabilities of failure. The procedure can be used to analyze a variety of complex reservoir systems. Probability tables derived from the analysis may be employed to improve the efficiency of operation of the reservoir system, particularly where detailed knowledge of the streamflow forecasting capability is available. The financial benefit of such forecasts can thereby be assessed. (See also W77-06708) (Bell-Cornell)
W77-06721

CONSTRUCTION AND ADJUSTMENT OF A TWO-LAYER MATHEMATICAL MODEL OF THE LLOBREGAT DELTA,
Ministerio de Obras Publicas, Barcelona (Spain). Computer Centre.
J. Cuena, and E. Custodio.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 950-964. 7 fig, 7 ref.

Descriptors: *Water resources, *Simulation analysis, *Aquifers, *Water management(Applied), Water supply, *Deltas, Optimum development plans, Water utilization, River regulation, Hydrology, Computer programs, Computer models, Saline water intrusion, Equations, Systems analysis, *Mathematical models.
Identifiers: *Barcelona(Spain), Llobregat Delta(Spain).

Barcelona, one of the two largest cities in Spain, has ever-increasing water supply problems. The present situation calls for the optimum utilization of all local resources rather than the construction of costly water transference canals. The local resources rather than the construction of costly water transference canals. The Llobregat River is the primary source of water and its associated alluvium acts as an important regulation system upon which many different types of supply are totally dependent. The aquifers in the Lower Llobregat and its delta have been modeled in order to provide a tool for optimizing their utilization and adequate management; however, at the opportune moment, they may be employed to stop, or at least reduce, the degree of sea-water intrusion and to improve artificial recharge. The mathematical model consists of two sets of superimposed polygons which simulate the two aquifers existing in the delta area. This model has certain special characteristics which were included in order to obtain a better adjustment to the boundary conditions and to the local hydrological conditions of the area. The model, which appears to be a useful management tool, has been programmed in general form which will allow for processing by different types of computer, as well as admitting changes in the geometrical network and the input functions. (See also W77-06708) (Bell-Cornell)
W77-06722

INTEGRATION OF AQUIFERS IN FLOOD CONTROL PROJECTS,
Technion - Israel Inst. of Tech. Haifa. Dept. of Agricultural Eng.
N. Buras.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 965-977. 4 fig, 5 tab, 10 ref.

Descriptors: *Flood control, *Flood protection, *Aquifers, *Conjuctive use, *Linear programming, Reservoir operation, Reservoir releases, Flooding, River basins, Water storage, Streamflow, Irrigation, Constraints, Computer models, Flood damage, Equations, Mathematical models, Systems analysis, Optimization.
Identifiers: Damage minimization, Flood volume, Minimum release, Maximum release, Supply maximization.

The lower parts of river basins in many arid and semi-arid regions are often economically developed and intensively cultivated. Under such climatic conditions, wet season rainfall of high intensity may cause damaging floods. The system under consideration consists of surface components (a river and its tributaries, dams and reservoirs, and urban and irrigated areas) and of groundwater aquifers. The problem is to integrate operationally the aquifers within the system so as to minimize damages caused by flooding. A linear programming model has been set up and two modes of operating the system have been considered: (1) maximizing the release from the uppermost surface reservoir at the beginning of the wet season; and (2) minimizing this release. In both cases, the flood volume is diminished to the same amount, but the number of days when inundating streamflows occur is smaller in the first case. The factor limiting the effectiveness of the integration of aquifers within flood control projects is the rate of infiltration into these sub-surface formations. The system objective is to mitigate as much as possible the flood damages and, at the same time, to store as much water as possible for irrigation purposes. (See also W77-06708) (Bell-Cornell)
W77-06723

OPTIMAL SEASONAL AND SHORT-TERM OPERATION OF A RESERVOIR USED FOR FLOOD CONTROL AND WATER SUPPLY,
Water Research Association, Marlow (England).
J. A. Cole.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 978-988. 6 fig, 6 ref, append.

Descriptors: *Reservoir operation, *Dynamic programming, *Flood control, *Water supply, Multiple-purpose reservoirs, Regulation, Runoff, Decision making, Short-term planning, Seasonal, Monthly, Reservoir releases, Storm runoff, Water demand, Flooding, Hydrology, Downstream, Flood damage, Mathematical models, Systems analysis, Optimization.
Identifiers: Cost minimization, *Release rules, Reservoir contents.

Starting from an objective of minimizing the combined costs of deficient water supply and of flood damage downstream, the monthly release rules of a reservoir are found by using dynamic programming. Examples are shown of how the rules may depend not only on prevailing contents but

lso on the previous monthly infow. Methods of aking prior inflow into account, without having ny significant increase in the problem's dimenions, are tested. Computational efficiency is also nhanced by limiting the number of decision tates. Given the seasonal vaues of each contents tate, as one result of the dynamic programming alculations, it is then shown how short-term regulation of the reservoir contents may be decided, sing a quantitative forecast of storm runoff. (See lso W77-06708) (Bell-Cornell)
V77-06724

TREAMFLOW REGULATION BY ARTIFIIAL RECHARGE FED FROM UPSTREAM URFACE STORAGE: DERIVATION OF CONROL RULES,
Vater Research Association, Marlow (England).
. Wyatt, D. G. Thorn, and P. A. Mawer.
n:Mathematical Models in Hydrology, roceedings of the Warsaw Symposium, Poland, uly 1971, Volume 2. IAHS/Unesco, Paris, rance, 1974, p 989-997. 7 fig, 4 ref.

Descriptors: *Streamflow, *Regulation, *Artificial echarge, *Dynamic programming, *Water torage, Groundwater, Surface waters, Upstream, Control, Aquifers, Conjunctive use, Constraints, Feasibility, Probability, Methodology, Costs, Markov processes, Algorithms, Rivers, Operaons research, Mathematical models, Optimizaon.
Identifiers: *Direct search method, *Control rules, Hill-climbing technique.

The conjunctive use of ground and surface water esources has been extensively reported for cases here inflows to the two sources are not strongly nked. In contrast, this paper considers the special ase of regulation of a common streamflow by ombined surface storage and artificial groundater recharge. Two methods are presented for nding control rules for regulating streamflow sing an on-channel surface store conjunctively ith abstraction from an artificial recharge to an quifer. The two methods are based on direct earch (hill-climbing) and dynamic programming ethods. The objective is to minimize use of the quifer, given that the operating costs of echarge/abstraction are higher than the costs of irect releases from the surface store. Comparave results are given for a single case, and further esults show the considerable reductions in surace storage made possible with the conjunctive se of artificial recharge. (See also W77-06708) Bell-Cornell)
/77-06725

HE METHODS OF DISTRIBUTION OF VATER RESOURCES IN RIVER DEVELOPIENT SYSTEMS,
kademiya Nauk SSSR, Moscow. Institut Vodykh Problem.
.. L. Velikanov, and D. N. Korobova.
n: Mathematical Models in Hydrology, roceedings of the Warsaw Symposium, Poland, uly 1971, Volume 2. IAHS/Unesco, Paris, rance, 1974, p 1001-1007. 3 fig, 3 ref.

Descriptors: *Water resources development, Water distribution(Applied), *River systems, Dynamic programming, Optimization, Feasibili/, Regional development, Planning, Water alance, Equations, Mathematical models, ystems analysis.
Identifiers: Maximiation, Effect function.

xamined is the general problem of distributing he water resources in river development systems, nd methods of mathematical programming are hown to be essential for solving such problems. he feasibility of applying dynamic programming ethods for solving problems of optimal distribuon of water resources is investigated on the basis f a study of a river development system that conins water users and water consumers. The use of dynamic programming methods for different schemes of river development is shown to call forth a need to account for the water balance and the limitations at each step of the solution. (See also W77-06708) (Bell-Cornell)
W77-06726

MODELE MATHEMATIQUE DE SIMULATION DU SYSTEME DES RESSOURCES HYDRAULIQUES SUPERFICIELLES DU LLOBREGAT,
Ministerio de Obras Publicas, Barcelona (Spain). Study and Experimental Centre.
J. C. Bartolome.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 1008-1016. 2 fig, 1 ref.

Descriptors: *River basins, *Simulation analysis, *Surface waters, Streamflow, Synthetic hydrology, Economics, Evaluation, Management, Stochastic processes, Alternative planning, Regional development, Hydraulics, Systems analysis, Mathematical models.
Identifiers: *River Llobregat(Spain).

This article is a general description of a mathematical model which simulates the surface water system of the basin of the River Llobregat in Spain. This description includes a general outline of the features of the basin, the generation of synthetic streamflow sequences at certain vital points within the basin, and the variables obtained as a result of the simulation process. The author describes generally the method of simulation; described also are the criteria employed in the economic evaluation of the statistical distribution of the variables in question, which were subsequently used to compare various solutions of basin management. (See also W77-06708) (Bell-Cornell)
W77-06727

CONJUNCTIVE USE OF THE TAJO-SEGURA AQUEDUCT SURFACE SYSTEM AND THE AQUIFERS OF THE LA MANCHA AREA,
Ministerio de Obras Publicas, Madrid (Spain). Geologico Servicio.
For primary bibliographic entry see Field 4B.
W77-06728

OPTIMAL PLANNING OF FLOWS IN MULTIRESERVOIR HYDRO-POWER SYSTEMS,
Boeing Computer Services Inc., Seattle, Wash. Mathematical Analysis Unit.
S. L. S. Jacoby, and J. S. Kowalik.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/ Unesco, Paris, France, 1974, p 1028-1039. 3 fig, 11 ref.

Descriptors: *Long-term planning, *Reservoirs, *Flow, Optimization, Reservoir storage, Constraints, Computers, Economic feasibility, Decision making, Equations, Mathematical models, Systems analysis.
Identifiers: *Nonlinear programming, *Hydropower systems, Outflow, Sensitivity, Power deficit.

The problem of optimal planning of flows for a large number of relatively long time periods in multi-reservoir hydro-power systems is considered. It is shown that this is a nonlinear programming problem. The problem variables are either reservoir storage contents at the end of the planning periods or averages for the planning periods of reservoir outflows. The objective may be to minimize power deficit or to minimize the maximum of the power deficits in any of the planning periods. This large nonlinear programming problem needs to be solved repeatedly to study the sensitivity of the optimal plan to changes in systems configuration, side conditions and constraints. It is shown how to obtain a meaningful model of the system on a computer and how to obtain a scheme enabling repeated computations in an accurate and economically feasible manner. (See also W77-06708) (Bell-Cornell)
W77-06730

HYDROLOGICAL EVALUATION OF CHANGES IN RUNOFF CHARACTERISTICS,
Hydrologic Engineering Center, Davis, Calif.
L. R. Beard.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 1048-1055. 3 fig, 1 tab.

Descriptors: *Hydrology, *Evaluation, Effects, *Runoff, *River basin development, Economics, Urban runoff, Reservoir construction, Levees, Channel improvement, Floods, Assessment, Storms, Computer programs, Probability, Simulation analysis, Mathematical models, Systems analysis, *Floods.
Identifiers: Urban development, Lumped-parameter model, Unit hydrograph procedure.

In addition to natural changes, there are cultural changes such as urban development, channel and levee improvements, and reservoir construction that can greatly affect flood runoff characteristics in a river basin, particularly when such changes are spread throughout the river basin. Some changes affect small floods and do not appreciably change maximum flood potential. Other changes might not affect the frequency and extent of minor floods but can substantially moderate or aggravate large floods. Many parts of the river basin are affected differently by any specific change. In order to evaluate all effects at all locations adequately, it is necessary to examine a large number of flood events of various magnitudes and of various areal and temporal characteristics under each pertinent set of basin characteristics. Described is a lumped-parameter model designed to perform the hydrological and economic evaluations for any type of river basin and for urban development, reservoir construction, and for levee and channel improvement. An example is given of a portion of a river basin where extensive channel improvement is proposed for the purpose of relieving frequent overbank flooding, and a computer program designed to accomplish the evaluation is described. (See also W77-06708) (Bell-Cornell)
W77-06732

GENERAL DESCRIPTION OF THE VISTULA RIVER PROJECT AND BASIC PLANNING DATA,
Bureau of Studies and Designs for Hydraulic Structures, Warsaw (Poland).
M. Jedrysik, A. Laski, and J. Zielinski.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco Paris, France, 1974, p 1056-1069. 2 fig, 3 tab.

Descriptors: *River basin development, *Projects, *Optimum development plans, Water shortage, Floods, Planning, Hydrologic data, Hydrologic aspects, Economics, Water requirements, Hydraulic structures, Water quality, Flood control, Mathematical models.
Identifiers: *Vistula River(Poland), Planning data.

The Vistula is the largest river in Poland and the development of its water resources has a fundamental significance for the overall development of the country. The most recent studies concerning comprehensive development of the Vistula River water resources were undertaken within the framework of the UNDP/UN Vistula River Project. These are a continuation of the previous studies which have been in progress for several years. The purpose of the Vistula River Project is to determine the optimal basin-wide solutions by applying mathematical modeling techniques. This

paper describes the Vistula basin and the Vistula River Project. Special emphasis is laid on the methodical preparation of the basic planning data and their scope (input data for the mathematical models). (See also W77-06708) (Bell-Cornell)
W77-06733

THE MULTI-STEP METHOD FOR SIMULATION AND OPTIMIZATION OF VISTULA RIVER PLANNING ALTERNATIVES,
Technical Univ., Warsaw (Poland). Inst. of Environmental Engineering.
Z. Kaczmarek, K. Krajewski, T. Kornatowski, A. Filipkowski, and J. Kindler.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 1070-1075. 3 fig, 3 ref.

Descriptors: *River basins, *Reservoirs, *Alternative planning, *Simulation analysis, *Optimization, Dynamic programming, Stochastic processes, Linear programming, Long-term planning, Hydrology, Flow, Downstream, Water allocation(Policy), Water supply, Water demand, Investment, Reservoir releases, Reservoir storage, Decision making, Constraints, Equations, Mathematical models, Systems analysis.
Identifiers: *Vistula River(Poland), Target outflows, Operating rules, Inflow hydrology, Out-of-kilter algorithm, Cost minimization.

A multi-step method is described for the simulation of a multi-reservoir river basin system. The method entails the use of three separate models to determine the optimum planning alternatives for the Vistula River system. The first model is called The Target Outputs Model; using the out-of-kilter algorithm, which is a special purpose linear programming method, the model determines the optimal (minimum) target releases from individual reservoirs for given inflows, water demands, outflow constraints and penalty costs for water deficits. The second model, The Reservoir Operating Rules Model, utilizes stochastic dynamic programming and determines the reservoir releases in such a way that departures from the release targets are minimized for a given probability of distribution of inflows. It also finds the flows at control profiles downstream of the reservoirs. Finally, The Allocation Model considers the allocation of water deficits arising from the inability to meet all demands given the optimized operating rules from model number 2 and penalty costs for deficits. (See also W77-06708) (Bell-Cornell)
W77-06734

THE OUT-OF-KILTER ALGORITHM AS A SINGLE-STEP METHOD FOR SIMULATION AND OPTIMIZATION OF VISTULA RIVER PLANNING ALTERNATIVES,
Water Resources Engineers Inc., Walnut Creek, Calif.
I. P. King, J. Filimowski, and J. Kindler.
In: Mathematical Models in Hydrology, proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 1076-1083. 7 fig, 3 ref.

Descriptors: *River basins, *Reservoirs, *Simulation analysis, *Optimization, *Alternative planning, Linear programming, Algorithms, *Water allocation(Policy), Water demand, Computer programs, Computer models, Networks, Methodology, River flow, Pumping, Costs, Constraints, Operations research.
Identifiers: *Out-of-kilter algorithms, *Vistula River(Poland), Target costs, Cost minimization.

A mathematical model is described for the simulation of a multi-reservoir river basin system. The system is set up as a network of arcs and nodes. A special purpose linear programming algorithm (the out-of-kilter algorithm) is used to find the optimal, least cost allocation of water to all demands. Overlapping time periods are used to eliminate the need for prespecified policies for the reservoir. The entire model program is written in Fortran and processes up to 15 years with a basic net of 100 arcs in one simulation. The method is demonstrated using an example river network having three reservoirs and six points at which natural runoff is aggregated. (See also W77-06708) (Bell-Cornell)
W77-06735

ENVIRONMENTAL IMPACT STATEMENTS IN WATER RESOURCES PLANNING AND DECISION MAKING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6E.
W77-06738

IMPROVEMENT OF PLANNING FOR POST-DEVELOPMENT WATER RESOURCE MANAGEMENT: A STUDY OF THE WEBER BASIN PROJECT,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Research.
For primary bibliographic entry see Field 6B.
W77-06739

CAUSES OF THE DRYING UP OF FORESTS IN THE FLOOD PLAIN OF THE LOWER REACHES OF THE URAL RIVER, (IN RUSSIAN),
For primary bibliographic entry see Field 4D.
W77-06801

A MODEL FOR THE WATER REGIME OF A DECIDUOUS FOREST WITH SPECIAL CONSIDERATION OF THE FUNCTIONAL INTERRELATIONSHIPS AMONG METEOROLOGICAL FACTORS, SOIL WATER CONTENT AND EVAPOTRANSPIRATION, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 2A.
W77-06864

FORECASTING FLOODS IN HAWAII (EXCLUDING HAWAII ISLAND),
National Weather Service, Honolulu, Hawaii. Pacific Region.
P. Haraguchi.
NOAA Technical Memorandum NWSTM PR-16, January 1977. 32 p, 10 fig, 6 tab, 37 ref.

Descriptors: *Hawaii, *Forecasting, *Warning systems, *Weather data, *Flood forecasting, *Flooding, Flood data, Rainfall, Thunderstorms, Lightning, Weather forecasting.

The floods from 1965 to the present (October 1976) were studied and the 11 most severe floods in respect to fatalities, monetary loss and areal extent were selected for detailed investigation. Observations of lightning and thunderstorms and short period intense rainfall were related to most floods since 1976. Data were insufficient for these studies prior to 1965. In summary there is, on the average, one severe localized flood a year. They occur mainly on Oahu, at night, from late November through early May. Flood damage averages about $1 million and damage amounts are increasing yearly mainly because of more property construction and inflation. Fatalities are not common. A 500-mb trough is usually present west of the islands before flooding. On Oahu and Maui, flood associated with low level easterlies occurred on windward side or just lee of windward mountain while flood preceded by deep southwesterlies occurred in the normally dry leeward area. Lightning and thunder observations are good indicators of possible flooding. In the severe floods, the rainfall for 1/2, one, and two hours prior to flooding exceeded the critical rainfall values. (NOAA)
W77-06873

FLOOD MANAGEMENT STUDY.
Northern Tier Regional Planning and Development Commission, Towanda, Pa.
For primary bibliographic entry see Field 6F.
W77-06952

DELINEATION OF FLOOD HAZARD AREAS: FLOOD HAZARD REPORT NO. 2, RARITAN RIVER.
Anderson-Nichols and Co., Inc., Boston, Mass.
Prepared for Department of Environmental Protection, Division of Water Resources, State of New Jersey, March 1972. 30 p, 13 fig, 15 plates, 6 tab, 4 ref.

Descriptors: *New Jersey, *Floods, Flooding, *Design flood, *Flood profiles, *Floodways, *Flood plains, *Flood protection, *Non-structural alternatives, *Control structures, Streamflow forecasting, Historic floods, Peak discharge, Flood plain zoning, Flood plain insurance, Erosion control, Channel improvement, Watershed management.
Identifiers: *Raritan River(NJ), *Flood fringe area.

General reasons for flooding problems as well as specifics about the Raritan River situation are given. Three hundred and thirty-one lineal stream miles of flood plains were studied within the 1,100 sq mi of Raritan River Basin. This study covers the Raritan River and contains some information on 6 sub-watersheds: South Branch and North Branch Raritan River, Millstone River, Green Brook, Lawrence Brook and South River. A number of major floods have occurred since the earliest recorded in 1810. The 30.6 mi segment of the Raritan River in this report slopes at an average of 2.3 ft/mi and flows through 18 communities. Design discharges have been calculated for this region. For the Floodway, the discharge is 2.4 times the Mean Annual Flood and for the Flood Hazard Area it is 3.0 times the Mean Annual Flood. The peak discharge for the Floodway is 54,000 cubic feet per second and for the Flood Hazard Area, 67,500 cfs. Contour maps show the delineation of the Floodway and Flood Fringe Area. The following recommendations are given: communities along the river should establish regulations to control land use along the river; no fill or structure should be permitted in the floodway which would alter the natural flow of the river; in the flood fringe the lowest floor elevation should be at least a foot above the flood hazard design elevation; the possibility of structural flood reduction measures should be considered periodically; National Flood Insurance should be considered; and municipalities should consider taxing land that is not suitable for development because of location in a flood area. (Smith-North Carolina)
W77-06953

FLOOD HAZARD INFORMATION: CAVE CREEK, ARIZONA CANAL TO 19TH AVENUE, PHOENIX, ARIZONA.
Army Engineer District, Los Angeles, Calif.
Prepared for Flood Control District of Maricopa County, Arizona, October 1971. 15 p, 5 fig, 13 plates.

Descriptors: *Arizona, *Floods, Flooding, *Flood profiles, *Flood plains, Flash flood, Annual flood, Streamflow forecasting, Maximum probable flood, Historic floods, Flood data, Peak discharge, Flood peak, Bank erosion, Floodways, Channels, Obstruction to flow, Dams, Channel improvement.
Identifiers: *Phoenix(AZ), *Cave Creek(AZ), *Intermediate Regional Flood, Arizona Canal(AZ), 50-year flood.

Land in the floodplains of this study area in the northwest part of Phoenix has been largely undeveloped to date, but pressure for development is expected to increase. Phoenix grew from a population of 107,000 in 1950 to 582,000 in 1970. The de-

mand for urbanization of flat land has been strong. Cave Creek, which drains 252 sq mi, originates in the mountains north of Phoenix and ends at its confluence with Arizona Canal. The flood season is generally from July through October, although floods can occur in any month. Floods are caused by general winter storms, general summer storms and local summer thunderstorms which cause flash floods, usually less than 3 hrs duration. Major floods occurred in 1905 and 1921. Cave Creek Dam, completed in 1923, serves as protection and has never been overtopped. The 1943 flood, largest since completion of the dam, had a peak discharge of 9,000 cubic ft/sec. It is predicted in an Intermediate Regional Flood, a peak discharge of 21,000 cfs will occur at the confluence of Cave Creek with Arizona Canal. Average channel velocities could range from 8-16 ft/sec. During a 50-year flood, a peak discharge of 13,000 cfs is anticipated with average channel velocities of 7-14 ft/sec. The sharp curve of the improved earth channel downstream from 19th Avenue could cause an erosion problem on the north and west bank of the channel. Several bridges over Cave Creek and Arizona Canal obstruct flood flows. In the past the canal has been overtopped several times. No federal flood control projects exist in the area, but Phoenix is undertaking some channel improvement. The Corps of Engineers has authorized a dam and channel system downstream of Cave Creek Dam. (Smith-North Carolina)
W77-06954

RECONNAISSANCE OF THE WATER RESOURCES OF THE CLINTON QUADRANGLE, WEST-CENTRAL OKLAHOMA,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-06959

SURFACE WATER NETWORK DESIGN BY REGRESSION ANALYSIS SIMULATION,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-06963

ANALOG-MODEL SIMULATIONS FOR SECONDARY CANAL CONTROLS AND FORWARD PUMPING WATER-MANAGEMENT SCHEMES IN SOUTHEAST FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06968

PRELIMINARY ASSESSMENT OF THE WATER RESOURCES OF THE TULALIP INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
B. W. Drost.
Open-file report 76-493, 1977. 89 p, 17 fig, 1 plate, 16 tab, 21 ref.

Descriptors: *Water resources, *Indian reservations, *Washington, *Available water, *Water quality, Surface waters, Groundwater resources, Aquifer characteristics, Hydrogeology, Water utilization, Water yield, Water demand, Chemical analysis, Water supply.
Identifiers: *Tulalip Indian Reservation(Wash).

In 1974 about 30 percent of the nearly 600 acre-feet of water used on the Tulalip Indian Reservation, Washington, was obtained from a surface-water reservoir, while nearly 70 percent was obtained from ground-water sources. Domestic use accounted for about 93 percent of total water use. Nutrient (phosphorus) concentrations measured in most surface-water samples were less than the maximum limit recommended by the U.S. Environmental Protection Agency. The recommended maximum limit for total coliform bacteria was never exceeded. Ground water is withdrawn from aquifers in unconsolidated deposits. Shallow aquifers, which provide about 45 percent of the total ground-water supply, are tapped by about 250 wells and yield 5 to 20 gpm to 30- and 42-inch diameter dug wells. Deeper aquifers yield about 55 percent of the ground-water supply to about 125 wells that are mostly between 100 and 150 feet deep. Yields are generally at least 20 gpm to 6- and 8-inch wells, and several wells have yields exceeding 300 gpm. Water in the shallow aquifers generally had an excessive concentration of dissolved iron, often exceeding the recommended maximum limit of 0.30 mg/liter, and total coliform bacteria in water from six wells exceeded 1 colony per 100 milliliters of water. Some wells in the deeper aquifers yield water with dissolved iron and (or) manganese concentrations exceeding the recommended maximum limit of 0.30 and 0.05 mg/liter, respectively. Although many deep coastal wells bottom far below sea level, only two wells indicated local saltwater intrusion. An aquifer underlying the central plateau and an artesian aquifer in the northeastern part of the reservation appear to offer the best potential for development of additional ground-water supplies. (Woodard-USGS)
W77-06971

IMPROVING ESTIMATES OF STREAMFLOW CHARACTERISTICS USING LANDSAT-1 (ERTS-1) IMAGERY,
Geological Survey, Nashville, Tenn. Water Resources Div.
E. F. Hollyday.
Journal of Research of the U S Geological Survey, Vol 4, No 5, p 517-531, September-October 1976. 3 fig, 6 tab, 11 ref.

Descriptors: Streamflow forecasting, *Remote sensing, *Satellite(Artificial), *Aerial photography, *Photogrammetry, Equations, Methodology, Evaluation, Regression analysis, Statistical models, Watersheds(Basins), Delaware, Maryland, Virginia.
Identifiers: *Delmarva Peninsula, Landsat-1.

Imagery from the first Earth Resources Technology Satellite (renamed Landsat-1) was used to discriminate physical features of drainage basins in an effort to improve equations used to estimate streamflow characteristics at gaged and ungaged sites. Records of 20 gaged basins in the Delmarva Peninsula of Maryland, Delaware, and Virginia were analyzed for 40 statistical streamflow characteristics. Equations relating these characteristics to basin characteristics were obtained by a technique of multiple linear regression. A control group of equations contains basin characteristics derived from maps. An experimental group of equations contains basin characteristics derived from both maps and imagery. Comparison of equations in the control group with corresponding equations in the experimental group reveals that for 12 out of 40 equations the standard error of estimate was reduced by more than 10 percent. It is concluded that data from Landsat imagery can substantially improve the accuracy of estimates of some streamflow characteristics at sites in the Delmarva Peninsula. (Woodard-USGS)
W77-06972

COMPREHENSIVE MONITORING OF METEOROLOGY, HYDRAULICS, AND THERMAL REGIME OF THE SAN DIEGO AQUEDUCT, CALIFORNIA,
Geological Survey, Bay St. Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 2D.
W77-06973

FLOODS IN LOUISIANA, MAGNITUDE AND FREQUENCY, THIRD EDITION,
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-06979

LONDON'S STORMWATER PROBLEM,
Greater London Council (England). Water and Wastewater Section.
For primary bibliographic entry see Field 5D.
W77-06983

SEDIMENTS AND WATER QUALITY OF URBAN STORM WATER,
Middlesex Polytechnic, London (England).
For primary bibliographic entry see Field 5B.
W77-06984

SIMPLIFIED METHODS OF COMPUTING THE QUANTITY OF URBAN RUNOFF,
Water Resources Engineers, Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-07072

ON-LINE ADAPTIVE CONTROL FOR COMBINED SEWER SYSTEMS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5D.
W77-07100

4B. Groundwater Management

CHEMICAL QUALITY OF EFFLUENTS AND THEIR INFLUENCE ON WATER QUALITY IN A SHALLOW AQUIFER,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W77-06658

MINERAL CONTENT OF SELECTED GEOTHERMAL WATERS,
Nevada Univ. System, Las Vegas. Water Resources Center.
For primary bibliographic entry see Field 3E.
W77-06667

MONITORING GROUNDWATER QUALITY: ILLUSTRATIVE EXAMPLES.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5A.
W77-06673

ON LARGE-SCALE SIMULATION OF GROUNDWATER FLOW SYSTEMS,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
K. Tiemer.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2, IAHS/Unesco, Paris, France, 1974, p 887-891. 1 fig, 4 ref.

Descriptors: *Groundwater resources, *Simulation analysis, *Aquifers, *Subsurface investigations, Management, Water demand, Flow, Hydrogeology, Mathematical models, Equations, Systems analysis, Methodology.
Identifiers: German Democratic Republic, Geohydraulic research, Subsurface reservoirs, Water availability.

The unfavorable relation between water demands and available water resources in the German Democratic Republic requires the optimal utilization of water resources, especially the efficient management of groundwater resources. To solve this problem, it is necessary to develop practicable

models of managed aquifers, an essential requirement for geohydraulic research in this country. In the areas of interest, the groundwater flow may be assumed to be in a horizontal plane. The difficulties of the mathematical problem result from the non-homogeneous hydrogeological properties of the aquifers and the complicated time-variable boundary conditions. However, combining mathematical and experimental methods it is possible to obtain acceptable approximate solutions, provided that all model parameters are known. In most cases, these parameters are widely unknown. Therefore, the simulation of typical groundwater situations is important for the development and testing of aquifer models. The effectiveness of the method presented herein--'Simulation of natural processes' or Indirect hydrological exploration'--is demonstrated using an example of a subsurface reservoir. As a result of this investigation, a proven mathematical model is available as well as a practicable solution algorithm. The model constitutes an adequate basis for precalculating the effects of intended water management measures on the groundwater balance. (See also W77-06708) (Bell-Cornell)
W77-06713

THE CONJUNCTIVE USE OF A MULTI-RESERVOIR SYSTEM AND A DUAL-PURPOSE DESALTING PLANT,
Sahand Co., Tehran (Iran).
F. Mobasheri, and V. Budhraja.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 895-900. 2 fig, 2 tab, 6 ref.

Descriptors: *Conjunctive use, Surface waters, *Desalination plants, *Dynamic programming, *Multiple-purpose reservoirs, Optimization, Reservoir operation, Water supply, Economic efficiency, Simulation analysis, Algorithms, Computer models, Operations research, Mathematical models.
Identifiers: Benefit maximization.

Products from surface reservoirs are subject to natural fluctuations in supply due to uncertainty in projecting the future stream flow data. A desalting plant used as a reserve capacity provides the possibility of producing fresh water to fill firm water demand during critical periods of surface water supply. This means that the firm water supply from surface reservoirs can be raised in the conjunctive system. Benefit from such an increase in supply can be larger than the cost of a dual-purpose desalting plant which produces water during critical periods of surface water supply and electricity when there is no need for fresh water from the desalting plant. Using the incremental dynamic programming technique, a mathematical model is developed to find the optimum conjunctive use of surface and desalted water which maximizes benefits. Several reservoir system configurations are used, e.g., reservoirs in series on the same river and parallel in different rivers. Reservoirs are multi-purpose, providing flood control, power production, water supply, and water quality control. The model functions on monthly stream flow data. State variables are monthly storage levels in the reservoirs and decision variables are monthly releases from reservoirs and the amounts of water produced by the desalting plant. (See also W77-06708) (Bell-Cornell)
W77-06714

CONSTRUCTION AND ADJUSTMENT OF A TWO-LAYER MATHEMATICAL MODEL OF THE LLOBREGAT DELTA,
Ministerio de Obras Publicas, Barcelona (Spain). Computer Centre.
For primary bibliographic entry see Field 4A.
W77-06722

STREAMFLOW REGULATION BY ARTIFICIAL RECHARGE FED FROM UPSTREAM SURFACE STORAGE: DERIVATION OF CONTROL RULES,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 4A.
W77-06725

CONJUNCTIVE USE OF THE TAJO-SEGURA AQUEDUCT SURFACE SYSTEM AND THE AQUIFERS OF THE LA MANCHA AREA,
Ministerio de Obras Publicas, Madrid (Spain). Geologico Servicio.
A. Sahuquillo.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 1017-1022. 2 fig, 5 ref.

Descriptors: *Conjunctive use, *Aqueducts, *Aquifers, *Surface waters, Alternative planning, Groundwater, Pumping, Water storage, Feasibility, Recharge, Water demand, *River basins, Regional development, Operations research.

Spain's Tajo-Segura Aqueduct, currently under construction, will divert 1200 Hm per year from the Tajo to the Segura Basin. The possibility if integrating the aquifers of the La Mancha area underlying the Aqueduct is discussed. Various alternatives are proposed: use of the water reserves; groundwater pumping only in dry years; use of the aquifers as storage units; feasibility of using the Aqueduct under a greater initial capacity in order to recharge the aquifers; or combinations of several of these alternatives. Groundwater studies are being carried out to obtain a better knowledge of these aquifers. (See also W77-06708) (Bell-Cornell)
W77-06728

HYBRID COMPUTER ANALYSIS OF A COMBINED SURFACE WATER--GROUNDWATER SYSTEM,
City Univ., London (England). Dept. of Civil Engineering.
W. J. Morris, and N. W. Morgan.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 1023-1027. 4 fig, 6 ref.

Descriptors: *Hybrid computers, *Surface waters, *Groundwater, *Simulation analysis, Conjunctive use, Hydrology, Hydraulics, Management, Alternative planning, Aquifers, Equations, Mathematical models, Systems analysis, *Computer models.
Identifiers: Linear equation, Nonlinear equation, Groundwater levels.

An analysis of a combined surface water--groundwater system with the aid of a hybrid computer is outlined and an assessment is made of the importance of the nonlinear terms in the partial differential equations used for simulating the groundwater system. For purposes of this study, the surface water system is considered as including the unsaturated zone and the hydraulic and hydrological processes at ground level, and the groundwater system is considered as all water within the saturated zone. It is shown that the accuracy of a simulation of such a combined system usng a hybrid computer is largely dependent on the availability and accuracy of the basic input data. A rapid and accurate evaluation of the controlling hydrological parameters can be made and the effect on groundwater levels of various water resource planning alternatives can be evaluated. (See also W77-06708) (Bell-Cornell)
W77-06729

ECONOMIC ANALYSIS OF ALTERNATIVE GROUNDWATER WITHDRAWAL RATES IN CONJUNCTION WITH SURFACE WATER IRRIGATION,
Washington State Univ., Pullman. Coll. of Agriculture.
M. Feldman, N. K. Whittlesey, and W. R. Butcher.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 026, Price codes: A07 in paper copy, A01 in microfiche. Washington Water Research Center, Pullman, Report No 27, September 1976. 126 p, 28 tab, 5 fig, 12 ref, append. OWRT B-051-WASH(2). 14-31-0001-3945.

Descriptors: Groundwater, *Withdrawal, *Conjunctive use, *Irrigation, Aquifers, *Economics, *Groundwater mining, *Input-output analysis, Water level.
Identifiers: Groundwater management.

Eastern Washington is experiencing rapid declines in groundwater levels due to irrigation pumping of the essentially fixed stock of groundwater. This study develops a conceptual framework for comparing economic factors of the present management policy to avoid exceeding a 10 foot per year decline in the static water level with alternative policies allowing greater decline rates or augmenting the water supply with surface water diverted from the Columbia River. A well cost model was developed to provide estimates of water costs for every potential well in the study area under alternative rates of water level decline. A computer model of the groundwater aquifer was utilized to provide estimates of the amount and location of the water that could be withdrawn from the aquifer while remaining within the limits of any management policy. An agricultural model (utilizing linear programming) calculated discounted net returns to agriculture, including non-irrigated agriculture, over a 50 year period. An input-output model was used to estimate the secondary economic impacts of additional irrigation development that could result from alternative management policies. Results showed that the actual depth from which water may be pumped depends heavily upon the rate of decline and the static water level. If water levels are relatively stable, water may be economically pumped from considerable depths. Rapid decline rates in the static water level will reduce the absolute depth at which water may be pumped economically. The results indicate that some economic gains would accure to irrigated farms and the local economy under policies which encourage more water use. However, the economic gains are proportionately much less than the changes in water use required to induce the economic gain.
W77-06740

POLLUTANT MOVEMENT TO SHALLOW GROUND WATER TABLES FROM SWINE WASTE LAGOONS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-06742

FURTHER DEVELOPMENT AND TESTING OF A STREAM-AQUIFER SYSTEM MODEL,
Kansas Water Resources Research Inst., Lawrence.
For primary bibliographic entry see Field 2F.
W77-06762

STUDY OF LEACHATE AT LANDFILL SITES 1975, VOLUME 1.
Holzmacher, McLendon and Murrell, Melville, N.Y.
For primary bibliographic entry see Field 5B.
W77-06851

PRELIMINARY BIBLIOGRAPHY ON GROUNDWATER IN DEVELOPING COUNTRIES,
Association of Geoscientists for International Development, St. John's (Newfoundland).

For primary bibliographic entry see Field 2F.
W77-06852

USGS SCIENTISTS BRING CALIFORNIA WATER SUPPLY INTO COMPLIANCE WITH FEDERAL REGULATIONS,
Geological Survey, Laguna Niguel, Calif.
For primary bibliographic entry see Field 5G.
W77-06853

WASTE INJECTION INTO STRATIFIED GROUND WATER BODIES,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W77-06855

HYDRAULICS AND ECONOMICS OF WELL FIELD LAYOUT.
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8B.
W77-06863

PERFORMANCE OF A RECHARGE AND RECOVERY SYSTEM IN AN AQUIFER WITH UNIFORM FLOW,
Technische Hogeschool, Delft (Netherlands). Geophysical Lab.
For primary bibliographic entry see Field 2F.
W77-06905

THE IMPACT OF FERTILIZER USE AND CROP MANAGEMENT ON NITROGEN CONTENT OF SUBSURFACE WATER DRAINING FROM UPLAND AGRICULTURAL WATERSHEDS,
Agricultural Research Service, Coshocton, Ohio. North Appalachian Experimental Watershed.
For primary bibliographic entry see Field 5B.
W77-06909

TABLES AND TYPE CURVES FOR ANALYSIS OF PUMP TESTS IN LEAKY PARALLEL-CHANNEL AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Vandenberg.
Technical Bulletin No 96, 1976. 28 p, 3 tab, 7 fig, 5 ref, 18 plates.

Descriptors: *Aquifers, *Leakage, Analysis, Curves, Computer programs, *Canada, Pumping.
Identifiers: *Parallel-channel aquifers, Esterhazy, Saskatchewan, *Leaky aquifers.

Analysis of drawdown data from pump tests in channel aquifers - as for example, buried bedrock channels - can be cumbersome when leakage effects and boundary effects set in simultaneously. Bukhari et al. (1969) have described a method for determining the leakage factor for cases where transmissivity and storativity can be determined from the early part of the drawdown data. Vandenberg (1976) has shown that if the distance measured along the axis of the channel between the pumped well and the observation well is greater than the width of the channel, the time-drawdown curve at the observation well can be closely approximated by assuming linear flow in the aquifer. This publication contains: (1) Extensive tables for the well function for leaky parallel-channel flow; (2) The corresponding type curves at a scale of .85 inches/log cycle, suitable for curve matching; (3) Several sets of type curves for cases where either the method of Bukhari et al. (1969) nor of Vandenberg (1976) can be used; (4) A computer program for plotting type curves for leaky artesian drawdown in a parallel channel for any configuration of pumped well and observation well; and (5) Examples illustrating the use of the type curves. (WATDOC)
W77-06941

RECONNAISSANCE OF THE WATER RESOURCES OF THE CLINTON QUADRANGLE, WEST-CENTRAL OKLAHOMA,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-06959

COMPARISON OF ITERATIVE METHODS OF SOLVING TWO-DIMENSIONAL GROUNDWATER FLOW EQUATIONS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-06965

ANALOG-MODEL SIMULATIONS FOR SECONDARY CANAL CONTROLS AND FORWARD PUMPING WATER-MANAGEMENT SCHEMES IN SOUTHEAST FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
E. H. Cordes, and R. A. Gardner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 825, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-93, December 1976. 60 p, 35 fig, 9 tab, 10 ref.

Descriptors: *Model studies, *Flow control, *Canals, *Florida, *Analog models, Flow augmentation, Water management(Applied), Low-flow augmentation, Groundwater recharge, Water storage, Pumping, Water wells.
Identifiers: Southeast Florida, *Biscayne aquifer(Fla).

The analog model of the Biscayne aquifer of southeast Florida was used to approximate the effects of two proposed water-management schemes. One involved adding a secondary control structure in a major canal which is controlled near the coast. In the model the controls were operated in accordance with canal water level both above and below the secondary control. Although the model could not differentiate between control openings of 1 foot or 5 feet, it showed that the secondary control is a viable method of conserving ground water. The second scheme involved pumping ground water ('forward pumping') from the Biscayne aquifer in inland areas during the dry season to: (1) augment canal flows toward the coast to sustain ground-water levels there, and (2) generate additional ground-water storage space for recharge in the wet season. Several sites on the model were programmed for forward pumping wells and the storage change was noted as a percentage of the ground-water withdrawal. (Woodard-USGS)
W77-06968

HYDROLOGIC INTERPRETATION OF GEOPHYSICAL DATA FROM THE SOUTHEASTERN HUECO BOLSON, EL PASO AND HUDSPETH COUNTIES, TEXAS,
Geological Survey, El Paso, Tex. Water Resources Div.
J. S. Gates, and W. D. Stanley.
Open-file report 76-650, November 1976. 37 p, 6 fig, 1 tab, 26 ref.

Descriptors: *Groundwater resources, *Surveys, *Remote sensing, *Instrumentation, *Texas, Geophysics, Electrical resistance, Evaluation, Aircraft, Geological surveys, Aquifer characteristics, Supplemental irrigation, Water supply.
Identifiers: *El Paso area(Tex), Airborne-electromagnetic surveys, Earth-resistivity surveys.

Airborne-electromagnetic and earth-resistivity surveys were used to explore for fresh ground water in the Hueco Bolson southeast of El Paso, Texas. Aerial surveys were made along about 500 miles of flight line, and 67 resistivity soundings were made along 110 miles of profile. The surveys did not indicate the presence of any large bodies of fresh ground water, but several areas may be underlain by small to moderate amounts of fresh to slightly saline water. The material underlying the flood plain of the Rio Grande is predominantly clay or sand of low resistivity. Along a band on the mesa next to and parallel to the flood plain, more resistive material composed partly of deposits of an ancient river channel extends to depths of about 400 to 1,700 feet. Locally, the lower part of this more resistive material is saturated with fresh to slightly saline water. The largest body of fresh to slightly saline ground water detected is between Fabens and Tornillo, Texas, mostly in the sandhill area between the flood plain and the mesa. Under assumed conditions, the total amount of water in storage may be as much as 400,000 to 800,000 acre-feet. The resistivity data indicate that the deep artesian zone southwest of Fabens extends from a depth of about 1,200 feet to about 2,800 feet. (Woodard-USGS)
W77-06970

PRELIMINARY ASSESSMENT OF THE WATER RESOURCES OF THE TULALIP INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-06971

REVIEW AND ANALYSIS OF HYDROGEOLOGIC CONDITIONS NEAR THE SITE OF A POTENTIAL NUCLEAR-WASTE REPOSITORY, EDDY AND LEA COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, N Mex. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06974

GEOLOGY AND GROUND WATER IN DOOR COUNTY, WISCONSIN, WITH EMPHASIS ON CONTAMINATION POTENTIAL IN THE SILURIAN DOLOMITE,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06975

WATER IN THE PALOUSE RIVER BASIN, WASHINGTON,
Geological Survey, Madison, Wis. Water Resources Div.; and Geological Survey Tacoma, Wash. Water Resources Div.
E. G. Nassar, and K. L. Walters.
Washington Department of Ecology, (Olympia), Water-Supply Bulletin 39, 1976. 246 p, 22 fig, 1 plate, 20 tab, 46 ref.

Descriptors: *Water supply, *Water demand, *Watershed management, *Hydrologic budget, *Water resources, Surface waters, Groundwater, Water quality, Water utilization, Water well, Aquifers, Pumping, Drawdown, Surface-groundwater relationships, *Irrigation, Municipal water, Evaluation, Available water, *Washington.
Identifiers: *Palouse River basin(Wash).

Surface-water supplies are inadequate for irrigation in much of the Palouse River basin in eastern Washington, and dryland wheat farming characterizes much of the area. Along the valleys where farms are irrigated from streams, upstream diversions during the low-flow period have sometimes depleted streamflow to the detriment of downstream irrigators. However, suitable sites for reservoirs for storage of winter and spring streamflows for summer irrigation are scarce; also, the large quantity of sediment deposited by streams in the basin would limit the usefulness of reservoirs.

A study directed toward defining low-flow characteristics of the streams could provide valuable information to water management agencies in the basin. A major ground-water problem exists in the heavily populated area of Pullman, where extensive pumping from wells for municipal supplies has lowered the artesian pressures to such an extent that wells that once flowed freely no longer do so. Any plan for continued development of the ground-water resource should include a wide spacing of new wells and a careful monitoring of water levels until the capacity of the local aquifers has been determined. Artificial recharge of aquifers may not be practical in the Palouse River basin because of the limited availability of surplus surface water to serve for recharge, and because the high sediment load in the surface water would require extensive treatment of the recharge water. (Woodard-USGS)
W77-06978

APPLICATION OF DIGITAL MODELLING TO THE PREDICTION OF RADIOISOTOPE MIGRATION IN GROUNDWATER,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06981

SUBSURFACE INJECTION-HOW MUCH DOES IT COST,
Black and Veatch, Denver, Colo.
For primary bibliographic entry see Field 5E.
W77-07011

WHAT'S NEW IN LANDFILL LINERS.
For primary bibliographic entry see Field 5G.
W77-07051

4C. Effects On Water Of Man's Non-Water Activities

ANTIEROSION ROLE OF FOREST PLANTINGS IN THE STEPPE ZONE OF THE MOLDAVIAN SSR, (IN RUSSIAN),
N. A. Pinchuk.
Izv Akad Nauk Mold SSR Ser Biol Khim Nauk 3, p 10-14, 1975.

Descriptors: *Erosion control, *Planting management, *Forest management, *Sediment discharge, Soils, *Permeability, *Runoff, Regulation, Oak, Scotch pine trees, Trees, Black locust trees, Maple trees, Shrubs.
Identifiers: *Moldavian SSR, USSR.

The effect of antierosion tree plantings of different composition on runoff, sediment discharge and water permeability of soils was studied by the artificial sprinkling method on 0.5 x 0.5 m runoff microplots. In southern Moldavian-SSR (USSR) forest litter in antierosion plantings serves as a hydrologic regulator. To accumulate and preserve forest litter these plantings should be made with a dense shrub undergrowth of a shady or semishady structure, mainly with oak on soils with average erosion and Scots pine and black locust with Norway maple on severely eroded soils.--Copyright 1976, Biological Abstracts, Inc.
W77-06745

PLACE AND ROLE OF PLANT COVER IN OPTIMIZATION OF THE DONBAS NATURAL ENVIRONMENT, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki; and Akademiya Nauk URSR, Kiev. Dept. of Geobotany and Palebotany.
V. S. Tkachenko.
Ukr Bot Zh 32(3), p 312-317, 1975.

Descriptors: *Vegetation effects, *Ecology, *Conservation, *Water yield improvement, Rivers, Protection, Forests, Erosion control, Vegetation, Optimization.
Identifiers: Biogeocenoses, Donbas, Plant cover, USSR, Ukranian SSR.

A number of methods (forest amelioration, nature-protection, a grotechnology, organization-economics, engineering and technology) must be used to insenify the medium-forming role of the plant cover for the purpose of improving the Donbas (Ukrainan SSR, USSR) natural environment. The problem can be solved by preserving natural biogeocenoses and by creating artificial biogeocenoses. Certain practical recommendations are given for erosion control, increasing the water content of revers and for optimizing the natural environment. --Copyright 1976, Biological Abstracts, Inc.
W77-06858

STATE INFORMATION NEEDS RELATED TO ONSHORE AND NEARSHORE EFFECTS OF OCS PETROLEUM DEVELOPMENT,
For primary bibliographic entry see Field 6G.
W77-06934

SEDIMENT DISCHARGE FROM AN AREA OF HIGHWAY CONSTRUCTION, APPLEMANS RUN BASIN, COLUMBIA COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa. Water Resources Div.
D. A. V. Eckhardt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 616, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-111, October 1976. 25 p, 6 fig, 4 tab, 16 ref.

Descriptors: *Sediment transport, *Sediment yield, *Soil erosion, *Road construction, *Storm runoff, Data collections, Turbidity, Sedimentation, Sediment control, *Pennsylvania.
Identifiers: Columbia County(Penn), Susquehanna River basin(Penn), Applemans Run basin(Penn).

The effects of highway construction on stream sediment loads were studied in Applemans Run basin, Columbia County, Pa., from October 1971 to May 1974. During the investigations, about 5,200 tons of suspended-sediment were discharged from the basin. Of this amount, about 2,700 tons, or about half the total sediment discharge, as derived from the highway construction area. Annual suspended-sediment yields from 17.5 acres under construction ranged from 40,000 to 66,000 tons/sq mi in the 1972 and 1973 water years, respectively. In the 1972 and 1973 er years of active construction, 83 percent of the sediment transported from the construction site was eroded each year in storms from January to June. Seasonal trends in sediment discharge for 1972 show that 69 percent of that year's suspended-load was transported in April, May, and June, whereas less than 1 percent was transported in July, August, and September. (Woodard-USGS)
W77-06969

URBANIZATION AND FLOODING IN SHADES CREEK BASIN, JEFFERSON COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala. Water Resources Div.
A. L. Knight.
Alabama Geological Survey, University, Information Series 55, December 1976. 73 p, 42 fig, 11 tab, 8 ref.

Descriptors: *Flood control, *Urbanization, *Flood forecasting, *Computer models, *Alabama, Flood profiles, Flood frequency, Regression analysis, Storm runoff, Storm drains, Surface runoff, Planning, Urban hydrology, Watershed management.
Identifiers: Jefferson County(Ala), *Shades Creek basin.

The magnitude of the 25-, 50-, 100-, and 500-year floods for drainage basins having various degrees of urban development in Jefferson County, Alabama may be estimated from graphical and mathematical relations. The basic equations utilize the relations among drainage area, lag time, a length-slope parameter, and percent imperviousness for a particular drainage basin. The relations presented in this report, and the U.S. Geological Survey step-backwater computer program, were used to compute water-surface profiles along Shades Creek. Flood profiles and maps were determined on the basis of main channel conditions as surveyed prior to December 1973 but assuming complete urbanization within the remaining part of the drainage basin. A completely urbanized area is defined as an area where curbing, guttering, and storm sewers are complete and where more than 45 percent of the watershed has impervious cover. (Woodard-USGS)
W77-06977

DIMINUTION RATIOS FOR PLANNING CONSTRUCTION-AREA SEDIMENT CONTROLS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4D.
W77-06980

4D. Watershed Protection

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, UMATILLA DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06602

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREA, GRANDE RONDE DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06603

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, POWDER DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06604

OREGON'S LONG RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, MALHEUR RIVER DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06605

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, OWYHEE DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06606

SEDIMENT YIELD PREDICTION BASED ON WATERSHED HYDROLOGY,
Agricultural Research Service, Temple, Tex.
J. R. Williams, and H. D. Berndt.
Paper No. 76-2535, American Society of Agricultural Engineers 1976 Winter Meeting, Chicago, Illinois, December 14-17, 1976. 14 p, 3 tab, 12 ref.

Descriptors: *Sediment yield, *Forecasting, *Hydrology, Watersheds(Basins), Reservoir design, Model studies, Runoff, Computers, Erosion, Equations, Farm management, Erosion control, Costs, Curves, Soil moisture, Peak discharge.
Identifiers: *Sediment-runoff model, *Modified universal soil loss equation, Sediment delivery ratio, Gross erosion.

A model for predicting sediment yield from ungaged watersheds was developed by attaching a sediment yield model to hydrologic models. The sediment-runoff model is useful in reservoir design and water quality modeling because daily, monthly, and annual sediment yield can be predicted with simple inputs and low computer costs. (Visocky-ISWS)
W77-06656

CURRENT METHODS USED IN THE SOIL CONSERVATION SERVICE TO ESTIMATE SEDIMENT YIELD,
Soil Conservation Service, Fort Worth, Tex.
E. C. Nicholas.
Paper No. 76-2532, American Society of Agricultural Engineers 1976 Winter Meeting, Chicago, Illinois, December 14-17, 1976. 8 p, 2 fig, 7 ref.

Descriptors: *Sediment yield, *Sedimentation rates, *Soil conservation, *Estimating, Forecasting, Equations, Erosion, Soil erosion, Suspended load, Deposition(Sediments), Methodology, Reservoirs, Land management, Farm management, Aerial photography, Curves.
Identifiers: *Universal soil loss equation, Gross erosion, Sediment delivery ratio.

The four basic procedures currently used in the Soil Conservation Service to estimate sediment yield depending on the environment and available data are: (1) gross erosion and sediment delivery ratio estimates, (2) predictive equations, (3) suspended sediment load measurements, and (4) sediment accumulation measurements. For verification, it is desirable to use more than one method. (Visocky-ISWS)
W77-06657

AN EXECUTIVE SUMMARY OF THREE EPA DEMONSTRATION PROGRAMS IN EROSION AND SEDIMENT CONTROL,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W77-06671

DEBRIS BASINS FOR CONTROL OF SURFACE MINE SEDIMENTATION,
Kentucky Dept. for Natural Resources and Conservation, Frankfort. Office of Planning and Research.
For primary bibliographic entry see Field 5G.
W77-06672

ON THE APPLICATION OF OPTIMIZATION TECHNIQUES TO CONCEPTUAL CATCHMENT MODELS,
Technische Universitaet, Dresden (East Germany).
For primary bibliographic entry see Field 2A.
W77-06709

ANTIEROSION ROLE OF FOREST PLANTINGS IN THE STEPPE ZONE OF THE MOLDAVIAN SSR, (IN RUSSIAN),
For primary bibliographic entry see Field 4C.
W77-06745

CAUSES OF THE DRYING UP OF FORESTS IN THE FLOOD PLAIN OF THE LOWER REACHES OF THE URAL RIVER, (IN RUSSIAN),
S. A. Nintin.
Lesovedenie 5, p 66-69, 1975.

Descriptors: *Forests, *Flood plains, *Flood flow, *Drying, Irrigation, Forest management, Forest watersheds, Rivers, Downstream, Vegetation regrowth, Irrigation, Cutting management, Watershed management.
Identifiers: *Ural River basin(USSR).

In flood-lands of the lower reaches of the Ural river (USSR) periodic thinning out of forests occurs in vast areas due to irregular flooding by high water flow. Irrigation of forested areas and timely cuttings of thinned stands to provide shoot regeneration are recommended.--Copyright 1976, Biological Abstracts, Inc.
W77-06801

PLACE AND ROLE OF PLANT COVER IN OPTIMIZATION OF THE DONBAS NATURAL ENVIRONMENT, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki; and Akademiya Nauk URSR, Kiev. Dept. of Geobotany and Palebotany.
For primary bibliographic entry see Field 4C.
W77-06858

LOSS OF 2,4-D IN RUNOFF FROM PLOTS RECEIVING SIMULATED RAINFALL AND FROM A SMALL AGRICULTURAL WATERSHED,
Southern Piedmont Conservation Research Center, Watkinsville, Ga.
For primary bibliographic entry see Field 5B.
W77-06908

OPEN SPACE AND URBAN WATER MANAGEMENT - PHASE II: CASE STUDIES AND FINDINGS,
North Carolina Univ. at Chapel. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6B.
W77-06917

SEDIMENT DISCHARGE FROM AN AREA OF HIGHWAY CONSTRUCTION, APPLEMANS RUN BASIN, COLUMBIA COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-06969

URBANIZATION AND FLOODING IN SHADES CREEK BASIN, JEFFERSON COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-06977

WATER IN THE PALOUSE RIVER BASIN, WASHINGTON,
Geological Survey, Madison, Wis. Water Resources Div.; and Geological Survey Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06978

DIMINUTION RATIOS FOR PLANNING CONSTRUCTION-AREA SEDIMENT CONTROLS,
Geological Survey, Reston, Va. Water Resources Div.
H. P. Guy.
In: Proceedings of National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, July 26-29, 1976, University of Kentucky, Lexington, Kentucky, p 91-97, 1976. 7 fig, 14 ref.

Descriptors: *Sediment control, *Erosion control, *Land management, Planning, Construction, Agriculture, Watershed management, Topography, Sediment yield, Analytical techniques.
Identifiers: Diminution ratio.

Planning erosion-control programs to limit sediment concentration in streams where part of the drainage bsin is construction area requires knowledge in the ratio of construction-area to rural-area concentration and the relative construction area of the basin. The diminution ratio required to obtain a specific stream concentration can be computed on the basis of these construction- and rural-area concentration determined from the Universal Soil Loss equation. The diminution ratio required to obtain a specific stream concentration can be computed on the basis of these construction- and rural-area concentrations determined from the Universal Soil Loss equation. The diminution ratio is the product of the factors necessry to achieve a specific limit of average sediment concentration in the stream draining the basin. Included are (1) the ratio of construction area to total area, (2) the sediment delivery factor, (3) the cropping management factor, and (4) the conservation practice factor. A map of the eastern United States shows diminution ratios based on a discharge-weighted annual stream-sediment concentration of 2,000 mg/liter, a soil erosivity factor of 0.4 a topographic effect factor of 1.0, and average annual stream-flow given by U.S. Geological Survey Hydrologic Atlas 212. (Woodard-USGS)
W77-06980

5. WATER QUALITY MANAGEMENT AND PROTECTION

GAS BUBBLE DISEASE OF SALMONIDS: A CRITICAL REVIEW,
Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab.
R. R. Rucker.
Technical Paper No. 58, February 1972, 11 p., 3 tab., 35 ref.

Descriptors: Freshwater fish, *Fish diseases, *Fish hatcheries, Atmospheric gases, *Animal pathology, Oxygen, Nitrogen, Supersaturation, Water temperature, *Metabolism, Carbon dioxide, Analytical technique, Gas chromatography, Mass spectrometry, Saturation, Reviews.
Identifiers: Saturation tables, *Gas bubble disease, *Nitrogen supersaturation.

Fish maintained in water supersaturated with air reach equilibrium with the gases dissolved in water. These gases in the fish tend to equilibrate to the atmosphere the same as the gases in the water. Gas-bubble disease is characterized by bubbles under the skin, in the fins, tail, mouth, behind the eyeballs, and in the vascular system. Carbon dioxide does not cause gas-bubble disease. Oxygen can cause gas-bubble even below 350 percent air saturation, but nitrogen can cause the disease even below 118 percent air saturation. Excess gas in water can be produced by pressure, increase in temperature, and biotic metabolism, and can be reduced by exposure to air. Carbon dioxide and oxygen can be quantitated by tritrimetry, while nitrogen analysis requires manometry, gas chromatography, or mass spectrometry, Saturation tables for atmospheric oxygen and nitrogen in water for O to 30C. are presented. (Katz)
W77-06920

5A. Identification Of Pollutants

A BIOLOGICAL MONITORING SYSTEM EMPLOYING RHEOTAXIS OF FISH,
Baden-Wuerttemberg Landesanstalt fuer Umweltschutz (West Germany).
For primary bibliographic entry see Field 5C.
W77-06609

EFFECT OF MALACHITE GREEN AND FORMALIN ON THE SURVIVAL OF LARGEMOUTH BASS EGGS AND FRY,
Cheraw National Fish Hatchery, S. C.
For primary bibliographic entry see Field 5C.
W77-06612

A PNEUMATIC GRAB FOR OBTAINING LARGE, UNDISTURBED MUD SAMPLES: ITS CONSTRUCTION AND SOME APPLICATIONS FOR MEASURING THE GROWTH OF LARVAE AND EMERGENCE OF ADULT CHIRONOMIDAE,
Institute of Terrestrial Ecology, Edinburgh (Scotland). Wetlands Research Group.
T. D. Murray, and W. N. Charles.
Freshwater Biology, Vol. 5, No. 2, p 205-210, 1975. 3 fig, 6 ref.

Descriptors: *Sampling, Equipment, *On-site investigations, *Technology, *Bottom sampling, *Benthic fauna, *Methodology, On-site data collections, Research equipment, Benthos, *Diptera, Mud, *Diptera.
Identifiers: *Pneumatic grab.

A description if given of the construction and operation of a pneumatic grab for taking samples of mud 0.25 square meters in area, which can be removed without disturbance. It is of value in a variety of studies, and examples are given for its use in maintaining enclosed benthic populations and for measuring the emergence of adult Chironomidae. An emergence trap and box liners used for enclosing experimental benthic populations for use in conjunction with the pneumatic grab are described. (Katz)
W77-06613

ZOOPLANKTON SAMPLING VARIABILITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Woods Hole Oceanographic Institution, Mass.
T. J. Lawson, and G. D. Grice.
Bulletin of Marine Science, Vol. 27(1), p. 80-84, 1977. 2 tab, 2 fig, 9 ref.

Descriptors: *Zooplankton, *Distribution, *Nets, *Sampling, *Variability, On-site data collection, Correlation analysis, Statistics, Analytical techniques, Methodology.
Identifiers: *Controlled experimental ecosystem, *Schindler plankton trap, Bongo net.

Zooplankton sampling variability in controlled experimental ecosystems (CEEs) was investigated using a small, vertically-hauled net and a Schindler plankton trap. Following sampling, all the zooplankton in the CEEs were collected by filtering the water. Based on precision, accuracy, and comparability between experiments, vertically integrated net hauls provide the best measure of zooplankton abundance in CEEs. (Katz)
W77-06615

DYNAMICS OF MICRO-ZOOPLANKTON POPULATIONS TREATED WITH COPPER: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
J. R. Beers, G. L. Stewart, and K. D. Hoskins.
Bulletin of Marine Science, Vol 27(1), p 66-79, 1977. 2 tab, 10 fig, 28 ref.

Descriptors: *Zooplankton, *Protozoa, Larvae, Biomass, *Bioassay, *Copper, On-site data collections, *Copper, *Heavy metals, Water pollution effects, Path of pollutants, *Biological communities, Monitoring, Bioindicators, Toxicity, On-site-investigations.
Identifiers: *Controlled experimental ecosystem, *Micro-zooplankton, Micrometazoa.

The taxonomic composition, numerical abundance, and biomass of the microzooplankton component of natural plankton populations from Saanich Inlet, British Columbia contained in large-volume (68 cu m) Controlled Experimental Ecosystems (CEEs) were monitored during two studies on the effects of copper. Populations subjected to 50 and 10 micrograms per liter copper were examined along with two control populations in the first experiment; enclosures with copper at 10 and 5 micrograms/l and a single control were observed during the second experiment. Differences between experimental and control CEE populations were greatest at the highest copper level, decreasing with lower concentrations. The major ciliate groups dropped out of the contained ecosystem with copper introduced at 50 micrograms/l and did not reappear. Oligotrich ciliates, but with different dominant species than in the controls, developed in environments to which 5 and 10 micrograms/l copper had been added. Among the important micrometazoan taxa, naupliar copepod abundances were lower relative to the controls in 50 and 10 micrograms/l, but not 5 micrograms/l, copper-treated enclosures. The observed effects on the micro-zooplankton taxa may not be related to direct action of copper on these organisms, but may have resulted from modifications to other trophic levels of the contained populations. (Katz)
W77-06616

EVALUATION OF POTENTIAL INDICATORS OF SUB-LETHAL TOXIC STRESS ON MARINE ZOOPLANKTON (FEEDING, FECUNDITY, RESPIRATION AND EXCRETION): CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
M. R. Reeve, M. A. Walter, K. Darcy, and T. Ikeda.
Bulletin of Marine Science, Vol 27(1), p 105-113, 1977. 3 tab, 1 fig, 14 ref.

Descriptors: *Marine animals, *Zooplankton, Copepods, Feeding rates, Fecundity, Respiration, *Copper, *Mercury, *Heavy metals, Water pollution effects, Toxicity, *Bioindicators, Laboratory tests, *Methodology, Mortality.
Identifiers: *Controlled experimental ecosystem, *Sub-lethal effects, Fecal pellet production, Egg production, LC 50.

Fecal pellet and egg production were used as indicators of the condition of small copepods exposed to low levels of copper and mercury in the laboratory. Natural copepod assemblages in three different locations were compared in their sub-lethal responses. Although effects could be demonstrated in the 1-10 microgram/l range, many biological and chemical factors combined to make it pointless to specify toxicity levels more precisely, particularly where the aim is to extrapolate data to other situations for regulatory purposes. Species composition, season, temperature, and chemical complexing capacity of the water would all introduce variability. It is suggested that in this concentration range, the kind of metal present may be less important than the total amounts. Respiration and excretion rates of zooplankton were not found to be sensitive indicators of sub-lethal stress. (Katz)
W77-06617

THE GROWTH OF YOUNG SALMONIDS (ONCHORHYNCHUS KETA): CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
British Columbia Univ., Vancouver. Inst. of Oceanography.
P. Koeller, and T. R. Parsons.
Bulletin of Marine Science, Vol 27(1), p 114-118, 1977. 4 tab, 1 fig, 7 ref.

Descriptors: Salmonids, *Chum salmon, *Juvenile fish, *Fish food organisms, Zooplankton, Crustaceans, Food chains, *Copper, *Heavy metals, Water pollution effects, Growth rates, Productivity.
Identifiers: *Controlled experimental ecosystem.

The growth of juvenile chum salmon (Oncorhynchus keta) in full-scale (1700m3) controlled ecosystems was followed over a period of 45 days. The controlled ecosystems supported the growth of juvenile salmon when large crustacean zooplankton were present as part of the natural food chain in the enclosures. In the presence of small zooplankton the young salmon were unable to increase in weight. In contrast to the marked effect of diet on the growth of juvenile salmonids, the presence of 2.5 micrograms/l inorganic copper (10 x ambient level) caused no observable effect on the growth or survival of the fish. These experiments indicate that factors (pollutants or natural events) which alter the spectrum of prey items available to young fish may be more important than the direct effect of physical or chemical factors on juvenile fish. (Katz)
W77-06618

EXPERIMENTAL OBSERVATIONS ON THE EFFECTS OF COPPER ON COPEPODS AND OTHER ZOOPLANKTON: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Rosentiel School of Marine and Atmospheric Science, Miami, Fla.
M. R. Reeve, J. C. Gamble, and M. A. Walter.
Bulletin of Marine Science, Vol 27(1), p 92-104, 1977. 1 tab, 7 fig, 23 ref.

Descriptors: *Zooplankton, *Copepods, Digestion, Filtration, Feeding rates, *Copper, *Heavy metals, Water pollution effects, Toxicity, Mortality, Path of pollutants, On-site data collections, Predation, *Grazing, Biological communities, Food chains.
Identifiers: *Controlled experimental ecosystem, Pseudocalanus, Calanus, Euphausia, Pleurobrachia, Fecal pellet production rates, Egg production rates.

Laboratory experiments were performed on ingestion, filtration, and fecal pellet production rates of the copepods Pseudocalanus sp. and Calanus sp. and on the feeding rates of Euphausia sp. and Pleurobrachia sp. taken from controlled environmental ecosystems to which 0, 5, and 10 micrograms/l copper had been added. In all cases, reduced activity could be demonstrated at these copper concentrations compared with populations from environmental controls. Data from sediment traps placed in the ecosystems suggested that effects of egg and fecal pellet production could also be observed. Population control by predation and grazing is also discussed. (Katz)
W77-06619

RESPONSE OF MACRO-ZOOPLANKTON POPULATIONS TO COPPER: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Woods Hole Oceanographi Institution, Mass.
V. R. Gibson, and G. D. Grice.
Bulletin of Marine Science, Vol. 27(1), p. 85-91, 1977. 3 tab, 3 fig, 9 ref.

Descriptors: *Zooplankton, *Fluctuations, Biomass, Biological communities, Sampling, Nets, On-site data collections, *Predation, Copepods, *Copper, *Heavy metals, *Water pollution effects, Toxicity, Mortality, Path of pollutants.

Identifiers: *Controlled experimental ecosystems, *Species composition, *Ctenophores, Medusae, Acartia sp., Pseudocalanus sp.

Fluctuations in zooplankton abundance and species composition are described for two copper experiments conducted in Controlled Experimental Ecosystems during 1974. Copper concentrations of 5, 10, and 50 micrograms/l were tested. The major phenomenon in both experiments was a severe reduction (>80%) in the abundance of zooplankton in all CEEs, control as well as copper polluted. A portion of the population decline was attributed to grazing by carnivorous ctenophores and medusae, making it difficult to quantitatively assess the effects of copper. The abundance of ctenophores and medusae remained higher in control than in copper perturbated CEEs, indicating that these organisms are adversely affected by the copper concentrations used in the experiments. At a nominal concentration of 50 micrograms/l copper, abundances of Pseudocalanus sp. and Acartia longiremis were reduced to 50% of their original levels 3-3.5 times more quickly than in the controls. Results in 5 and 10 micrograms/l CEEs were more variable and less significant. It is not known whether these effects were the direct result of copper on the organisms, or an indirect result of alterations at lower trophic levels. (Katz)
W77-06620

EFFECTS OF COPPER ON SILICIC ACID UPTAKE BY A MARINE PHYTOPLANKTON POPULATION: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Alaska Univ., College. Inst. of Marine Science.
J. J. Goering, D. Boisseau, and A. Hattori.
Bulletin of Marine Science, Vol. 27(1), p. 58-65, 1977. 4 tab, 21 ref.

Descriptors: *Phytoplankton, Silicates, *Copper, *Heavy metals, Water pollution effects, *Path of pollutants, *Bioassay, On-site investigation, Diatoms, Growth rates, Marine algae, Marine plants, *Silica, Plant growth, Plant physiology.
Identifiers: *Controlled experimental ecosystem, *Silicic acid uptake.

Stable isotope tracer techniques were used to examine the effect of copper on silicic acid uptake by natural populations of marine phytoplankton. Short term exposures (1-6 days) of phytoplankton to four levels of added copper, 2.5, 5.0, 10.0, and 25.0 micrograms/l were studied. Copper additions, in general, inhibited uptake when compared to controls with the greatest effect at 25 micrograms/l copper. Uptakes at this copper concentration ranged from 49-98% of the control with a mean of 61% and many values near 50%. The estimated rates of dissolution of silica from phytoplankton cell walls in the presence or absence of copper were low. This implies that exposure of siliceous phytoplankton to copper up to 25 micrograms/l does not greatly alter their dissolution rate. (Katz)
W77-06621

RESPONSE OF NATURAL MARINE BACTERIAL POPULATIONS TO COPPER: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Woods Hole Oceanographic Institution, Mass.
R. F. Vaccaro, F. Azam, and R. E. Hodson.
Bulletin of Marine Science, Vol. 27(1), p. 17-22, 1977. 4 fig, 12 ref.

Descriptors: *Copper, *Heavy metals, *Marine bacteria, *Phytoplankton, Ions, On-site data collection, Photosynthesis, Biological communities, Succession, Resistance, *Water pollution effects, Path of pollutants, *Toxicity, Mortality.
Identifiers: Enclosed marine ecosystem, Heterotrophic bacteria, *Copper ion.

The addition of Cu^{2+} at 10 and 50 micrograms/l to two enclosed marine ecosystems led to a marked increase in the relative numbers and activity of bacterial heterotrophs. This acceleration appears to follow the release of available organic carbon from one or more copper-sensitive components of the original ecosystem. Ultimately, the bacterial survivors, which demonstrate an increased tolerance to copper with time, reciprocate by providing a source of plant nutrients suitable for the establishment of succeeding phytoplankton regimes. (Katz)
W77-06622

EFFECTS OF FOUR OILS ON MARINE BACTERIAL POPULATIONS: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. E. Hodson, F. Azam, and R. F. Lee.
Bulletin of Marine Science, Vol. 27(1), p. 119-126, 1977. 2 tab, 2 fig, 20 ref.

Descriptors: *Marine bacteria, *Microorganisms, *Oil wastes, *Oil pollution, *Water pollution effects, *Toxicity, Mortality, Resistance, On-site data collection, Carbon radioisotopes, Chemical analysis, Organic compounds.
Identifiers: Controlled experimental ecosystem, Processed oil, Crude oil, Tolerance, Glucose, Mineralization, Total hydrocarbon concentration.

During the August, 1974 CEPEX (Controlled Ecosystem Pollution Experiment) hydrocarbon experiment, the effects of four oils (Louisiana crude, Kuwait crude No. 2 fuel oil, and Bunker C oil) on heterotrophic uptake and mineralization of D-glucose-14C by 1 microgram-filterable microbial populations from Saanich Inlet, British Columbia, Canada, were examined. The four oils inhibited D-glucose uptake and mineralization; the degree of inhibition was dependent upon both the oil type and concentration. The two processed oils were more toxic than the two crude oils tested. Low concentrations (e.g. 80 micrograms/l) of Bunker C oil stimulated bacterial metabolism. Populations exposed to 10 micrograms/l of No. 2 fuel oil for 30 days in CEE enclosures did not acquire oil tolerance. Neither the potential for oxidation of 14C-labeled hydrocarbons nor the total bacterial density was enhanced by one-month's exposure to 10 micrograms/l of No. 2 fuel oil. These data suggest that concentrations of these oils in seawater above 300 micrograms/l can significantly inhibit marine bacterial activity. (Katz)
W77-06623

EFFECTS OF COPPER ON PHYTOPLANKTON STANDING CROP AND PRODUCTIVITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
W. H. Thomas, O. Holm-Hansen, D. L. R. Siebert, F. Azam, and R. Hodson.
Bulletin of Marine Science, Vol. 27(1), p. 34-43, 1977. 1 tab, 10 fig, 27 ref.

Descriptors: *Copper, *Heavy metals, *Toxicity, *Mortality, *Water pollution effects, Phytoplankton, Productivity, Standing crops, Growth rates, Carbon radioisotopes, Photosynthesis, Food chain.
Identifiers: *Controlled experimental ecosystem.

Two experiments were performed in which copper was added to seawater and its associated plankton enclosed in plastic containers moored in Saanich Inlet, British Columbia. In the first experiment (10 and 23 to 50 microgram/l copper) phytoplankton crops, photosynthesis, and growth rates were initially inhibited by copper. Excretion of 14C-labelled organic matter was high in copper-treated populations. Initial inhibition was followed by recovery of the phytoplankton crops and of photosynthesis so that, at the end of the experiment (27 days), values were similar to those in untreated control enclosures. There were no significant differences in the particulate carbon:nitrogen or carbon:phosphorus ratios between the control and test enclosures, indicating that copper did not change the gross chemical composition of the phytoplankton. In the second experiment (5 and 10 microgram/l copper), copper seemed to increase the algal standing crops, but not the rate of photosynthesis, over levels in the control enclosure. The lack of inhibitory effects of copper might have been because the crop at the time of copper addition consisted mostly of microflagellates which were the copper-resistant algae noted in the first experiment. The slight increase in plant biomass in treated CEEs was, however, most likely due to inhibition of zooplankton which would result in reduced grazing pressure on the algal crops. (Katz)
W77-06624

EFFECTS OF COPPER ON THE DOMINANCE AND THE DIVERSITY OF ALGAE: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
W. N. Thomas, and D. L. R. Seibert.
Bulletin of Marine Science, Vol. 27(1), p. 23-33, 1977. 10 figs, 2 tabs, 15 ref.

Descriptors: *Copper, *Heavy metals, *Water pollution effects, *Path of pollutants, Diatoms, *Phytoplankton, Marine algae, Dinoflagellates, *Biomass, Toxicity, Mortality, On-site data collections, Bioassay.
Identifiers: *Controlled experimental ecosystems, Microflagellates, Centric diatoms, Pennate diatoms, Diversity.

Two experiments were performed in which copper was added to plastic experimental enclosures (CEEs) moored in Saanich Inlet, British Columbia. In the first experiment, copper was added 1 day after mooring at concentrations of 10 and 50 micrograms per liter copper. Ten days later, populations of centric diatoms, Chaetoceros sp., declined as a proportion of the crop in copper treated enclosures. These populations were replaced by copper-insensitive algae (microflagellates, Nitzschia delicatissima and Navicula distans). Taxonomic diversity declined in both control and treated enclosures, but was very much lower in copper treatments. Biomass diversities also declined, but the differences between control and treated enclosures were not significant. In the second experiment, copper was added 10 days after the start at concentrations of 5 and 10 mg/l copper. Before copper addition diatoms declined proportionally and were replaced by microflagellates. Thereafter, in the control enclosure, the proportion of centric diatoms and dinoflagellates increased. Copper treatment resulted in low proportions of centric diatoms and the complete absence of dinoflagellates 4 days after copper treatment. The remaining population consisted mainly of pennate diatoms, of which Nitzschia d. was prominent. Taxonomic and biomass diversity declined in all enclosures prior to copper treatment; copper treatment in this experiment did not result in significant changes in either diversity measurement. These studies provide data substantiating the hypothesis that certain algae will predominate over others when pollutants are introduced into the sea. (Katz)
W77-06625

TEMPERATURE, SALINITY AND LIGHT PENETRATION STRUCTURES: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
British Columbia Univ., Vancouver. Inst. of Oceanography.
M. Takahashi, and F. A. Whitney.
Bulletin of Marine Science, Vol. 27(1), p. 8-16, 1977. 11 figs, 15 ref.

Descriptors: *Water temperature, *Salinity, *Light penetration, *Euphotic zone, Stratification, On-site data collection, Physical properties,

*Marine microorganisms, Cycling nutrients, Diatoms, Zooplankton, Phytoplankton, *Sea water.
Identifiers: *Controlled experimental ecosystems, *Pelagic ecosystems.

Temperature, salinity, and light penetration profiles were taken frequently during eight separate experiments in 0.25-scale controlled experimental ecosystems (CEEs), each lasting approximately 1 month, and one experiment in full-scale CEEs, lasting 2.5 months. In both scale CEEs, the temperature profiles showed similar temporal changes to those of the outside waters. Initial salinity structures were maintained throughout the experiment, except for some modification by rain and wave action, while that outside changed due to estuarine and tidal activity as well. In the 0.25-scale CEEs, waves promoted vertical mixing and, in the top 5 to 7 m, occasionally caused water exchange. The water column in the full-scale CEEs was highly stratified, preventing some organisms and regenerated nutrients from being advected into the euphotic zone. The floats and plastics of the CEEs reduced direct solar energy up to 50% and diffused the incident light. (Katz)
W77-06626

LOCH EWE BAG EXPERIMENT, 1974,
Marine Lab., Aberdeen (Scotland).
J. C. Gamble, J. M. Davies, and J. H. Steele.
Bulletin of Marine Science, Vol. 27(1), p. 146-175, 1977. 5 tab, 25 figs, 46 ref.

Descriptors: *On-site data collections, *Methodology, *Primary production, Carbon radioisotopes, Water temperature, Salinity, *Copper, *Heavy metals, Larvae, Benthic fauna, Phytoplankton, Zooplankton, Marine biology, *Cycling nutrients.
Identifiers: *Controlled experimental ecosystems, *Lock Ewe(Scotland).

The study of planktonic ecosystems in large plastic enclosures (bags) elucidates the effects of a range of factors including different rates of nutrient enrichment, variations in predator numbers, and additions of copper to the system. Differences in rates of nutrient enrichment alter the rate of primary production without greatly altering phytoplankton biomass. Variations in population structure of the phytoplankton and in herbivore biomass appear to result from differences in predator numbers. The effects of natural stresses appear similar to those induced by a pollutant. (Katz)
W77-06627

THE UPTAKE OF LEAD, ZINC, CADMIUM, AND COPPER BY THE PULMONATE MOLLUSC, HELIX ASPERSA MULLER, AND ITS RELEVANCE TO THE MONITORING OF HEAVY METAL CONTAMINATION OF THE ENVIRONMENT,
Bristol Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-06629

STABLE ELEMENTS OF RADIOECOLOGICAL IMPORTANCE IN CERTAIN ECHINODERM SPECIES,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
C. Papadopoulou, G. D. Kanias, and E. Moraitopoulou-Kassimati.
Marine Pollution Bulletin, Vol. 7(8), p. 143-144, 1976. 2 tab, 1 fig, 14 ref.

Descriptors: *Radioecology, Neutron activation analysis, *Radio-chemical analysis, Radioisotopes, *Radioactive wastes, *Path of pollutants, Water pollution sources, Marine animals, Bioindicators, Public health, Benthos, Trace elements, Pollutant identification, Spectroscopy.
Identifiers: *Echinoderms, Gamma-ray spectroscopy, *Marine ecosystems.

Echinoderms may present variations in their elementary composition according to the surrounding medium and to their food sources. The accumulation of certain trace elements by these organisms is of radioecological interest, besides the biological one. The elements cobalt, zinc, chromium, caesium, silver, tin, iron, rubidium, selenium and scandium were determined in seven echinoderm species by neutron activation analysis and gamma-ray spectroscopy. The calculated values of the concentration factors of the determined elements are reported and discussed from the radioecological point of view. (Katz)
W77-06640

AN OFFSHORE BIOMONITORING SYSTEM FOR CHLORINATED HYDROCARBONS,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, T. C. Heesen, and D. J. McDermott.
Marine Pollution Bulletin, Vol. 7(8), p. 156-159, 1976. 4 figs, 17 ref.

Descriptors: *Mussels, *DDT, *Polychlorinated biphenyls, *Chlorinated hydrocarbons, *Bioindicators, On-site data collections, Industrial wastes, Water pollution effects, Path of pollutants, Bottom sediments, *Methodology, Bioassay, Biochemistry, *Monitoring, Pollutant identification.
Identifiers: *Mytilus californianus, Taut-line buoy system, Submarine outfalls.

Uncontaminated intertidal mussels transferred to a tautline buoy system near a major submarine outfall off southern California proved to be useful bio-indicators of water column contamination. Mussel survival exceeded 90%, and specimens maintained for 13 weeks near the polluted bottom (35m) and the sea surface accumulated DDT above control concentrations by factors of 200 and 20, respectively. Corresponding factors for PCB were 60 and 6. (Katz)
W77-06641

COASTAL METEOROLOGICAL NETWORKS TO DETERMINE EFFECTS OF NUCLEAR PLANT COOLING SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
For primary bibliographic entry see Field 2B.
W77-06643

PETROLEUM HYDROCARBONS FROM EFFLUENTS: DETECTION IN MARINE ENVIRONMENT,
Hunter Coll., New York. Dept. of Environmental Health Sciences.
J. T. Tanacredi.
Journal of the Water Pollution Control Federation, Vol 49, No 2, p 216-226, February 1977. 7 fig, 5 tab, 32 ref.

Descriptors: *Pollutant identification, *Oil wastes, *New York, *Water pollution sources, *Marine biology, *Oil pollution, *Waste water(Pollution), Benthos, Analytical techniques, Aquatic life, Fluorescence, Spectroscopy, Chromatography, Chemical analysis, Instrumentation, Oil, Water pollution, Oily water, Effluents, Pollutants, Organic compounds.
Identifiers: *Petroleum hydrocarbons, *Marine environments, *Crankcase wastes, *Waste oil disposal, *Jamaica Bay(NY), Marine organisms, Crankcase oil.

Weekly samples from four wastewater treatment facilities discharging into Jamaica Bay were analyzed for the presence of waste crankcase petroleum products. Two novel ultraviolet-fluorescence spectroscopic techniques were utilized to exhibit qualitatively the presence of waste automotive petroleum hydrocarbons in each of the final effluents of water pollution control plants by comparison of sample 'profiles' to 'profiles' generated by standard oils. The surface waters and a benthic organism (Mya arenaria) residing in Jamaica Bay were also analyzed for petroleum hydrocarbons using these techniques. Ultraviolet-fluorescence spectroscopic analyses furnished dramatic evidence for the presence of a significant quantity of hydrocarbons associated with waste petroleum products in all samples collected. Gas chromatographic and mass spectroscopic analyses indicate petroleum contamination of mollusks. (Henley-ISWS)
W77-06660

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF EUTROPHICATION IN SAGINAW BAY,
Bendix Aerospace Systems Div. Ann Arbor, Mich.
R. H. Rogers.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-12434, Price codes: A02 in paper copy, A01 in microfiche. Report BSR 4201, October 1975. 11 p, 4 fig, 4 tab, 7 ref. NASA NAS5-20942.

Descriptors: *Remote sensing, *Water quality, *Lake Huron, Satellites(Artificial), *Mapping, Eutrophication, Nutrients, Chlorophyll, Phosphorus, Water temperature, Correlation analysis, Regression analysis, Data processing.
Identifiers: *LANDSAT, *Saginaw Bay(Mich).

Computer techniques developed for mapping water quality parameters from LANDSAT data were demonstrated, using ground truth collected in an ongoing survey of water quality in Saginaw Bay (Lake Huron), Michigan sponsored by the US Environmental Protection Agency. Chemical and biological parameters were collected at 27 bay stations in concert with LANDSAT overflights. Application on stepwise linear regression to 12 of these parameters and corresponding LANDSAT measurements resulted in relationships that can be applied to map any one of the 12 water quality parameters over the entire bay. The regression correlation coefficients varied from 0.99 for total phosphorus to 0.72 for chlorophyll a corrected. Five of the water quality parameters are best correlated with LANDSAT Band 6 alone. One parameter, temperature, relates to Band 5 alone, and only two bands are justified for mapping the remaining six parameters. (Sims-ISWS)
W77-06665

COMPUTER MAPPING OF LANDSAT DATA FOR ENVIRONMENTAL APPLICATIONS,
Bendix Aerospace Systems Div. Ann Arbor, Mich.
R. H. Rogers, J. B. McKeon, L. E. Reed, N. F. Schmidt, and R. N. Schecter.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-13551, Price codes: A02 in paper copy, A01 in microfiche. Report BSR 4206, November 1975. 17 p, 5 fig, 9 ref. NASA NAS5-20942.

Descriptors: *Remote sensing, *Mapping, *Land use, *Water quality, Satellites(Artificial), Data processing, Watersheds(Basins), Water pollution, Water pollution sources, Runoff, Sediments, Nutrients, Classification, Land classification, Forests, Cities, Urbanization, *North Carolina.
Identifiers: *LANDSAT, Triangle J Council of Government(NC).

LANDSAT computer compatible tapes were used as a basis for inventorying land cover within the Triangle J Council of Government's 1,750 sq mi study area. Ten land cover categories were interpreted for the study area at a detail of 0.44 hectares (1.1 acres). The study area included 3 urban density categories, 4 forest types, agricultural-managed lands, bare soil-construction sites, and water. The resulting products included color-coded overlays for each of the 10 categories for a

1:96,000 scale base map, a color composite map of the same categories and scale, and a computer tape containing 54 quadrangles (7.5 minute) where each 50 meter grid cell was coded as to the 10 land cover types. This taped data is being agrregated into 4 hectare (about 10 acres) grid cells and merged with soils and slope data to compute sediment and nutrient flows in the drainage areas. The complete inventory was accomplished with a period of 60 days at a cost of less than one cent per acre, a significant improvement in dollars and time over previously reported efforts. (Sims-ISWS)
W77-06666

MINERAL CONTENT OF SELECTED GEOTHERMAL WATERS,
Nevada Univ. System, Las Vegas. Water Resources Center.
For primary bibliographic entry see Field 3E.
W77-06667

MONITORING GROUNDWATER QUALITY: ILLUSTRATIVE EXAMPLES.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 936, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA 600/4-76-036, Las Vegas, Nevada, July 1976. 92 p, 18 fig, 8 tab, 37 ref, 1 append. R. M. Tinlin, editor. EPA 69-01-0759.

Descriptors: *Arkansas, *California, *New York, *Connecticut, *Arizona, *Groundwater, *Water pollution, Water resources, *Monitoring, *Water quality, Water wells, Control systems, Data collections, Industrial wastes, Nitrates, Septic tanks, Salinity, Aquifers, Leachate, Cesspools, Chemical properties, Measurement, Water supplies, Oxidation lagoons.
Identifiers: *Brine disposal, Landfill leachate, Plating wastes contamination, Percolation ponds, Agricultural pollution.

This study was designed to show by example site-specific procedures for monitoring various classes of groundwater pollution sources. The first five case histories of actual or potential groundwater pollution were presented, including the monitoring techniques and their efficacy. The case histories cover brine disposal in Arkansas, plating waste contamination in Long Island, New York, landfill leachate pollution in Milford, Connecticut, an oxidation pond near Tucson, Arizona, and multiple-source nitrate pollution in the Fresno-Clovis, California, metropolitan area. The report concluded with hypothetical illustrative examples for developing and selecting monitoring alternatives based on a cost comparison between other alternatives and hydrologic judgment. The examples illustrated cover agricultural return flow, septic tanks, percolation ponds, and landfills. (Henley-ISWS)
W77-06673

THE DISTRIBUTION OF NATURAL AND ANTHROPOGENIC ELEMENTS AND COMPOUNDS IN PRECIPITATION ACROSS THE U.S.; THEORY AND QUANTITATIVE MODELS,
North Carolina Univ., Chapel Hill. Dept. of Botany.
For primary bibliographic entry see Field 2B.
W77-06675

MEASUREMENTS OF PLANKTONIC BIOMASS IN A RESERVOIR,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
D. W. Toetz.
Available from the National Technical Information Service, Springfield, VA 22161 as ORO-425 431, Price codes: A02 in paper copy, A01 in microfiche. Oklahoma State Univ., Dept. of Zoology Contribution 505, (1975). 9 p. 2 tab, 7 ref. AEC AT-(40-1)-4254.

Descriptors: *Reservoirs, *Plankton, *Biomass, *Measurement, *Variability, *Oklahoma, Euphotic zone, On-site investigations, Analytical techniques, Statistical methods, Pollutant identification.
Identifiers: *Lake Carl Blackwell(Okla), Melosira, Analysis of variance(ANOVA).

The assumption that planktonic biomass measurements at two nearby stations at the same euphotic zone depth would yield correlated data was tested in Lake Carl Blackwell, Oklahoma. The predominant diatom Melosira was used in the analysis of variance (ANOVA). The widest range in absolute values encountered were: 0.07-0.30 mg particulate nitrogen/1; 0.78-2.09 mg particulate carbon/1; 0.07-7.0 mg chlorophyll-a/cu m and 0-688 Melosira/ml. The only consistent pattern to emerge from two-way (ANOVA) is that station effects are an important variability source for Melosira. Three-wat (ANOVA) run with sampling time as an additional variable emphasized that for Melosira station site was a significant source but sampling time was not. However, interactions between samples and time of sampling and station and time of sampling were significant. In all three chemical parameters sampling time contributed a significant source of variability. Moreover, samples x time of sampling interaction was also significant in all cases. Chlorophyll-a and particulate nitrogen tended to increase with time. Sample effects and the samples x time of sampling interactions were significant in a three-way (ANOVA) for particulate carbon and particulate nitrogen. The test results are given as a guide to research planners. (Auen-Wisconsin)
W77-06679

SOME EFFECTS ON INTEGRAL PHOTOSYNTHESIS OF ARTIFICIAL CIRCULATION OF PHYTOPLANKTON THROUGH LIGHT GRADIENTS,
For primary bibliographic entry see Field 5C.
W77-06696

THE USE OF REMOTE SENSING TO DETECT HOW WIND INFLUENCES PLANKTONIC BLUE-GREEN ALGAL DISTRIBUTION,
For primary bibliographic entry see Field 5C.
W77-06697

INDUCTION OF HEPATIC MICROSOMAL ENZYMES BY AROCLOR 1254 IN ICTALURUS PUNCTATUS (CHANNEL CATFISH),
Texas A and M Univ., College Station. Dept. of Veterinary Physiology and Pharmacology.
For primary bibliographic entry see Field 5C.
W77-06759

THE MEASUREMENT OF TEMPERATURE TOLERANCE: VERIFICATION OF AN INDEX,
Maryland Univ., Baltimore County, Baltimore. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-06764

WATER CHEMISTRY AND WATER QUALITY,
Uppsala Univ. (Sweden). Dept. of Physical Geography; and Uppsala Univ. (Sweden). Div. of Hydrology.
E. Eriksson.
Ambio, Vol. VI, No. I, p 27-30, 1977 1 tab, 13 ref.

Descriptors: *Water quality, *Water chemistry, Water pollution, Water quality control, Water quality standards, Toxicity, Monitoring, *Pollutant identification, Analytical techniques.

Analytical determination of the chemical composition of water is discussed as well as the criteria for judging water quality as it is dependent upon the use of water. Water quality standards for domestic water use are particularly emphasized. A table is included which lists various contaminants and the amounts of each allowed by several countries around the world. Water quality management and monitoring is discussed. (Chilton-ORNL)
W77-06778

MEDIAN TOLERANCE LIMITS OF SOME CHEMICALS TO THE FRESH WATER FISH CYPRINUS-CARPIO,
Andhra Univ., Waltair (India). Coll. of Engineering.
For primary bibliographic entry see Field 5C.
W77-06780

PARTIAL EXTRACTION OF METALS FROM AQUATIC SEDIMENTS,
Geological Survey, Albany, N.Y. Central Lab.
B. A. Malo.
Environmental Science and Technology, Vol. 11, No. 3, March 1977, p 277-282, 10 tab, 1 fig, 7 ref.

Descriptors: *Separation techniques, *Metals, Sediments, Monitoring, Monitoring, Pollutant identification, Analytical techniques.

Four procedures which use 0.3 M HC1, pH 3 or pH 7 citrate-dithionite, or acetic acid-hydroxylmine solutions were evaluated with respect to their potential use in removing surface coatings from aquatic sediment particles. The 0.3 M HC1 extraction required fewer manipultions than the citrate-dithionite procedure, yielded approximately the same recovery efficiency with minimum structural degradation, and resulted in an easily analyzed solution. These advantages make the 0.3 M HC1 procedure preferable for routine use in monitoring the readily acid-soluble minor elements in aquatic sediments. (Chilton-ORNL)
W77-06781

HEAVY METAL CONCENTRATIONS IN WATER, SEDIMENTS, AND FISH FROM MEDITERRANEAN COASTAL AREA, ISRAEL,
Israel Oceanographic and Limnological Research Ltd., Haifa. Haifa Labs.
For primary bibliographic entry see Field 5C.
W77-06782

A PRELIMINARY SURVEY OF MERCURY IN FISH FROM BOMBAY AND THANA ENVIRONMENT,
Institute of Science, Bombay (India). Inorganic and Nuclear Chemistry Lab.
For primary bibliographic entry see Field 5C.
W77-06785

INDICATOR VALUES OF VASCULAR PLANTS IN CENTRAL EUROPE, (IN GERMAN),
Goettingen Univ. (West Germany). Systematisch-Geobotanisches Institut.
For primary bibliographic entry see Field 2I.
W77-06803

A COMPREHENSIVE PLAN FOR THE GLOBAL INVESTIGATION OF POLLUTION IN THE MARINE ENVIRONMENT AND BASELINE STUDY GUIDELINES.
United Nations Educational Scientific and Cultural Organization, Paris (France).
UNESCO, Intergovernmental Oceanographic Commission, Technical Series, No. 14, 1976. 42 p, 4 tab.

Descriptors: *Water pollution, *Baseline studies, *Resources development, *Environmental effects, Water pollution effects, Oceans, Pollutant identification, Monitoring, *Comprehensive planning.
Identifiers: *Outer Continental Shelf, Mass balance, Transfer processes, Marine pollution, Biogeochemical cycle, Pollution monitoring.

This report is an amalgamation of a document entitled 'A Comprehensive Plan for a Global Investigation of Pollution in the Marine Environment', and a document entitled 'Report of the IOC/ICES Working Group on Baseline Study Guidelines', as amended by the IOC Executive Council at its seventh session in Bergen, June 1976. The GIPME Comprehensive Plan provides an international framework within which national and regional programs on various aspects of marine pollution may be coordinated to contribute to an understanding of global pollution problems. The ultimate objective of a comprehensive investigation of marine pollution is to provide a sound scientific basis for the assessment and regulation of the pollution problem, including sensibly planned and implemented monitoring programs. Equal priority is given to a number of research activities dealing with inputs, pathways, sinks, effects and dose/response reltionships. Baseline studies will provide valuable data on inputs, distributions and pathways, and to some degree will help the mass-balance studies. (Sinha-OEIS)
W77-06850

A PILOT STUDY ON THE DESIGN OF A PETROLEUM HYDROCARBON BASELINE INVESTIGATION FOR NORTHERN PUGET SOUND AND STRAIT OF JUAN DE FUCA,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5C.
W77-06875

HIGH SEAS OIL POLLUTION: PARTICULATE PETROLEUM RESIDUES IN THE NORTH ATLANTIC,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5B.
W77-06911

NASA DEVELOPS WATER MONITORING SYSTEM,
Boeing Aerospace Co., Seattle, Wash.
A. Jeffers, and R. E. Taylor.
Water and Sewage Works, Vol. 124, No. 3, p 76-80, March 1977. 1 tab, 4 fig.

Descriptors: *Monitoring, *Sewage effluents, *Automation, Sampling, Analysis, Data Processing, Computers, Instrumentation, Equipment, On-site data collections, Pollutants, Sewage, Oxygen demand, Hydrogen ion concentration, Hardness(Water), Ions, Dissolved oxygen, Turbidity, Nitrates, Water pollution, Water treatment, Pollutant identification.
Identifiers: *Sensors, Water monitor systems.

The National Aeronautics and Space Administration has undertaken the task to develop an automatic water quality monitoring system that can assure conformance to projected high effluent quality standards and result in an increase and acceleration in the practice of reclamation and reuse of water. The objective of this water quality monitoring program was to develop a system which includes the necessary sensors, sample collection system, and data acquisition and display system to monitor in 'real time' the effluent discharge from waste treatment plants and to provide the data which determines the quality of the wastewater. The WMS (water monitor system) was installed in a mobile trailer which houses the DAS (data acquisition system), sensors, sample conditioning/distribution system, and the report generation system. The system can be integrated with a maximum of 40 water quality sensors. The major elments which comprise the WMS were described. (Sims-ISWS)
W77-06912

DISSOLVED NITROGEN, DISSOLVED OXYGEN AND RELATED WATER TEMPERATURES IN THE COLUMBIA AND LOWER SNAKE RIVERS, 1965-1969,
National Marine Fisheries Service, Seattle, Wash.
For primary bibliographic entry see Field 5C.
W77-06925

IDENTITY, ORIGIN AND DEVELOPMENT OF OFF-FLAVORS IN GREAT LAKES ANADROMOUS FISH,
Wisconsin Univ.-Madison.
R. C. Lindsay.
Wisconsin Department of Natural Resources, Madison Completion Report for Project AFC-13, for the period July 15, 1974 to June 30, 1976, February 1977. 7 p. PL-89-304, Proj AFC-13.

Descriptors: *Oil pollution, *Pollutant identification, Wisconsin, Great Lakes, *Anadromous fish, Lake Michigan, Fish, *Salmon, Aromatic compounds, *Taste, *Organoleptic properties, Polychlorinated biphenyls.
Identifiers: Phthlate esters, *Aromatic hydrocarbons, Volatile compounds, *Flavors(Fish).

The principal effort has been directed towards the chemical identification of volatile compounds present in Great Lakes salmon and environmentally related materials. Volatile compounds were collected from samples using vacuum and atmospheric steam distillations with subsequent ether extractions. Aroma concentrates obtained from the recovery procedures were subjected to high resolution gas chromatographic analysis and mass spectrometry. Compounds with potent and distinctive odors and/or structures which indicated that the substances were different from those routinely encountered in most foods were identified. The occurrence of a number of aromatic hydrocarbons along with the aliphatic even-carbon numbered hydrocarbons would strongly suggest salmon pick-up of oil or petroleum-based product contamination materials. The identification of polychlorinated biphenyl compounds indicates that compounds of relatively low degrees of chlorination are currently present in salmon along with other compounds exhibiting greater chlorination of the biphenyl ring system. (NOAA)
W77-06931

BLANK AND SALINITY CORRECTIONS FOR AUTOMATED NUTRIENT ANALYSIS OF ESTUARINE AND SEA WATERS,
New Hampshire Univ., Durham.
T. C. Loder, and P. M. Glibert.
Sea Grant Program Report No. UNH-SG-JR-101, Dec 1976. 32 p, 8 fig, 6 tab, 34 ref. Also as: Woods Hole Oceanographic Inst. Contribution No. 3897. SG-4-2037 R/EM-2.

Descriptors: *Estuaries, *Sea water, *Nutrients, *Salinity, Measurement, *Pollutant identification, Methodology, Analytical techniques.

Routine measurements of dissolved micronutrients in sea water are performed by numerous laboratories using a Technicon Auto Analyzer II System. The methods employed are generally the Technicon Industrial Methods with various modifications. Experimentation has shown, however, that there are some problems with these methods in the determination of blanks, which can cause significant errors in estuarine or sea water samples. The blank problems result from: (1) the index of refraction of the sea water sample, (2) reaction products of various wetting agents and sea water, (3) the absorbance of colored substances in the sample, either particulate or dissolved, and (4) the salt error or variable production of reaction products of the nutrient in the sample and the color reagents as a function of sample salinity. In this paper several methods are recommended for determining the blank and salt correction factors. The method to be used depends on the nature of the samples (fresh, estuarine or sea water) and the nutrient being analyzed. (NOAA)
W77-06938

ADENOSINE TRIPHOSPHATE (ATP) LEVELS IN MICROBIAL CULTURES AND A REVIEW OF THE ATP BIOMASS ESTIMATION TECHNIQUE,
Canada Centre for Inland Waters, Burlington (Ontario).
A. A. Qureshi, and J. Patel.
Scientific Series No. 63, 1976, 33 p., 9 fig., 10 tab., 101 ref., append.

Descriptors: *Bacteria, *Fungi, *Biomass, Analysis, Microorganisms, Assay, Technology, *Pollutant identification, Analytical techniques, Bioassay, Reviews, Cultures, Microbiology, Estimating.
Identifiers: *Adenosine triphosphate.

In laboratory-grown cultures of a lake bacterium and three lake fungi, the concentration of cellular ATP was found to vary appreciably during the various stages of growth. Generally, the highest level of ATP was observed during the lag and early log growth phases. Thereafter, the ATP concentration rapidly decreased and stabilized at a relatively constant level during the stationary phases of the growth cycle. With respect to the use of the Du-Pont Biometer for ATP determinations, it was observed that after calibration and strict adherence to procedure during analysis, relatively consistent results could be obtained with both standard ATP solutions and test solutions. Of the various solvents examined for determining the stability of the standard ATP, boiling Tris-HCl buffer (0.02M, pH 7.75) was the best solvent. This solvent also proved to be highly satisfactory for the extraction of ATP from bacterial and fungal cultures used in this investigation. The report also provides background information on the ATP biomass estimation technique, general remarks on the technique, and an extensive bibliography of its use and application in diverse systems. (WATDOC)
W77-06942

AUTOMATED METHOD FOR THE DETERMINATION OF THE PHOSPHORUS CONTENT OF DETERGENTS,
Environmental Protection Service, Ottawa (Ontario). Chemistry Lab.
N. L. Cathcart.
Regulations, Codes and Protocols Report EPS 1-WP-76-1, December, 1976, English and French, 6 p., 1 fig., 2 ref.

Descriptors: *Phosphorus, *Detergents, *Automation, Methodology, Sampling, *Canada, Regulation, Legislation, Water quality standards, *Pollutant identification.
Identifiers: *Canada Water Act Regulations, Reagents.

An experiment to determine the phosphorus content of laundry detergents is described. The particular method is used to monitor phosphorus levels persuant to the Canada Water Act Regulations. (WATDOC)
W77-06944

BURNING WASTE CHLORINATED HYDROCARBONS IN A CEMENT KILN,
St. Lawrence Cement Co., Mississauga, (Ontario).
For primary bibliographic entry see Field 5E.
W77-06946

RECONNAISSANCE OF THE WATER RESOURCES OF THE CLINTON QUADRANGLE, WEST-CENTRAL OKLAHOMA,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-06959

MEASUREMENT IN A MARINE ENVIRONMENT USING LOW COST SENSORS OF TEMPERATURE AND DISSOLVED OXYGEN,
National Oceanic and Atmospheric Administration, Washington, D.C. Environmental Data Service; and Geological Survey, Edgewater, Md. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-06960

DETERMINATION OF FREE FORMIC AND ACETIC ACIDS BY GAS CHROMATOGRAPHY USING THE FLAME IONIZATION DETECTOR,
Geological Survey, Lakewood, Colo. Water Resources Div.
W. R. White, and J. A. Leenheer.
Journal of Chromatographic Science, Vol 13, p 386-389, August 1975. 3 fig, 1 tab, 21 ref.

Descriptors: *Chemical analysis, *Acids, *Aqueous solutions, *Gas chromatography, *Analytical techniques, Waste disposal, Injection wells, Path of pollutants, Groundwater movement, Sampling, Water wells, *Pollutant identification.
Identifiers: *Formic acid, *Acetic acid, *Flame ionization detector.

Formic and acetic acids in aqueous solution are analyzed by gas chromatography using the flame ionization detector. A specially conditioned four-foot glass column packed with Porapak Q coated with 3% phosphoric acid is used. The lower detectable limits for formic and acetic acids in solution are 100 micrograms respectively. By combining steam distillation and concentration steps, concentrations of 1.0 mg/liter of formic acid and 0.03 mg/liter of acetic acid can be measured. (Woodard-USGS)
W77-06961

HYDROCHEMISTRY OF THE LAKE MAGADI BASIN, KENYA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-06967

PRELIMINARY ASSESSMENT OF THE WATER RESOURCES OF THE TULALIP INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-06971

CHARACTERIZATION OF SOLUBLE ORGANIC MATTER IN LEACHATE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
E. S. K. Chian, and F. B. DeWalle.
Environmental Science and Technology, Vol 11, No 2, p 158-162, February, 1977. 4 fig, 2 tab, 26 ref.

Descriptors: *Pollutant identification, *Leachates, Analysis, Physical characteristics, Chemical characteristics, *Filtration, Membranes, *Organic matter, *Chromatography, Lipids, Separation techniques, Water pollution, Groundwater.
Identifiers: Organic matter analysis, Membrane ultrafiltration.

Membrane ultrafiltration, gel permeation chromatography, and specific organic analyses were used to determine the composition of unknown major organic fractions in leachate. Results indicated that a major fraction of organics permeated a 500-MW membrane in ultrafiltration and most were present as free volatile fatty acids. The second largest fraction was a fulvic-like material with relatively high carboxyl and aromatic hydroxyl group density. A high-molecular-weight, humic carbohydrate-like complex, with a significant amount of hydrolyzable amino acids, was a small percentage of the organics. In tests, 75% of organic mater was identified. Lipids associated with the high-molecular-weight humic fraction were indicated by solvent extraction. Aromatic hydroxyl compounds were extracted with butanol. Data indicated that universal bacterial processes might govern the character of naturally occurring organics. (Collins-FIRL)
W77-07039

FORMS OF SULFUR IN SEWAGE SLUDGE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
L. E. Sommers, M. A. Tabatabai, and D. W. Nelson.
Journal of Environmental Quality, Vol 6, No 1, p 42-46, January-March, 1977. 7 tab, 21 ref.

Descriptors: *Pollutant identification, *Sulfur compounds, *Sludge, Analysis, Heavy metals, Carbon, Nitrogen, Phosphorus, Cadmium, Organic wastes, Waste disposal, Inorganic compounds, *Sewage sludge.

An analysis was undertaken to determine the forms and amounts of organic and inorganic components of elements composing sludge. Bulk sludge samples from eleven Indiana treatment plants were subjected to gravimetric and titrimetric determinations, to a modified semimicro-Kjeldahl procedure, and to steam distillation, acidimetric titration, colorimetric determination, and various metal analyses. The samples were from plants using anaerobic digestion and either activated sludge or trickling filter secondary treatment procedures. It was found that total sulfur ranged from 0.7-2.1% and that 1-27% of this was inorganic sulfur extractable with 0.1M LiCl. Sulfur was composed of sulfide sulfur (less than 1 to 35%), inorganic nonsulfate sulfur (18-53%), carbon-bonded sulfur (18-56%), ester sulfate sulfur and inorganic sulfate sulfur (0-35%), and unidentified organic sulfur (0-42%). These forms were found to vary with time and no consistent relationships were found between the amounts of organic carbon, nitrogen, sulfur and phosphorus in the sludges. It was determined that the amounts of lead and zinc were significantly correlated with sulfide sulfur, as was cadmium with organic sulfur, ester sulfate sulfur, and 0.1M LiCl extractable sulfur. No such relationships were found for other metals and various sulfur fractions. (Collins-FIRL)
W77-07044

DRUGS AND DRUG METABOLITES AS ENVIRONMENTAL CONTAMINANTS: CHLOROPHENOXYISOBUTYRATE AND SALICYLIC ACID IN SEWAGE WATER EFFLUENT,
Veterans Administration Hospital, Kansas City, Mo.
C. Hignite, and D. L. Azarnoff.
Life Sciences, Vol. 20, No. 2, p 337-342, January, 1977. 1 fig, 1 tab, 9 ref.

Descriptors: *Water pollution sources, *Chemical analysis, *Analytical techniques, *Pollutant identification, Waste identification, Sewage effluents, Potable water, Gas chromatography, Mass spectrometry, Waste water treatment.
Identifiers: Drugs, Metabolites, Salicylic acid, 2-(4-chlorophenoxy)-2-methylpropanoic acid(CPIB).

Effluent of the Big Blue River Sewage Treatment Plant, Kansas City, Missouri, was analyzed to determine the content of drugs or drug metabolites. Composite 24-hour samples were collected and extracted under acidic, neutral, and basic conditions with methylene chloride. The extracts were screened by gas chromatography-mass spectrometry. Results indicated the presence of 2-(4-chlorophenoxy)-2-methylpropanoic acid (CPIB), the active metabolite of clofibrate, a hypolipidemic drug; and 2-hydroxy benzoic acid (salicylic acid), a metabolite of aspirin. Average 24-hour discharges of CPIB from August, 1975 to May, 1976 were 2.1 kilograms/day and salicylic acid discharges for the same period were 8.64 kilograms/day. Concentrations in raw sewage for CPIB were 2.8 kilograms/day. Raw sewage concentrations of salicylic acid were much higher and a 90% removal of this metabolite was shown from the data. Neither compound was detected in drinking water. Further investigations for drugs in water were suggested. (Collins-FIRL)
W77-07045

THE CHEMICAL CHARACTERISTICS OF THE CITY OF WINNIPEG WASTE WATER,
Winnipeg Waterworks, Waste, and Disposal Div. (Manitoba).
W. D. Carroll, and P. C. Lee.
Chemistry in Canada, Vol. 29, No. 1, p 14-17, January, 1977. 3 fig, 8 tab.

Descriptors: *Pollutant identification, Analysis, *Monitoring, *Chemical properties, Sludge treatment, Sewage treatment, Treatment facilities, Activated sludge, Oxygen, Oxidation lagoons, Heavy metals, Organic matter, Nutrients, Biochemical oxygen demand, Domestic wastes, Industrial wastes, Waste water treatment, *Canada.
Identifiers: *Winnipeg(Canada).

The City of Winnipeg, Canada, uses a conventional sewage treatment plant, a pure oxygen activated sludge plant, and conventional stabilization ponds to provide secondary treatment of waste water. Industrial wastes are about 35% of the 55 mgd influent volume at the conventional plant. The oxygen activated sludge plant has an inflow of 10 mgd, which is primarily domestic sewage. The lagoon system handles about 5 mgd of domestic sewage in three primary cells. The city monitors treatment by characterizing the levels and variations of organics, nutrients, and heavy metals loadings. Analyses are made of suspended solids, grease, BOD, TOC, NH3, NO3, TKN, total phosphorus, copper, nickel, zinc, chromium, lead, and cadmium. TOC was used as a tool for predicting BOD in raw waste water because it provides a close approximation of potentially oxidizable carbonaceous content of samples. Nutrient levels of sewage with a significant industrial component were bout equal to that of raw waste water. Chromium, zinc, lead, and nickel levels from industrial sources probably could be reduced to levels equal to that of domestic sewage. About 50-85% of the metal content ended up in the sludge, except for nickel which is removed at much lower rates. The metal content of effluents was low when compared to drinking water criteria. These analyses provide some data needed to assess the character and extent of contaminants, and the most cost-effective approach to control them. (Collins-FIRL)
W77-07047

ESCHERICHIA COLI AS A SANITARY-INDICATOR MICROORGANISM, (IN RUSSIAN),
G. G. Mirzoev.
Gig Sanit 1, p 86-88, 1976.

Descriptors: *E coli, *Bioindicators, *Microorganisms, *Pollutant identification, Public health, Human diseases, Epidemiology.
Identifiers: Pathogenic microorganisms.

E. coli is not considered a suitable index for the sanitary evaluation of water, milk, milk products and other food products. E. coli is ubiquitous; its presence does not indicate fecal contamination since it makes up only 2-3% of the fecal microflora. A 5 yr analysis of sanitary microbiological laboratories showed 2.3 and 9.3% deviations from coli-titer standards. No significant correlation was established between the coli-titer and the epidemiological state of an area, even in a case of dysentery. Sanitary microbiological studies should be directed at the detection of carriers of pathogenic microorganims and workers with chronic disease at water works, in the milk and

meat industry, and in other food-related jobs.--Copyright 1977, Biological Abstracts, Inc.
W77-07067

QUANTITATIVE ANALYSIS OF ENTEROVIRUSES IN WATER WITH VARIOUS DEGREES OF POLLUTION, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene.
V. I. Zotova, and L. A. Myshlyaeva.
Gig Sanit 3, p 63-65, 1976.

Descriptors: *Pollutant identification, *Adsorption, Resins, *Ion exchange, Water pollution, *Viruses, *Water analysis, Chlorination.
Identifiers: *Enteroviruses, Picornavirus, Poliovirus.

A test of the adsorption capacity of the ion-exchange resin AV-17 in the chemical method of virus concentrtion and the efficacy of the resin in quantitative analysis indicated that the adsorption capacity is inversely proportional to the degree of water pollution. The vaccine strain poliomyelitis virus LSC was used as a model. The use of conversion factors increased the accuracy of quantitative analysis of test water samples. Primary cultures of monkey kidney cells were used to assay the virus. In a practical application 67 water samples from open reservoirs and 80 sewage water samples were tested for degree of purification. Cytopathic agent composition in river water was 15-30 virus particles/l; untreated sewage water contained 980-2320 plaque forming units (PFU)/l, reduced to 660-1200 PFU/l by mechanical and biological purification and 100-350 PFU/l by chlorination.--Copyright 1977, Biological Abstracts, Inc.
W77-07070

WATER QUALITY SIMULATION OF TAHOE-TRUCKEE SYSTEM, NEVADA-CALIFORNIA-VOLUME I,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5B.
W77-07075

WATER QUALITY INVESTIGATIONS IN THE SOUTH PLATTE RIVER BASIN, COLORADO, 1971-72.
National Field Investigations Center, Denver, Colo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 912, Price codes: A12 in paper copy, A01 in microfiche. EPA Report 1972. 266 p, 30 fig, 17 ref, 9 append.

Descriptors: *Pollutant identification, *Water quality, Analysis, *Rivers, *Streams, Water pollution sources, Pollution abatement, Treatment facilities, Municipal wastes, Industrial wastes, Evaluation, *Colorado.
Identifiers: *South Platte River Basin(Colo).

Stream surveys were conducted of the South Platte River Basin (Colorado) to determine water quality changes since a survey in 1964-65. Surveys were made of Bear Creek, Clem Creek, Boulder Creek, St. Vrain Creek, the Big and Little Thompson Rivers, Cache la Poudre River, and the South Platte River. Twenty-three municipal waste treatment facilities were evaluated, as were industrial pollution sources. Developments in the control of industrial wastes since the earlier survey were evaluated as well. (Collins-FIRL)
W77-07076

THE ELECTROLYTIC RESPIROMETER-II. USE IN WATER POLLUTION CONTROL PLANT LABORATORIES,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-07081

CONCENTRATION AND DETERMINATION OF TRACE ORGANIC POLLUTANTS IN WATER,
Iowa State Univ., Ames.
R. C-Y. Chang.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No. 77-1019. PhD Thesis, 1976, 89 p.

Descriptors: *Pollutant identification, *Analytical techniques, *Trace elements, *Phenols, Chlorination, Oxidation, Resins, Anion exchange, Chemical reactions, Gas chromatography, Chlorides, Organic matter, Water treatment, *Waste water treatment.

A method was developed for concentrating and determining phenols in natural water, treated potable water and waste water. Determination was by selective sorption on a macroreticular anion-exchange resin and elution with acetone-water. Concentration was by evaporation after extraction with methylene chloride; measurements were performed by gas chromatography. The techniques used for preventing phenol loss due to chlorination, oxidation, and other reactions during determination were presented. Recovery was excellent for samples with model organic compounds of various classes added to water. Volatile and less volatile gas chromatographic compounds were determined. Removal of organic components in potable water was possible by this sorption method. A rapid method for determining and concentrating halomethanes in potable water was developed. (Collins-FIRL)
W77-07098

5B. Sources Of Pollution

ZOOPLANKTON SAMPLING VARIABILITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W77-06615

PARTICLE CHARACTERISTICS AND DISPERSAL PATTERNS OF SUGAR CANE WASTES IN SELECTED RIVERS AND ESTUARIES OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
D. J. Morelock, and K. Grove.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 907, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, February 1976. 45 p, 19 fig, 8 tab, 6 ref. OWRT A-042-PR(1).

Descriptors: *Sugarcane, Streams, Estuaries, Bays, *Organic wastes, Sediments, Carbon, *Puerto Rico, Sediment distribution, Dispesin, Path of pollutants, Water pollution sources, Rivers, Waste disposal.
Identifiers: Anasco River(PR) Anasco Bay(PR).

The lower 2.5 km of the Anasco River is an estuary. Salt wedge movement is dependent on river discharge. The average position is 1 km upstream. The river empties onto the narrow insular shelf of Anasco Bay. The shelf edge is marked by a line of submerged coral reefs 1.5 km. offshore. The salt wedge has a profound influence on sedimentation in the river. In the estuary, sediments are fine grained, poorly sorted clayey silt to silty sand. Above the estuary, there are coarser sands and gravel. The organic content of sediments below the sugar mill during production is over 90%. Downstream, organic content is low and the organic debris is much finer. The traction and siltation load and part of the suspension load is deposited at the salt wedge head and in the estuary due to floccultion at the mixing boundary. Sediments in the bay are derived from coral reefs, alluvial plain shore erosion and from the discharge of the river. These are mixed with relict sediments deposited during the lowered Wisconsin sea level. The two major facies are carbonate reef deposits and terrigenous sediments. Each of the facies and the distribution of organic debris can be correlated with the topography, current and wave patterns, and general physical characteristics of the shelf area. The results of the study indicate that estuaries are poor disposal sites for organic pollutants. Most of the wastes are deposited in the estuary and remain there for long periods. They are only partly removed during periods of high river discharge.
W77-06632

CHLORINE REACTIONS WITH SEAWATER CONSTITUENTS AND THE INHIBITION OF PHOTOSYNTHESIS OF NATURAL MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W77-06637

THE FAUNA OF THE POLLUTED RIVER TEES ESTUARY,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5C.
W77-06638

AN OFFSHORE BIOMONITORING SYSTEM FOR CHLORINATED HYDROCARBONS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W77-06641

MIXING IN UPPER LAYER OF A LAKE DURING HEATING CYCLE,
Institute of Oceanographic Sciences, Wormley (England).
For primary bibliographic entry see Field 2H.
W77-06649

SEDIMENT YIELD PREDICTION BASED ON WATERSHED HYDROLOGY,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 4D.
W77-06656

CHEMICAL QUALITY OF EFFLUENTS AND THEIR INFLUENCE ON WATER QUALITY IN A SHALLOW AQUIFER,
Los Alamos Scientific Lab., N. Mex.
W. D. Purtymun, J. R. Buchholz, and T. E. Hakonson.
Journal of Environmental Quality, Vol. 6, No. 1, p 29-32, January-February 1977. 2 fig, 4 tab, 5 ref. ERDA W-7405-ENG.36.

Descriptors: *New Mexico, *Water quality, *Alluvial aquifers, *Waste water disposal, Effluents, Water pollution sources, Chemicals, Aquifers, Data collections, On-site investigations, Evaluation, Storm runoff, Hardness(Water), Fluorides, Calcium, Carbonates, Sodium, Nitrates, Chlorides, Bicarbonates, Magnesium, Specific conductivity, Hydrogen ion concentration.
Identifiers: *Mortandad Canyon(NM), Dilution ratios, Total dissolved solids.

The chemical quality of liquid effluent released from an industrial waste treatment plant at the Los Alamos Scientific Laboratory controls the quality of water in a shallow aquifer in the alluvium of Mortandad Canyon. The dilution of the effluent with surface flow in the canyon reduces the concentrations of the chemicals as they move down gradient into the aquifer. Mass estimates of residual chemicals in solution in the aquifer average 1-6% of the total chemicals released to the canyon from 1963-1974. The average annual con-

centration of sodium, nitrate, chloride, and total dissolved solids in the aquifer through a 12-year period was directly correlated with annual average concentrations in the effluent. This relationship provides a means of predicting the impact of the chemical effluents on the quality of water in the aquifer. Chemical concentrations in solution in the aquifer have increased over prerelease levels; however, there has not been a steady accumulation of these materials in the water with time. The rapid loss of water and its associated chemicals from the aquifer prevents chemical accumulation and indicates that cessation of effluent release to the canyon would rapidly improve the quality of water in the aquifer. (Humphreys-ISWS)
W77-06658

PETROLEUM HYDROCARBONS FROM EFFLUENTS: DETECTION IN MARINE ENVIRONMENT,
Hunter Coll., New York. Dept. of Environmental Health Sciences.
For primary bibliographic entry see Field 5A.
W77-06660

COMPUTER MAPPING OF LANDSAT DATA FOR ENVIRONMENTAL APPLICATIONS,
Bendix Aerospace Systems Div. Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W77-06666

AN ESTIMATE OF THE INPUT OF ATMOSPHERIC TRACE ELEMENTS INTO THE NORTH SEA AND THE CLYDE SEA (1972-3),
Atomic Energy Research Establishment, Harwell (England).
R. S. Cambray, D. F. Jefferies, and G. Topping.
AERE-R 7733, January 1975. 30 p, 4 fig, 10 tab, 39 ref, 2 append.

Descriptors: *Water pollution sources, *Oceans, *Atmosphere, *Trace elements, *Sampling, Rain water, Sea spray, Analytical techniques, Evaluation, Data collections, On-site investigations, Heavy metals, Foreign countries.
Identifiers: *North Sea, *Clyde Sea(Scotland), Dry deposits.

Samples of airborne dust, rainwater, and dry deposit were collected at five coastal stations in the United Kingdom, from a Gas Platform in the North Sea and at a coastal station in North Holland. Estimates were made of the atmospheric input of trace elements into the North Sea and Clyde Sea, and comparisons were made with the estimated content of these seas. It was shown that the atmosphere is a significant source for certain heavy metals and other trace elements. The estimates of dry deposit were generally less than half those for deposition by rain which, because the rain-collecting funnel was continuously exposed, includes a component of dry deposition. A maritime effect, expressed by increased concentrations of trace elements in rainwater collected in the presence of sea-spray, was discussed in an appendix and attributed to a massive enhancement of trace elements in the surface microlayer of the sea. An estimate of the amount of precipitation over the sea was also given and discussed in an appendix. (Humphreys-ISWS)
W77-06668

MONITORING GROUNDWATER QUALITY: ILLUSTRATIVE EXAMPLES.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5A.
W77-06673

LAKE CURRENTS AND TEMPERATURES NEAR THE WESTERN SHORE OF LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W77-06687

THE MINING FAUNA IN FOUR MACROPHYTE SPECIES IN MIKOLAJSKIE LAKE,
Polish Academy of Sciences, Warsaw. Lab. of Ecological Bioenergetics.
For primary bibliographic entry see Field 5C.
W77-06688

THE GENERATION OF RESIDUAL FLOWS IN NORWAY: AN INPUT-OUTPUT APPROACH,
Oslo Univ. (Norway). Inst. of Economics.
For primary bibliographic entry see Field 5G.
W77-06698

OPTIMAL OIL TANKER SIZE WITH REGARD TO ENVIRONMENTAL IMPACT OF OIL SPILLS,
California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 5G.
W77-06702

THE HISTORIC AND PRESENT RELATIONSHIPS BETWEEN PHYTOPLANKTON, LIMITING NUTRIENTS, AND SEDIMENT-WATER GEOCHEMICAL PROCESSES IN SELECTED MAINE LAKES,
Maine Univ. at Orono. Land and Water Resources Inst.
For primary bibliographic entry see Field 5C.
W77-06741

POLLUTANT MOVEMENT TO SHALLOW GROUND WATER TABLES FROM SWINE WASTE LAGOONS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
T. G. Ciravolo, D. C. Martens, D. L. Hallock, E. R. Collins, Jr., and E. T. Kornegay.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 052, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 100, March 1977. 61 p, 7 fig, 21 tab, 32 ref. OWRT B-068-VA(1).

Descriptors: *Path of pollutants, Water pollution sources, Hogs, *Groundwater movement, Waste disposal, *Farm lagoons, Clays, *Farm wastes, *Seepage, Monitoring, Nutrients, Water tables, Bacteria, Drainage, *Virginia, Coastal Plains, Anaerobic conditions.
Identifiers: *Swine-waste lagoons, Soluble nutrients.

The effect of three anaerobic swine-waste lagoons on the quality of nearby ground water was investigated. The lagoons, in the Coastal Plain region of Virginia, were located on soils with high water tables and with varying drainage characteristics. Over a 14-month period in 1974 and 1975, ground water samples were taken from wells located at various depths and distances from the lagoons. These samples were analyzed to determine the extent of contamination due to the lagoons. The biological constituent analyzed was the number of fecal coliform bacteria; chemical constituents analyzed were concentrations of Cl, Cu, Mn, NH4-N, NO3-N, PO4-P, and Zn. Research findings showed that the quality of ground water was affected least around one lagoon constructed at ground level in a poorly drained soil with a clay subsoil. No ground water contamination was found more than 3 m from this lagoon. In contrast, ground water around two lagoons constructed with embankments above ground level, one in a sandy clay loam subsoil and the other in a sandy subsoil, showed traces of swine-waste components as far away as 30 m. Pollutant levels in ground water around the former lagoon were below U.S. Public Health Service drinking water standards, while pollutant levels around the latter lagoon exceeded those standards on many occassions. These experimental results indicate that seepage may occur from lagoons with embankments above ground level in sandy soil, and that biological sealing in such lagoons may not sufficiently protect shallow aquifers from contamination.
W77-06742

LONG-TERM CHANGES OF THE PELAGIC PRIMARY PRODUCTION IN HEATED LAKES, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
For primary bibliographic entry see Field 5C.
W77-06755

THE INFLUENCE OF HEATED EFFLUENT WATERS ON THE THERMAL-OXYGEN RELATIONS AND WATER TRANSPARENCY IN THE KONIN LAKES COMPLEX, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
For primary bibliographic entry see Field 5C.
W77-06756

ADSORPTION OF POLYCHLORINATED BIPHENYL (AROCLOR 1254) ON SHRIMP,
Louisiana State Univ., Baton Rouge. Dept. of Food Science.
For primary bibliographic entry see Field 5C.
W77-06758

THE ALGAL FLORA IN THE THERMAL BATHS OF MONTEGROTTO TERME (PADUA). ITS DISTRIBUTION OVER ONE-YEAR PERIOD,
Padova Univ. (Italy). Istituto di Botanica e Fisiologia Vegetale.
For primary bibliographic entry see Field 5C.
W77-06770

DISPERSAL AND DISPERSION OF POND SNAILS IN AN EXPERIMENTAL ENVIRONMENT VARYING TO THREE FACTORS, SINGLY AND IN COMBINATION,
Iowa Univ., Iowa City. Dept. of Zoology; and Iowa Univ., Iowa City. Lakeside Lab.
For primary bibliographic entry see Field 5C.
W77-06773

LONG-TERM LEAD ACCUMULATION IN ABALONE (HALIOTIS SPP.) FED ON LEAD-TREATED BROWN ALGAE (EGREGIA LAEVIGATA),
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5C.
W77-06776

LABORATORY STUDIES ON THE EFFECT OF METALS ON OXYGEN UPTAKE BY SEWAGE SLUDGE IN BRACKISH WATER,
Bristol Univ. (England). Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W77-06788

A COMPREHENSIVE PLAN FOR THE GLOBAL INVESTIGATION OF POLLUTION IN THE MARINE ENVIRONMENT AND BASELINE STUDY GUIDELINES.
United Nations Educational Scientific and Cultural Organization, Paris (France).
For primary bibliographic entry see Field 5A.
W77-06850

LIBRARY OF THE URBANA-CHAMPAIGN

STUDY OF LEACHATE AT LANDFILL SITES 1975, VOLUME 1.
Holzmacher, McLendon and Murrell, Melville, N.Y.
Department of Environmental Control Publication, Suffolk County, New York, 1975. 131 p, 44 fig, 7 tab, append.

Descriptors: *Landfills, *Water pollution sources, *Monitoring, *Control systems, Data collections, Water wells, Groundwater, *New York, Solid wastes, Leachate, Leaching, *Path of pollutants, Pollution abatement.
Identifiers: *Leachate migration, Migration patterns, Suffolk, County, Long Island(NY).

Increasing population growth and eastward expansion in Suffolk County, coupled with recent evidence suggesting that leachate from landfill sites may endanger the quality of the ground water supply, have hastened the need for solid waste management studies on Long Island, New York. The hydrogeology of each landfill site was defined by the examination of local water well logs and Suffolk County hydrologic studies. Core borings provided data regarding the nature of the underlying material. Characteristics of leachate production and migration are fairly uniform for any given climate zone and composition of refuse. However leachate migrating from landfill often responds to hydrogeologic and fluid dynamic mechanisms not entirely understood. Because the migration path of the leachate plume is uncertain it is important that leachate from landfill be carefully monitored. Monitoring systems should be designed at each site so that vertical as well as aerial distribution of the leachate concentrations can be determined. This can be achieved by placement of observation wells screened at different depths. An additional monitoring safeguard of plotting and periodic testing of local, adjacent private water wells, was used to supplement the above monitoring system. By these methods the spread of leachate can be studied and a control program initiated. (Heiss-NWWA)
W77-06851

USGS SCIENTISTS BRING CALIFORNIA WATER SUPPLY INTO COMPLIANCE WITH FEDERAL REGULATIONS,
Geological Survey, Laguna Niguel, Calif.
For primary bibliographic entry see Field 5G.
W77-06853

WASTE INJECTION INTO STRATIFIED GROUND WATER BODIES,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
F. L. Peterson, S. W. Wheatcraft, and D. L. Heutmaker.
Water and Sewage Works, Vol. 124, No. 1, p 60-65, January, 1977. 9 fig.

Descriptors: *Injection wells, *Waste water disposal, *Density stratification, *Saline water-freshwater interfaces, Mixing, Hydrologic models, Saline water intrusion, Ggoundwater, Water wells.
Identifiers: Ambient flow fields.

To study the mechanics of waste injection into a density-stratified ground water system, experiments were conducted utilizing a sand-packed hydraulic model; the system consisted of a freshwater lens overlying a saltwater body, with a zone of mixing separating the fresh and salt water. Rate of injection, injection depth in relation to the salt-fresh interface, length of injection well section, density of injected and ambient fluids, and ambient flow field strength were evaluated as to their effect on the mechanics of the injection process and ultimate fate of the injected waste effluents. Though several of these parameters, notably depth of injection, affected details of injection plume movement and shape, none of the parameters exerted any significant control on the ultimate fate of the plume; injection plumes always migrated well into the freshwater lens regardless of variations in parameters. There was little evidence of salt water entrainment in the plumes, suggesting the principal means of effluent plume movement to be mass displacement rather than mixing processes. (Eberle-NWWA)
W77-06855

INVESTIGATION OF FLUSHING TIME IN THE LAFAYETTE RIVER, NORFOLK, VIRGINIA,
Old Dominion Univ., Norfolk, Va. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-06881

MICROBIAL METHANE CONSUMPTION REACTIONS AND THEIR EFFECT ON METHANE DISTRIBUTIONS IN FRESHWATER AND MARINE ENVIRONMENTS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-06899

INTERSTITIAL WATER CHEMISTRY OF ANOXIC LONG ISLAND SOUND SEDIMENTS. 1. DISSOLVED GASES,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
C. S. Martens, and R. A. Berner.
Limnology and Oceanography, Vol 22, No 1, p 10-25, January 1977. 8 fig, 4 tab, 46 ref. NSF 7002-AC2, GA 30288X; DES 75-06199.

Descriptors: *Water chemistry, *Bottom sediments, *Water analysis, *Methane, *Water quality, Analytical techniques, Chemistry, Sediments, Chemical analysis, Connate water, Gas chromatography, Gases, Nitrogen, Argon, Water properties, Sulfate, Salinity, Temperature.
Identifiers: *Dissolved gases, *Long Island Sound, *Methane content, Anoxic sediments, Methanogenic bacteria, Methane distributions, Microbial ecology.

Measurements of dissolved N2, Ar, CH4, and SO4(--) and salinity and temperature were used to examine the processes controlling their distributions in the interstitial waters of nearshore sediments. Where sulfate reduction is incomplete, dissolved N2 and Ar concentrations in the upper 10-30 cm appear to be controlled by macroinfaunal irrigation activities and to vary in accordance with overlying water conditions. Below 30 cm, N2 and Ar concentrations appear to have been last affected by August through October irrigation. In harbor sediments where sulfate reduction is complete at shallow depths, low N2 and Ar concentrations result from in situ stripping by methane bubbles. Methane concentrations remain below about 0.1 mM until about 90% of seawater sulfate is removed. As sulfate concentrations approach zero, methane builds up to bubble saturation. Concave-up methane depth distributions can be explained by methane consumption following first-order kinetics in the zone of sulfate reduction. Laboratory jar experiments with natural sediments indicated no methane production during sulfate reduction, which is in agreement with previous models and distribution studies of sulfate reducing and methanogenic bacteria in lake sediments. Combined laboratory and field results support the hypothesis that methane is produced mainly after sulfate is depeleted but is consumed within the sulfate reduction zone as it diffuses upward. (Henley-ISWS)
W77-06900

IRON-RICH RHYTHMICALLY LAMINATED SEDIMENTS IN LAKE OF THE CLOUDS, NORTHEASTERN MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 2J.
W77-06901

PARTICULATE TRANSPORT OF RADIONUCLIDES 14C AND 55FE TO DEEP WATERS IN THE PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
D. Lal, and B. L. K. Somayajulu.
Limnology and Oceanography, Vol 22, No 1, p 55-59, January 1977. 1 fig, 2 tab, 22 ref.

Descriptors: *Radioisotopes, *Sediments, *Pacific Ocean, Organic matter, On-site data collections, Oceans, Laboratory tests, Carbon radioisotopes, Iron, Carbon, Sediment transport, Sea water, Particle size, Oceanography, *Path of pollutants.
Identifiers: Calcareous particles, Sinking rates.

Observations during 1969-1971 indicated that radionuclides 14C and 55Fe in particulates in Pacific Ocean waters 28-31 deg N, 119-121 deg W up to depths of 2,500 m were transported from the surface within a short time (less than 10 yr). The mean downward sinking rates for 55Fe and 14C were deduced to be 0.0005 and 0.0025 cm/s. The appreciably faster transport of 14C is consistent with the fact that the mean size calculated for biogenic calcareous particles transporting 14C is larger than that for the 55Fe-labeled particles. (Sims-ISWS)
W77-06902

PHOSPHATE PREDICTION MODEL FOR STREAMS BY MEANS OF DISCRIMINANT ANALYSIS,
Cologne Univ. (West Germany). Geographisches Institut.
R. Herrmann, and W. Symader.
Hydrological Sciences Bulletin, Vol 21, No 3, p 397-406, September 1976. 2 fig, 6 tab, 14 ref.

Descriptors: *Phosphates, *Water pollution sources, *Forecasting, *Model studies, Streams, Foreign countries, Mathematical models, Analytical techniques, On-site data collections, Correlation analysis, Land use, Foreign research, Watersheds(Basins), *Path of pollutants.
Identifiers: *Discriminant analysis, *Germany, *Eifel Mountains(Germany).

An attempt was made to predict phosphate load by means of discriminant analysis. Eight groups of data were defined by a cluster analysis. Principal component analysis and an F-ratio of the predictor variables were used to find a most favorable groups of predictor variables by which an optimal separation between the eight different groups of data is possible. The discriminant functions, linear combination of the predictors, together with additional help of a classification procedure like Euclidic distances, may be used to assign an individual phosphate measurement to the group it best corresponds to. The discriminant analyses showed that a linear combination of 2 out of a total of 33 predictors, namely the combination of (1) runoff and (2) settlement area, has the best discriminant power. Multivariate tests of significance were performed. Tables were constructed that demonstrate the predicted versus actual group membership. Phosphate load and the predictor variables were measured from 1973 to 1974 in 21 streams draining basins with a variety of groundcovers (farm land, woods, and urbanized areas) in the Eifel Mountains and the bordering loess plains in Germany. (Sims-ISWS)
W77-06906

EFFECT OF THE NILE FLOOD ON THE ESTUARINE AND COASTAL CIRCULATION PATTERN ALONG THE MEDITERRANEAN EGYPTIAN COAST,
Alexandria Univ. (Egypt). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-06907

LOSS OF 2,4-D IN RUNOFF FROM PLOTS RECEIVING SIMULATED RAINFALL AND

FROM A SMALL AGRICULTURAL WATERSHED,
Southern Piedmont Conservation Research Center, Watkinsville, Ga.
A. W. White, Jr., L. E. Asmussen, E. W. Hauser, and J. W. Turnbull.
Journal of Environmental Quality, Vol 5, No 4, p 487-490, 1976. 2 fig, 2 tab, 24 ref.

Descriptors: *Water pollution, *Pollutants, *Herbicides, *2,4-D, *Georgia, *Agricultural chemicals, Water quality, Water analysis, Water chemistry, Water pollution sources, Agricultural runoff, Small watersheds, Storm runoff, Subsurface runoff, Leaching, Rainfall, Soils, Agricultural watersheds, Chemical wastes, Pesticide residues.
Identifiers: Dissipation, Analytical procedures.

Movem4nt of 2,4-D (2,4-dichlorophenoxy) acetic acid) was not significant in either surface or subsurface runoff from a small agricultural watershed on a sandy herbicide application (0.56 kg/ha) each year, and initial concentrations were related to the time lapse between herbicide application and the date of the first runoff event. Maximum concentrations were 8.1, 6.2, and 2.5 micrograms/liter, in 1970, 1971, and 1972, respectively. The corresponding time lapse for the same years was 20, 27, and 34 days. Persistence studies showed that the 2,4-D concentration in the surface 0.5 cm of soil decreased 95%, from 4.7 to 0.23 ppm in only 7 days, and after 34 days, the soil concentration was only 0.01 ppm. Although subsurface flow was three times greater than surface runoff during the 3-year period, 2,4-D movement in subsurface water was negligible. Concentrations were usually zero or less than 1 microgram/liter. Soil sampled to a 90-cm depth showed no 2,4-D accumulation or buildup in the soil profile. Simulated rains (8.25 cm in 30 min) applied to subplots on the watershed showed that there is a potential for greater 2,4-D losses in surface runoff when it rains soon after herbicide application. When rains were applied 1, 8, and 35 days after herbicide application, the average 2,4-D concentrations in runoff were 25.2, 5.8, and 0.7 micrograms/liter, respectively. (Henley-ISWS)
W77-06908

THE IMPACT OF FERTILIZER USE AND CROP MANAGEMENT ON NITROGEN CONTENT OF SUBSURFACE WATER DRAINING FROM UPLAND AGRICULTURAL WATERSHEDS,
Agricultural Research Service, Coshocton, Ohio. North Appalachian Experimental Watershed.
F. W. Chichester.
Journal of Environmental Quality, Vol 5, No 4, p 413-416, October-December 1976. 2 fig, 3 tab, 13 ref.

Descriptors: *Nitrogen compounds, *Fertilizers, *Water pollution sources, *Agricultural chemicals, *Agricultural watersheds, *Ohio, Nitrates, Leaching, Water quality, Nitrogen, Ammonia, Nutrient removal, Nutrients, Water pollution, Land management, Hydrogeology, Groundwater, Soils, Watershed management, Fertilization.
Identifiers: *Nitrogen content, *Crop management practices, *Nitrate leaching, Soil drainage, Nitrogen forms, Nitrogen transport, Agricultural practices.

Spring flow and stream base flow sites were sampled weekly on, and adjacent to, a 123-ha agricultural watershed in the Allegheny-Cumberland Plateau physiographic region of east-central Ohio. Nitrogen content of samples was used to determine the influence of various N fertilizer and crop management practices on the quality of subsurface water draining from defined contributing areas. Measured nitrogen contents of spring flow were related to fertilizer N regime of the different agricultural practices investigated. Changes in land management on the area contributing to spring flow were reflected in changes in nitrogen content of water from that spring. The amount of nitrogen which was transported into the stream channel was directly related to seasonal variation in subsurface flow rate in two ways. First, the concentration of N in spring flow increased with an increase in the amount of water percolating through the overlying soil and shale. Second, the extent to which downstream quality was affected, i.e., the distance from the area of fertilizer application at which an increase in nitrogen content could be detected, also increased with the volume of flow from the springs. (Henley-ISWS)
W77-06909

NUTRIENTS, CHLOROPHYLL, AND INTERNAL TIDES IN THE ST. LAWRENCE ESTUARY,
Laval Univ., Quebec. Department de Biologie.
J.-C. Therriault, and G. Lacroix.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 12, p 2747-2757, December 1976. 11 fig, 1 tab, 16 ref.

Descriptors: *St. Lawrence River, *Estuaries, *Tidal waters, Nutrients, *Chlorophyll, Tides, Currents(Water), *Water temperature, *Salinity, *Nitrates, *Dissolved oxygen, *Phosphates, On-site investigations, Data processing, Mixing, Circulation, Water circulation, *Path of pollutants, Water pollution.
Identifiers: *Laurentian Channel, *Internal tides, Internal oscillations.

Tide-dependent variations of temperature, salinity, dissolved oxygen, phosphate, nitrate, and chlorophyll a support the existence of internal tides (longitudinal and transversal) in the St. Lawrence estuary. Vertical oscillations of the poorly oxygenated and nutrient-rich intermediate and deep waters of the estuary have been documented at the head of the Laurentian Channel, the region in which the internal tides are thought to be generated. Penetration of intermediate waters (high-nutrient and low-oxygen concentrations) beyond the Laurential Channel associated with the internal tides and linked with an intense mixing process in the upstream region permits the nutrient enrichment of the surface waters and their eventual advection in the seaward direction. (Sims-ISWS)
W77-06910

HIGH SEAS OIL POLLUTION: PARTICULATE PETROLEUM RESIDUES IN THE NORTH ATLANTIC,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
E. M. Levy, and A. Walton.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 12, p 2781-2791, December 1976. 9 fig, 5 tab, 15 ref.

Descriptors: *Oil pollution, *Atlantic Ocean, *Sampling, Surveys, Data processing, Water pollution sources, Oceans, Oil spills, Circulation, Ocean circulation, Ocean currents, Pollutants, Path of pollutants, Water pollution.
Identifiers: *Particulate petroleum residues, *North Atlantic, Tar.

The results of a continuing investigation into the occurrence and distribution of particulte petroleum residues on the surface of the North Atlantic were presented. From 1971 to 1974 more than 850 samples were collected from the North Atlantic on transects between the east coast of Canada and South America, the Caribbean, Baffin Bay and surrounding waters, the Labrador Sea, and the Azores. Repeated sampling was carried out in the Gulf of St. Lawrence and the region between Nova Scotia and Bermuda. The results indicated that the waters north of the Gulf Stream-North Atlantic Current system were virtually free from floating petroleum residues, while the waters of the Gulf Stream, Sargasso Sea, and Caribbean Sea were much more heavily polluted. Although concentrations as high as 91.8 mg/sq m were encountered, the general level of pollution was much less with tar contents in southern waters following a lognormal distribution with a geometric mean of 0.16 mg/sq m. The geographical distribution of tar is interpreted in terms of inputs from shipping and tanker traffic, and surface circulation patterns. (Sims-ISWS)
W77-06911

DISPERSION OF LIQUID WASTE FROM A MOVING BARGE,
Alabama Univ., Tuscaloosa.
J. Ball, and T. D. Reynolds.
Journal of Water Pollution Control Federation, Vol. 48, No. 11, p 2541-2548, November 1976. 8 fig, 3 tab, 7 ref.

Descriptors: *Waste disposal, *Barges, *Industrial wastes, *Oceans, Wastes, Disposal, *Waste dilution, Water pollution, *Dispersion, Ecological distribution, Sea water, Waste treatment, Water quality, Water pollution sources, Waste water disposal, Water analysis, Environmental sanitation, *Path of pollutants.
Identifiers: *Ocean dumping, Waste discharge, Discharge techniques, Dispersion phenomenon, Barge velocity.

Recent Environmental Protection Agency ocean dumping regulations required field investigations of the dispersion of liquid wastes behind moving barges. Data from two such studies, combined with ocean dumping data from previous work, available in the literature, permitted a re-evaluation of the dispersion phenomenon. Field data and the procedures used to collect it were presented. Data indicated that in all cases, the waste concentrations in the water followed a straight line on a log-log graph rather than first-order decay according to eddy diffusion theory. A general relationship was presented to describe the field data and included the effect of barge velocity and discharge rate. (Henley-ISWS)
W77-06913

FATE OF NITROGEN AND PHOSPHORUS IN SOILS UNDER SEPTIC TANK WASTE DISPOSAL FIELDS,
Agricultural Research Service, Beltsville, Md. Biological Waste Management Lab.; Agricultural Research Service, Beltsville, Md. Soil Nitrogen Lab.; and Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
L. J. Sikora, and R. B. Corey.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 5, p 866-870, 875, September-October 1976. 4 fig, 35 ref.

Descriptors: *Nitrogen compounds, *Phosphorus compounds, *Septic tanks, *Water pollution sources, *Soil disposal field s, Nitrates, Leaching, Water quality, Nitrogen, Ammonia, Nutrient removal, Phosphates, Phosphorus, Disposal, Domestic wastes, Nutrients, Waste treatment, Hydrogen ion concentration.
Identifiers: *Waste disposal fields, Public health problems.

Probable nitrogen forms in soils under septic tank waste disposal fields were predicted by correlating observed soil moisture tensions with aeration status. The conditions beneath most waste disposal fields are sufficiently aerobic for nitrate to be the probable nitrogen form. The probable phosphorus form would depend upon many factors, including mineral content and pH of the soil. Due to high P concentration in septic tank wastes, both sorption and decomposition-precipitation reactions must be considered when determining P movement. Only in soils with little sorption capacity would the pollution potential of phosphorus from septic tank waste be considerable. (Henley-ISWS)
W77-06914

MISSISSIPPI SOUND TEMPORAL AND SPATIAL DISTRIBUTION OF NUTRIENTS,
Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss. Gulf Coast Research Lab.
C. K. Eleuterius.
Report No MASGP-76-024, (1976). 63 p, 54 fig, 4 tab, 8 ref, append. SG-04-5-158-54.

Descriptors: *Estuaries, *Nutrients, *Baseline studies, *Resources development, *Environmental effects, *Water quality, Water resources, Mississippi, Effluents, Nitrates, Phosphates, Dredging, Construction, *Temporal distribution, *Spatial distribution, *Path of pollutants.
Identifiers: *Mississippi Sound.

Mississippi Sound, as estuarine system, is the eventual recipient of the accumulative effluents from activities throughout the drainage basin and is further altered by other direct actions such as dredging and construction. In order to assess the effect of present and future development on the water quality of the Sound, it is necessary to ascertain the existing regime of nutrients through determination of descriptive norms and causal relationships. A 'baseline' thus established serves as a reference to which perturbations in the nutrient levels can be compared to evaluate whether the level is a normal variation or an abnormality. The estuarine waters are the principal sources of the major elementary components of estuarine organisms: carbonate, phosphate and nitrate ions. While added amounts of phosphates and nitrates serve to increase the fertility of the estuary, excessive amounts result in algae blooms and accompanying anoxic conditions. Excessive nutrient levels result in degradation of water quality and are therefore used as indicators of pollution. One objective of the Mississippi Sound research effort was to ascertain the temporal and spatial distribution of nutrients. (NOAA)
W77-06932

LITERATURE REVIEW OF WASTEWATER CHARACTERISTICS AND ABATEMENT TECHNOLOGY IN THE WOOD AND TIMBER PROCESSING INDUSTRY.
For primary bibliographic entry see Field 5D.
W77-06951

DETERMINATION OF FREE FORMIC AND ACETIC ACIDS BY GAS CHROMATOGRAPHY USING THE FLAME IONIZATION DETECTOR,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-06961

REVIEW AND ANALYSIS OF HYDROGEOLOGIC CONDITIONS NEAR THE SITE OF A POTENTIAL NUCLEAR-WASTE REPOSITORY, EDDY AND LEA COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, N Mex. Water Resources Div.
J. W. Mercer, and B. R. Orr.
Open-file report 77-123, February 1977. 35 p, 7 fig, 1 tab, 36 ref.

Descriptors: *Radioactive waste disposal, *Surveys, *Underground waste disposal, *Aquifer characteristics, *Water quality control, *New Mexico, Reviews, Evaluation, Groundwater movement, Hydrogeology, Groundwater recharge, Nuclear wastes, Sites, Planning.
Identifiers: Eddy and Lea Counties(N Mex).

This interim report reviews and summarizes the hydrogeology of rocks associated with the Permian salt beds (Castile and Salado Formations) of Los Medanos area in southeastern New Mexico. The information will be considered, together with other factors, in the preparation of an analysis of the impact of a potential nuclear-waste repository on the environment. Most of the geologic units in and adjacent to the Permian salt deposits are characterized by low permeabilities and highly mineralized water. Sandstone of the Delaware Mountain Group, which underlies the salt, has an average hydraulic conductivity of 0.16 ft/d and an average porosity of 15.65 percent. Flow is north-northeastward toward the margin of the Capitan Limestone, at velocities ranging from 0.0005 to 0.0008 ft/d. The Capitan Limestone, a relatively high yielding limestone-reef aquifer adjacent to the study area, has transmissivity values ranging from 500 sq ft/d to 10,000 sq ft/d and an average hydraulic conductivity of about 5 ft/d. Water movement west of the Pecos River is northeastward in the reef, with discharge at Carlsbad Springs. East of the Pecos River, water moves at very low rates and the direction of movement is uncertain. The Castile and Salado Formations, which might be used to contain the nuclear waste, have a few isolated pockets of brine and gas, but generally transmit little or no ground water. (Woodard-USGS)
W77-06974

GEOLOGY AND GROUND WATER IN DOOR COUNTY, WISCONSIN, WITH EMPHASIS ON CONTAMINATION POTENTIAL IN THE SILURIAN DOLOMITE,
Geological Survey, Madison, Wis. Water Resources Div.
M. G. Sherrill.
Open-file report 77-61, February 1977. 92 p, 19 fig, 5 tab, 34 ref.

Descriptors: *Hydrogeology, *Water pollution sources, *Path of pollutants, *Groundwater movement, Groundwater resources, Water quality, Waste disposal, Agricultural chemicals, Industrial wastes, Municipal wastes, *Wisconsin.
Identifiers: Door County(Wis).

Door County, a recreational and fruit-growing area bordering Lake Michigan in northeastern Wisconsin, has had a long history of ground-water contamination from surface and near-surface sources. Contamination is most severe in late summer when fruit-canning operations and the influx of tourists create additional wastes. Silurian dolomite is the upper bedrock unit in the county and yields generally adequate supplies of very hard water with locally objectionable concentrations of iron and nitrate. Thin soil cover and well-fractured dolomitic bedrock give easy entry to ground-water contaminants throughout large parts of Door County. Many contaminants enter the dolomite by surface or near-surface seepage. There is little attenuation of contamination concentrations in the well-jointed dolomite, and contaminants may travel long distances underground in a relatively short time. The major source of ground-water contamination is bacteria, from individual waste-disposal systems, agricultural, industrial, and municipal wastes. Areas of the county underlain by contaminated zones include only a small percentage of the total ground-water system and are separated by large volumes of ground water free of contamination. (Woodard-USGS)
W77-06975

APPLICATION OF DIGITAL MODELLING TO THE PREDICTION OF RADIOISOTOPE MIGRATION IN GROUNDWATER,
Geological Survey, Menlo Park, Calif. Water Resources Div.
J. B. Robertson.
Reprint from: Isotope Techniques in Groundwater Hydrology 1974, Vol II, p 451-478, 1974: International Atomic Energy Agency, Vienna, Austria, 1974. 15 fig, 12 ref.

Descriptors: *Model studies, *Tracking techniques, *Path of pollutants, *Radioisotopes, *Groundwater movement, Digital computers, Radioactive wastes, Analytical techniques, Forecasting, Tritium.
Identifiers: Sr-90 movement in groundwater.

Recently developed numerical techniques have been adapted to the solution of transient radioactive solute migration problems in groundwater. The differential equations of groundwater movement are first solved by standard finite difference methods, then the differential equations of solute transport are solved by the method of characteristics. Validity of the simulation techniques is demonstrated for real examples of tritium, chloride and Sr-90 migration in groundwater at the National Reactor Testing Station, Idaho. This is probably the first documented field-verification of such a model that includes the effects of convective transport, two-dimensional dispersion, radioactive decay and ion exchange. Model results demonstrate the relative sensitivity of groundwater transport systems to various parameters, such as dispersion coefficients and ion-exchange distribution coefficients. The models can be very useful in predicting the behavior of natural isotopes, artificial tracers or waste in groundwater. The models allow variable hydraulic parameters in space and time, as well as variable chemical parameters. Predictive use of such models is demonstrated for several different conditions in heterogeneous basaltic aquifer. Thirty-year predictions of tritium and Sr-90 migrations are shown with variable hydraulic and chemical influences. Additional methods and potential applications of modelling are suggested, including tracer migration studies and natural isotope distributions in groundwater. (Woodard-USGS)
W77-06981

SEDIMENTS AND WATER QUALITY OF URBAN STORM WATER,
Middlesex Polytechnic, London (England).
J. B. Ellis.
Water Services, Vol. 80, No. 970, p 730-734, December, 1976. 4 fig, 10 ref.

Descriptors: *Storm runoff, *Urban runoff, *Water pollution sources, Heavy metals, Sediments, Oxygen demand, Surface runoff, Hydrology, Hydrogen ion concentration, Storm water, Water quality.
Identifiers: Silk Stream(London England).

The Silk Stream catchment, a tributary of the River Brent, in North London, was studied to gather information on the relatonship between sediments and water quality of urban storm water. Storm water runoff contains a substantial quantity of pollutants which can present a more serious problem than municipal wastes. Typical components of storm water are organic compounds, fecal bacteria, heavy metals, and suspended solids. Oils, phenols, detergents, and greases are other pollutants. Hydrogeologic and other characteristics of the area were studied. Storm water sediment composition is dominated by inorganic mineral fractions (45-70%) from roof, pavement, and street surfaces; also included are brick, glass, concrete, ash, bitumen, rubber-coated particles, minor amounts of plastics, aggregate, and metallic particles. These sediments are well sorted, spherical, and concentrated in the 0.1-0.5 millimeter range. Accumulated discharge of huge amounts of sediment in the receiving channels produces a very thick gelatinous benthal sludge. When these sludges are oil, grease, and detergent, flocs bubble to the surface. This bubbling and flotation are signs of decomposition, just as depressed pH and dissolved oxygen values indicate. Benthal sludges have a high ionic adsorptive capacity, mainly from inorganic matter in the sediment. Organic components increase the potential by decomposing to release complex, toxic compounds into surrounding sediments or by solutional release into the stream. There is a strong likelihood of coprecipitation of trae metals with these substances as well as with free iron oxides, rubber, and bitumen components. The use of sediment loads to upgrade nutrient rich waters, to take chemical species from the solution phase, or to remove these species, heavy metals, and organic compounds from the stream are all feasible water quality goals. (Collins-FIRL)

W77-06984

BIOGENIC ELEMENTS AND SULFATE REDUCTION IN WATER OIL CARBONATE LAYER, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
E. P. Rozanova, V. N. Bykov, A. L. Baldina, and T. A. Kosogorova.
Mikrobiologiya 45(2), p 365-369, 1976.

Descriptors: *Sulfates, Oil, Bacteria, *Biodegradation, *Hydrogen sulfide, Carbonates, Salinity, Sediments.
Identifiers: *Biogenic elements, *USSR(Polaznensky deposit).

Biogenous sulfate reduction (bacterial) and accumulation of secondary H2S were caused by the action of pumping waters with a low mineral content on carbonate collectors with a high concentration of relict H2S during long periods of time. The amount of sulfates, phosphates and ammonium N in water from layers of various mineralization is sufficient for active sulfate reduction. Sulfates and phosphates are eliminated from rocks of layers with diluted waters. The maximum increase of SO42- in waters was 1545 mg/l, that of HPO42- was 0.34 mg/l. The amount of ammonium decreases with mineralization of the layer waters, remaining within the range of 129-7 mg/l. The content of CO2 and HCO3- increases in diluted waters to 197 and 695 mg/l, respectively, correlating with biogenous processes. The highest number of sulfate reducing bacteria (dozens of thousands of the cells per ml) was found in H2O with mineralization of 19 g/l. Curves for the content of SO42-, HPO42-, NH4+ and CO2 have a common maximum in waters of the Polaznensky deposit (USSR) with a salinity of 62 g/l.--Copyright 1977, Biological Abstracts, Inc.
W77-07040

DRUGS AND DRUG METABOLITES AS ENVIRONMENTAL CONTAMINANTS: CHLOROPHENOXYISOBUTYRATE AND SALICYLIC ACID IN SEWAGE WATER EFFLUENT,
Veterans Administration Hospital, Kansas City, Mo.
For primary bibliographic entry see Field 5A.
W77-07045

ACCUMULATION OF HEAVY METALS IN SOILS FROM EXTENDED WASTE WATER IRRIGATION,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
R. C. Sidle, J. E. Hook, and L. T. Kardos.

Descriptors: *Heavy metals, *Irrigation, *Soil contamination, Sewage effluents, Sewage disposal, Soil types, Waste water treatment, Copper, Zinc, Cadmium, Lead, Nickel, Cobalt, Metals, Vegetation, Food chains.

Accumulation and distribution of heavy metals due to waste water infiltration were investigated in soil profiles of a reed canarygrass and a corn rotation area. The soils were irrigated year-round with chlorinated secondary treated waste water effluent. Copper, zinc, cadmium, lead, nickel, and cobalt were studied. Effluent concentrations of these metals were in the lower range for heavy metals in waste water effluents given in previous studies. Extractable soil copper and zinc accumulated substantially at a depth of 0 to 30 centimeters in the reed canarygrass area, but cadmium levels in the surface foot of soil increased to a lesser degree. Copper was the only metal with a significant accumulation rate over time in the same depth range of the corn areas, and less than the copper concentration in the d canarygrass areas. No definite indications were found that the heavy metals moved from this depth range in either area and there were no definite accumulation trends with time for lead, nickel, or cobalt in either area. No serious soil contamination by these metals was indicated in either study area. Cadmium:zinc ratios approached that of the waste water applied in both cases, which was 0.68 to 1%. Further monitoring of heavy metal levels in the surface foot of soil and in vegetation would avoid possible food chain contamination. (Collins-FIRL)
W77-07049

PHOSPHATES IN SOILS TREATED WITH SEWAGE WATER: II. FRACTIONATION OF ACCUMULATED PHOSPHATES,
Agricultural Univ., Wageningen (Netherlands).
J. Beck, F. A. M. de Haan, and W. H. van Riemsdijk.
Journal of Environmental Quality, Vol 6, No 1, p 7-12, January-March, 1977. 2 fig, 4 tab, 24 ref.

Descriptors: *Phosphates, *Sewage disposal, Soil contamination, Sewage effluents, Organic matter, Inorganic compounds, Aluminum, Hydrogen ion concentration, Waste water treatment, Storage.
Identifiers: Sewage farms.

Investigations, using phosphate fractionation methods, were conducted on sewage farm soils to determine whether the chemical forms of phosphate accumulation in soil change with prolonged sewage water addition. Phosphate accumulation in soils flooded with sewage water for 30 and 50 years is mostly restricted to the upper 50 centimeters of soil. Phosphorus fractionation methods revealed that 15-20% accumulated in organic form. Most of the inorganic fraction was found in combination with aluminum or iron, and solubility relationship determinations indicated a possible precipitation of apatite-like compounds in soils with a nearly neutral pH. Aluminum combined phosphates were found to be prevalent. It was thought that phosphate retention is mostly governed by reactions with aluminum since the phosphate fractions distribution pattern remained practically the same during the lifetime of the sewage farm. Ultimate storage capacity of the soil for phosphate bonding is mainly determined by the presence of active aluminum compounds. (See also W77-07052 and W77-07054) (Collins-FIRL)
W77-07053

PHOSPHATES IN SOILS TREATED WITH SEWAGE WATER: III. KINETIC STUDIES ON THE REACTION OF PHOSPHATES WITH ALUMINUM COMPOUNDS,
Agricultural Univ., Wageningen (Netherlands).
W. H. van Riemsdijk, F. A. Westrate, and J. Beek.
Journal of Environmental Quality, Vol 6, No 1, p 26-29, January-March, 1977. 3 fig, 4 tab, 8 ref.

Descriptors: *Adsorption, *Phosphate, *Kinetics, Chemical reactions, Sewage effluents, Sewage disposal, Waste water disposal, Soil contamination, Chemical properties, Disposal.
Identifiers: Aluminum hydroxide.

The reaction of phosphate and aluminum hydroxide and alpha Al2O3 was studied in order to understand the kinetics of phosphate precipitation reactions in land disposal of raw sewage water. An initial phosphate concentration of 0.35 millimoles/liter at 20C was used. Sources of the phosphate were solutions of KH2PO4 and synthetic inorganic sewage water. Highest values of removed phosphate occurred when KH2PO4 solutions were used; this was attributed to the lack of competitive anions for adsorption. The ionic strength of this solution was lower and phosphate activities were much higher than in synthetic waste water. The mechanism of the reaction kinetics was similar with both adsorbent types used and was, possibly, influenced by the surface structure of the adsorbent. Characteristics of phosphate removal reactions were a first, fast adsorption on the surface of the adsorbent, and the formation of a solid aluminum phosphate phase. After 40 days, the reaction rate does not fit the presented first order equation. (See also W77-07052 and W77-07053) (Collins-FIRL)
W77-07054

SOLUBILITY AND PLANT UPTAKE OF CADMIUM IN SOILS AMENDED WITH CADMIUM AND SEWAGE SLUDGE,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
J. J. Street, W. L. Lindsay, and B. R. Sabey.
Journal of Environmental Quality, Vol 6, No 1, p 72-77, January-March, 1977. 8 fig, 4 tab, 34 ref.

Descriptors: *Cadmium, *Adsorption, *Solubility, *Soils, Physical properties, Chemical properties, Sludge, Alkalinity, Corn, Organic matter, Toxicity, Absorption.
Identifiers: Precipitation, Freundlich equation.

Adsorption and precipitation are investigated as controlling factors in cadmium concentration in soils. Factors studied, in addition to adsorption and precipitation, were plant uptake and chemical extraction of cadmium. The addition of soluble cadmium to soil produced a rapid removal of cadmium from solution by adsorption on to soil constituents and by the possible formation of solid phases of cadmium compounds. Solutions containing less than 50 micrograms of Cd(2+)/milliliter produced data which fit the empirical Freundlich equation in all soils. In alkaline sandy soils, high concentration cadmium precipitated, perhaps, as CdCO3 and Cd3(PO4)2. When added to soil, either alone or with sludge, cadmium was taken up by corn seedlings. Cadmium alone was more readily taken up by soil than the combination of cadmium and sludge. Organic matter in one test soil depressed cadmium uptake, possibly indicating a reduced availability of cadmium sorbed to organic matter. High levels of cadmium can be accumulated by corn seedlings without visual toxicity symptoms. The DTPA soil test method was useful in estimating the cadmium uptake by corn seedlings grown on cadmium-contaminated soils. (Collins-FIRL)
W77-07055

UNDERFLOW FROM SLUDGE-IRRIGATED CROPLAND,
Springfield Sanitary District, Ill.
R. C. Andrew, and A. P. Troemper.
Journal Water Pollution Control Federation, Vol 49, No 1, p 161-168, January, 1977. 1 fig, 10 tab.

Descriptors: *Irrigation, *Underflow, *Liquid wastes, Sludge digestion, Sludge disposal, Aerobic treatment, Drainage, Suspended solids, Biochemical oxygen demand, Leachates, Soil disposal fields, Soil contamination, Metals, Inorganic compounds, Organic matter, Nitrogen, Oxidation, Economics, *Illinois.
Identifiers: Springfield Sanitary District(IL).

The Springfield Sanitary District, Illinois, has instituted the use of cropland spray irrigation for liquid disposal of aerobically digested sludge. Two sites totaling 66 acres are used. They have permanent underdrainage systems which collect and pump the underflow back to the aeration tanks at the treatment plant. Data indicated underdrain water volumes were more parallel to rainfall than to applied sludge volumes. Soil filtration produced a 99.96% average BOD5 reduction and an 99.98% average suspended solids reduction. Average component levels were 0.9 milligrams/liter of BOD5, 5.6 milligrams/liter of suspended solids, and 1,179/100 milliliters of fecal coliform. The median pH was 7.1 for applied sludge and 7.0 for underdrain water; soil pH was basically unaffected. Small amounts of phosphates leached to underdrain water and phosphate removal averaged 98.5%. Enough iron, aluminum, and calcium were present to react with phosphates and make insoluble products which were held in the upper soil layers. Nitrogen was almost completely oxidized

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to nitrate nitrogen. Under normal conditions, the cations calcium, magnesium, potassium, and sodium will not be likely to leach to underdrain water. Chromium, lead, cadmium, and nickel did not appreciably collect in the soil. This method was the most economical of all tested and irrigation proved a viable disposal means for waste water sludge. It is simple, needs a minimum of operation attention, and does not create an odor nuisance if sludge is well digested before application. (Collins-FIRL)
W77-07056

SHORT COURSE PROCEEDINGS: APPLICATIONS OF STORMWATER MANAGEMENT MODELS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 163, Price codes: A19 in paper copy, A01 in microfiche. Report EPA-670/2-75-065, June, 1975. 426 p, 137 fig, 56 tab.

Descriptors: *Model studies, *Water management(Applied), *Storm water, *Storm runoff, *Combined sewers, Hydrologic data, Water pollution, Pollution abatement, Simulation analysis, Mathematical models, *Computer programs.
Identifiers: *EPA Stormwater Management Model(SWMM).

Presentations are made of various storm water models to solve the problem of storm and combined sewer overflows and to make state pollution control agencies aware of these resources for pollution abatement. Discussed in the proceedings are such problems as the environmental effects of urban storm water runoff, the quantity and quality aspects of this runoff, the effects of runoff on the quality of receiving waters, and decision-making regarding quantity and quality control of water. The papers presented included data requirements and case studies of the different models, along with comparative analyses. Amongst the various models, the EPA Stormwater Management Model (SWMM) was highlighted. (See W77-07067 thru W77-07073) (Kutcher-FIRL)
W77-07066

INTRODUCTION TO URBAN STORM WATER RUNOFF MODELS,
Water Resources Engineers, Springfield, Va.
R. F. Shubinski.
In: Short Course Proceedings: Applications of Storm Water Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 177-199. 15 fig, 4 tab, 6 ref.

Descriptors: *Model studies, *Storm runoff, Water quality, Sewerage, Watersheds, Hydrologic aspects, *Urban runoff, Infiltration, Sewage effluents, Drainage, Flow.

Storm water runoff models were applied to a simplified urban drainage system. This system was composed of subsystems dealing with surface runoff, transport and quality of flow, and receiving waters. The surface runoff subsystem was a drainage area tributary to a sewer inlet--a system of surface elements, gutters, and drainage ditches. The transport system is the physical works which carry storm waters and their pollutant load from inlets through underground conduits to a point of disposal. Receiving systems could be streams, lakes, estuaries, or coasts. The hydrologic effects of urbanization and the characteristics of the urban watershed were considered. Factors controlling urban runoff include rainfall, infiltration, depression storage, surface detention and gutter detention, and storage in house drains, catch basins and major sewage elements. Land use influences imperviousness and surface cover which regulate surface depression, detention, and infiltration. A storm drainage model should analyze storm discharge from urban runoff by dividing the total basin into smaller homogeneous units to calculate individual runoff contributions. Collection of individual sub-basin outflows and their routing through main storm sewers allow determination of total watershed outflow at the basin outlet. (See also W77-07066) (Collins-FIRL)
W77-07071

SIMPLIFIED METHODS OF COMPUTING THE QUANTITY OF URBAN RUNOFF,
Water Resources Engineers, Springfield, Va.
R. P. Shubinski.
In: Short Course Proceedings: Applications of Storm Water Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 200-213. 7 fig, 4 tab, 2 ref.

Descriptors: *Analytical techniques, *Storm runoff, *Urban runoff, *Unit hydrographs, Peak discharge, Precipitation, Rainfall-runoff relationships, Watersheds(Basins), Design data, Drainage engineering, *Methodology.

Methods are considered for the computation of urban runoff quantities. Flow-frequency analysis involves using equations to obtain natural watershed conditions; plotting the computed discharges on probability paper and fitting a smooth curve; adjusting natural discharge for urbanization effects; and determining the required discharge. The rational method computes overland and channel travel time to obtain concentration time for watershed and design rainfall duration; it also computes the basin-wide coefficient of runoff precipitation intensity; and it determines peak discharge. The unit hydrograph method requires determining the rainfall excess available to the direct runoff process; separating baseflow from the corresponding hydrograph; determining volume of direct runoff; and dividing ordinates of the hydrograph (without baseflow) by volume of direct runoff. (See also W77-07066) (Collins-FIRL)
W77-07072

THE WRE STORM MODEL,
Water Resources Engineers, Springfield, Va.
R. P. Shubinski.
In: Short Course Proceedings: Applications of Storm Water Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 214-242. 8 fig, 5 tab, 9 ref.

Descriptors: *Model studies, *Water pollution sources, *Storm runoff, *Urban runoff, Precipitation(Atmospheric), Land use, Erosion, Urban hydrology, Analysis, Water quality, Watershed management.

The WRE STORM model was developed to help determine future magnitudes of urban runoff pollution loads from a given watershed, to help determine the pollution load for average and extreme events, and to determine the occurrence of a given extreme event. The STORM (storage, treatment, overflow, and runoff model) considers interctions of precipitation, air temperature for snowpack accumulation and snowmelt, runoff, pollutant accumulation on land surface, land surface erosion, treatment rates, storage, and overflows from the storage/treatment system. Land uses considered in this model include: single family residential, multiple family residential, commercial, industrial, parks, and non-urban or undeveloped areas. It is used with many years of continuous hourly precipitation records and may be used for selected single events as well as for continuous simulation. (See also W77-07066) (Collins-FIRL)
W77-07073

WATER QUALITY SIMULATION OF TAHOE-TRUCKEE SYSTEM, NEVADA-CALIFORNIA-VOLUME I,
Nevada Univ., Reno. Desert Research Inst.
J. A. Westphal, J. V. A. Sharp, and R. L. Bateman.
Available from the National Technical Information Service as PB-247 798, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-76-005a, 1976. 67 p, 19 fig, 15 tab, 54 ref.

Descriptors: *Model studies, *Inorganic compounds, Water quality, *Water quality control, *Rivers, *Streams, Flows, Industrial wastes, Municipal wastes, Agricultural runoff, Surface waters, California, Nevada, Lakes.
Identifiers: *Tahoe-Truckee water system(Nev and Calif).

A model was developed to aid inorganic water quality control in the Tahoe-Truckee water system of Nevada and California. In this system impoundments, diversions for and returns from industrial, agricultural, and municipal uses, and groundwater returns influence inorganic quality and surface water flows. Mass-flux-balance is the basis of the model. Assumptions used relative to the model include: a conservative nature for inorganic constitutents, instantaneous, complete mixing, and the accurate recapitulation of flows at an unused gaging station. The model is based on data collected over three years at 40 sites. Calcium, sodium, potassium, chloride, sulfate bicarbonate, silica, magnesium, and total dissolved solids (less silica) were modeled. The model simulates concentrations at selected points and quality of dispersed flows. (Collins-FIRL)
W77-07075

WATER QUALITY INVESTIGATIONS IN THE SOUTH PLATTE RIVER BASIN, COLORADO, 1971-72.
National Field Investigations Center, Denver, Colo.
For primary bibliographic entry see Field 5A.
W77-07076

A NONLINEAR MULTILEVEL TRANSPORTATION MODEL FOR WATER RESOURCE-WATER QUALITY MANAGEMENT,
Utah State Univ., Logan.
S. Pratishthananda.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No. 76-25,626. PhD Thesis, 1976, 181 p.

Descriptors: *Model studies, *Water resources, Comprehensive planning, Water reuse, Water quality, Effluents, Water users, Costs, Groundwater, Water resources.

A nonlinear multilevel transportation model was developed for the study of large scale water resources systems. This included allocation to multiple users and effluent treatment to meet required water quality standards. The basic framework is a modified transportation matrix. Included are cost functions for treatment and water transport. Salt Lake County, Utah, was used as a case study area. It was divided into four subregions with the water supplies as the interconnecting variables. Surface water, groundwater and import water were allocated to municipal, industrial and agricultural users for projected 1985 median needs. Effluent from treatment facilities were required to meet goals of Public Law 92-500. Management alternatives considered were allocations with no reuse of treated effluent and allocations with effluent reuse allowed for industrial and agricultural users. The reuse of effluent proved to be least costly. The model was considered as efficient as or better than nonlinear formulations. (Collins-FIRL)
W77-07096

5C. Effects Of Pollution

THE ACCUMULATION OF ORGANIC MERCURY FROM SEA WATER BY THE PLAICE, PLEURONECTES PLATESSA L.,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
R. J. Pentreath.
Journal of Experimental Marine Biology and Ecology, Vol. 24, p. 121-132, 1976. 7 fig, 5 tab, 12 ref.

Descriptors: *Metals, *Mercury, *Tracers, *Fish physiology, Metabolism, Path of pollutants, Mode of action, Water quality, Analytical techniques, Bioassay, *Absorption, Growth stages, Isotopes, Organic compounds, Fish eggs, Juvenile fish.
Identifiers: *Plaice, Pleuronectes platessa, Bioaccumulation, Tissue analysis.

The accumulation of organic mercury from sea water by plaice (Pleuronectes platessa) eggs, larvae and adult fish was studied using labeled CH3-HgCl as a tracer. The isotope was rapidly accumulated, the largest fraction taken up by muscle tissue. High concentration factors were attained by many internal organs, particularly blood, spleen, and kidney. Longer biological half-times than previous estimates with labeled HgCl2 were obtained. The possible consequences of inorganic mercury accumulated from sea water being excreted at the rate of methylmercury were calculated. (Katz)
W77-06607

ROTARY-FLOW TECHNIQUE FOR TESTING FITNESS OF FISH,
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
P. E. Lindahl, S. Olofsson, and E. Schwanbom.
Biological Monitoring of Water and Effluent Quality, ASTM STP 607, p. 75-84, 1977. 3 fig, 9 ref.

Descriptors: *Design, *Methodology, *Laboratory tests, Water pollution, Water quality, Toxins, Research and Development, *Water temperature, Thermal properties, Fish physiology, Tolerance, Laboratory equipment.
Identifiers: *Fish fitness, *Cod, Salmo salar, *Ethanol.

An improved version of rotary-flow apparatus which allowed tests of fitness with fish of different size at constant temperature was described. Optimal experimental conditions were investigated with cod. The method was applied to the study of the influence of temperature on the effect of ethanol in cod and to comparison of the fitness of cod from an inconsiderably contaminated and a polluted area. (Katz)
W77-06608

A BIOLOGICAL MONITORING SYSTEM EMPLOYING RHEOTAXIS OF FISH,
Baden-Wuerttemberg Landesanstalt fuer Umweltschutz (West Germany).
W. K. Besch, A. Kemball, K. Meyer-Waarden, and B. Scharf.
Biological Monitoring of Water and Effluent Quality, ASTM STP 607, p. 56-74, 1977. 10 fig, 17 ref.

Descriptors: *Design, *Monitoring, *Laboratory tests, *Methodology, Toxicity, Toxins, Lethal limit, Fish physiology, *Fish behavior, Water quality, Water pollution, *Carp.
Identifiers: *Rheotaxis, Surfacing, Biological monitoring system, Acute poisoning, Toxicology, Specific toxic effects.

An automatic toxicity monitoring and alarm device using rheotaxis was described. The device was also used for static laboratory tests. When loss of rheotaxis along with surfacing were used for criteria for acute poisoning instead of death, the time required for toxicity tests was shortened. Visual observation of other parameters of behavior, such as schooling, yielded other information pertinent to the specific effects of certain toxins or particular concentrations of toxins. Loss of rheotaxis and surfacing was recorded automatically. Testing of the automatic monitoring device in the laboratory led to the development of a multichannel, automatically recording test apparatus. (Katz)
W77-06609

AN ELECTRONIC SYSTEM TO MONITOR THE EFFECTS OF CHANGES IN WATER QUALITY ON FISH OPERCULAR RHYTHMS,
National Inst. for Water Research, Pretoria (South Africa).
W. S. G. Morgan.
Biological Monitoring of Water and Effluent Quality, ASTM STP 607, p. 38-55, 1977. 8 fig, 1 tab, 13 ref.

Descriptors: *Monitoring, *Toxicity, *Methodology, *Water quality, *Design, Water pollution, Analytical techniques, Fish behavior, Electrical equipment, Fish physiology, Toxicity, Data collection.
Identifiers: Critical toxic condition, Biological automatic monitoring system, Electronic monitoring system, *Opercular rhythms(Fish), Water quality changes.

A rapid automated biological monitoring system intended to complement physical-chemical monitoring techniques was developed utilizing the fact that fish opercular rhythms increase under toxic conditions. Any increase above the expected rate under normal conditions was electronically monitored. A built-in visual alarm system served as an advance warning of the development of a toxic condition. The system was also able to control toxic industrial discharges, thus aiding the preservation of receiving water quality. (Katz)
W77-06610

LAS INHIBITION OF DIFFUSION AND UPTAKE OF TRITIATED URIDINE DURING TELEOST EMBRYOGENESIS,
Loyola Univ. of Chicago, Ill.
H. W. Manner, and C. Muehleman.
Environmental Biology of Fish, Vol. 1, No. 1, p 81-84, 1976. 2 tab, 1 fig, 13 ref.

Descriptors: *Mode of action, *Bioassay, *Embryonic growth stage, *Water pollution effects, *Surfactants, *Linear alkylate sulfonates, *Membrane processes, *Analytical techniques, *Tritium, *Absorption, Laboratory tests, Detergents, Sulfonates, Teleosts, Minnows, Permeability, Radioactivity, Radioisotopes, Inhibitors, Fish reproduction.
Identifiers: *Embryogenesis, *Pimephales promelas, *RNA synthesis, *Uridine.

Fathead minnow embryos (Pimephales promelas) of 5 different developmental ages (5, 33, 48, 72 and 96 hours after fertilization) were used as controls and exposed for 2 hours to a solution of 0.25 microCi per ml of tritiated uridine. Another set of embryos of the same ages were subjected to the same regimen except that during the one hour immediately preceding the uridine incubation, the control embryos were placed in water while experimental embryos were placed in water containing 15 ppm 11.2 LAS. In both cases, radiation counts per minute per embryo and per milligram of embryo increased over the 4 day developmental period. The embryos with LAS regimens displayed lower radiation counts at all ages as compared to controls, indicating an inhibition of diffusion and uptake of tritiated uridine and/or RNA synthesis. The possible mechanism of LAS is discussed. (Katz)
W77-06611

EFFECT OF MALACHITE GREEN AND FORMALIN ON THE SURVIVAL OF LARGEMOUTH BASS EGGS AND FRY,
Cheraw National Fish Hatchery, S. C.
L. D. Wright.
The Progressive Fish-Culturist, Vol. 38, No. 3, p 155-157, 1976. 2 tab, 14 ref.

Descriptors: *Bass, *Fish eggs, *Fry, *Toxicity, *Fungicides, Juvenile fish, Fish hatcheries, Fish parasites, Pathogenic fungi, Incubation, Laboratory tests, Mortality, Fish diseases, Bioassay.
Identifiers: Micropterus salmoides, *Malachite green, *Formalin, Saprolegnia.

Largemouth bass eggs and fry were exposed to various concentrations of malachite green and formalin. Formalin could safely be used as a fungus control for the eggs at the standard concentration of 4,000 ppm for 10 minutes, and the fry could safely be prophylactically treated at 50 ppm for 60 minutes. Malachite green proved to be extremely toxic and should not be used as a fungicide or prophylactic.
W77-06612

A PNEUMATIC GRAB FOR OBTAINING LARGE, UNDISTURBED MUD SAMPLES: ITS CONSTRUCTION AND SOME APPLICATIONS FOR MEASURING THE GROWTH OF LARVAE AND EMERGENCE OF ADULT CHIRONOMIDAE,
Institute of Terrestrial Ecology, Edinburgh (Scotland). Wetlands Research Group.
For primary bibliographic entry see Field 5A.
W77-06613

THE EFFECTS OF METHOXYCHLOR ON RIFFLE INVERTEBRATE POPULATIONS AND COMMUNITIES,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
P. J. Eisele, and R. Hartung.
Transactions of American Fisheries Society, Vol. 105, No. 5, p 628-633, 1976. 2 tab, 3 fig, 17 ref.

Descriptors: Streams, *Toxicants, *Pesticides, *Invertebrates, *Biological communities, *Bottom sampling, *Benthic fauna, *On-site investigations, Water pollution effects, Environmental effects, Stoneflies, Diptera, Ecosystems, Artificial substrates.
Identifiers: *Methoxychlor, *Riffle invertebrates, Baetids.

A study was conducted to evaluate the chronic effects of a toxicant on interacting stream invertebrate populations. The study involved the continuous dosing of a small stream at o.2 micrograms per liter methoxychlor for over one year. Invertebrate populations were monitored by artificial substrate and bottom sample collections of riffle invertebrates. Most invertebrate populations experienced som reduction due to the stream dosing. Some taxa)baetids and plecopterans) were effected as reflected by population reductions in dosed areas. Many taxa (hydropsychids, simulids and aeschnids) were temporarily affected, experiencing initial population reductions in dosed areas but then recovering to control levels. Other taxa (chironomids and elmids) were not affected. The riffle invertebrate community colonizing artificial substrates experienced a temporary decrease in bottom sample collections. In general, most longterm effects were minor in comparison to naturally occurring phenomena such as flooding. (Katz)
W77-06614

DYNAMICS OF MICRO-ZOOPLANKTON POPULATIONS TREATED WITH COPPER: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5A.

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W77-06616

EVALUATION OF POTENTIAL INDICATORS OF SUB-LETHAL TOXIC STRESS ON MARINE ZOOPLANKTON (FEEDING, FECUNDITY, RESPIRATION AND EXCRETION): CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 5A.
W77-06617

THE GROWTH OF YOUNG SALMONIDS (ONCHORHYNCHUS KETA): CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5A.
W77-06618

EXPERIMENTAL OBSERVATIONS ON THE EFFECTS OF COPPER ON COPEPODS AND OTHER ZOOPLANKTON: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Rosentiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 5A.
W77-06619

RESPONSE OF MACRO-ZOOPLANKTON POPULATIONS TO COPPER: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Woods Hole Oceanographi Institution, Mass.
For primary bibliographic entry see Field 5A.
W77-06620

EFFECTS OF COPPER ON SILICIC ACID UPTAKE BY A MARINE PHYTOPLANKTON POPULATION: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5A.
W77-06621

RESPONSE OF NATURAL MARINE BACTERIAL POPULATIONS TO COPPER: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W77-06622

EFFECTS OF FOUR OILS ON MARINE BACTERIAL POPULATIONS: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5A.
W77-06623

EFFECTS OF COPPER ON PHYTOPLANKTON STANDING CROP AND PRODUCTIVITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5A.
W77-06624

EFFECTS OF COPPER ON THE DOMINANCE AND THE DIVERSITY OF ALGAE: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5A.
W77-06625

TEMPERATURE, SALINITY AND LIGHT PENETRATION STRUCTURES: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5A.
W77-06626

LOCH EWE BAG EXPERIMENT, 1974,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5A.
W77-06627

TOXICITY OF FLUORIDE TO BROWN TROUT FRY (SALMO TRUTTA),
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
D. A. Wright.
Environmental Pollution, vol. 12, p. 57-62, 1977; 3 fig, 10 ref.

Descriptors: *Absorption, *Brown trout, *Fry, *Hardness(Water), *Toxicity, *Bioassay, *Lethal limit, *Fluorides, Juvenile fish, Trout, Salmonids, Rainbow trout, Mortality, Laboratory tests, Fluoridation, Industrial wastes.

The toxicity of fluoride to brown trout fry (Salmo trutta) was tested using groups of 100 animals in tapwater containing 29 ppm calcium with sodium fluoride added. Results obtained were similar to published work on S. gairdneri which showed a distinct fall in mortality rates below 20 mg/litre fluoride. Fluoride uptake was the same in dead fish taken from the toxicity testing aquaria and live fish. Concentration factors (animal fluoride concentrations:external fluoride concentrations) were small, reaching a maximum of 2.3 in animals in 5 mg/litre fluoride after 160 h. (Katz)
W77-06628

THE UPTAKE OF LEAD, ZINC, CADMIUM, AND COPPER BY THE PULMONATE MOLLUSC, HELIX ASPERSA MULLER, AND ITS RELEVANCE TO THE MONITORING OF HEAVY METAL CONTAMINATION OF THE ENVIRONMENT,
Bristol Univ. (England). Dept. of Botany.
P. J. Coughtrey, and M. H. Martin.
Oecologia, vol. 27, p. 65-74, 1977. 1 fig, 5 tab, 53 ref.

Descriptors: *Lead, *Zinc, *Cadmium, *Copper, *Absorption, *Animal physiology, *Mollusks, *Heavy metals, *Water pollution sources, Monitoring, Size, Invertebrates, Path of pollutants, Growth stages.
Identifiers: Bioaccumulation, *Helix aspersa, Terrestrial mollusks, Body weight(Mollusks).

The occurrence of lead, zinc, cadmium, and copper in individuals of Helix aspersa from two sites of varying degrees of contamination was studied. Zinc, cadmium, and copper were shown to increase to a linear fashion with animal weight. The rate of uptake for zinc and cadmium in particular was significantly greater at the more contaminated site. Statistical analysis of the data, using correlation and regression techniques provided information on apparent intermetallic effects. Because metal uptake and body weight show a positive linear relationship only the use of animals of similar weight and/or size can be used for monitoring purposes. Even then, different patterns of uptake into different organs and interactions between metal uptakes are such as to seriously question the use of Helix, and other molluscs, for monitoring purposes unless specific organs from comparably sized and/or aged animals are used. (Katz)
W77-06629

THE TOXIC EFFECTS OF SELECTED HEAVY METALS ON UNADAPTED POPULATIONS OF VORTICELLA CONVALLARIA VAR SIMILIS,
Surrey Univ., Guilford (England). Dept. of Microbiology.
D. P. Sartory, and B. J. Lloyd.
Water Research, Vol. 10, p. 1123-1127, 1976. 1 fig., 2 tab., 10 ref.

Descriptors: *Toxins, *Toxicity, *Heavy metals, *Protozoa, *Metals, Lethal limit, Water pollution sources, Mortality, Path of pollutants, Environmental effects, Laboratory tests, Sewage effluents, *Lead, *Mercury, *Zinc, Mode of action.
Identifiers: Bioaccumulation, *Vorticella convallaria var similis, Free metal ions.

Unadapted populations of Vorticella convallaria var similis, a sessile peritrich protozoan found abundantly in healthy rivers, activated sludge, percolating filters and slow sand filters were subjected to a range of concentrations of three common pollutant metals. These populations were killed by concentrations of and above, 0.0005 mg/l. of the free metal ion of either lead or mercury. Colonies were also killed by concentrations of, and above, 0.075 mg/l. of the free metal ion of zinc, 12 hr 50% lethal doses were calculated, and for V. convallaria var similis were 0.00036 mg/l. for lead, 0.005 mg/l. for mercury and 0.29 mg/l. for zinc. (Katz)
W77-06636

CHLORINE REACTIONS WITH SEAWATER CONSTITUENTS AND THE INHIBITION OF PHOTOSYNTHESIS OF NATURAL MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. W. Eppley, E. H. Renger, and P. M. Williams.
Estuarine and Coastal Marine Science, Vol. 4, p. 147-161, 1976. 6 fig, 6 tab, 25 ref.

Descriptors: *Chlorine, *Chlorination, *Cooling water, *Water pollution sources, *Plankton, *Phytoplankton, Inhibition, Photosynthesis, Sea water, Salinity, Condensers, Water quality, Environmental effects, Analytical techniques, Growth rates.
Identifiers: Hypochlorite, Skeletonema costatum.

The time course of chlorine disappearance was followed in filtered (1), non-filtered (2), and u.v.-oxidized (3) seawater. In (1) and (2) there was an initial rapid decline in both free and residual chlorine followed by a slower decline of these species. No decline was observed in (3), suggesting that the removal of organic matter and/or the oxidation of metal ions by u.v.-oxidation removed those molecular species that reacted with chlorine. Reaction rate was more rapid in (2) than in (1), suggesting that particulate organic matter may also react with chlorine. Reaction kinetics of chlorine were complex but approximated second order in the slow phase. The inhibition of phytoplankton photosynthesis by chlorine was studied by adding hypochlorite to samples. Chlorine concentrations required for 50% inhibition varied with exposure time. For 24-h incubations such inhibitions took place with residual chlorine concentrations of 10 parts/10 to the 9th power. The inhibition appeared to be irreversible. The deleterious impact on marine phytoplankton by the use of seawater for cooling power plants lay in the use of chlorine to prevent slime build-up on the condensor system parts. (Katz)
W77-06637

THE FAUNA OF THE POLLUTED RIVER TEES ESTUARY,
Leeds Univ. (England). Wellcome Marine Lab.
J. S. Gray.
Estuarine and Coastal Marine Science, Vol. 4, p. 653-676, 1976. 8 fig, 8 tab, 62 ref.

Descriptors: *Estuaries, Water pollution, *Water pollution sources, *Productivity, Community development, Biomass, Worms, Algae, Population, Growth rates, Distribution patterns, *Environmental effects, Succession, Bacteria, Ecology, Wildlife, Invertebrates, Annelids, Food chains, *Nematodes, Ecosystems, Biological communities, Ecological distribution, *Gastropods.
Identifiers: Polycheates, *River Tees estuary(England).

The fauna at the mouth of the grossly polluted river Tees estuary, England, was surveyed in summer 1971 and spring 1973. Gastrotrichs and nematodes dominated numerically and were more abundant within the estuary than at open coast beaches, (2 x 10 to the 6th power compared with 8 x .000001 animals sq m). Few environmental factors correlated with faunal abundance. Sewage bacteria showed a positive correlation with gastrotrichs at open coast beaches and a negative correlation at sheltered beaches, whereas nematodes showed a positive correlation with sewage bacteria at a sheltered sand beach and a negative correlation at a muddy beach. Annelids did not show correlations with granulometric factors and comprised 98% of the biomass of the muddy area. Using data on annelid species, diversity patterns and a variety of multivariate analyses all showed that at the muddy Seal Sand, a central area could be distinguished from a peripheral area. The central area was physically stable and was covered by an algal mat. This area contained the polycheates Capitella capitata, Polydora ciliata, Streblospio shrubsolii and Manayunkia aestuarina and the oligochaetes Peloscolex benendeni and Tubifex pseudogaster. The macrofauna comprised fewer species when compared with a survey done in 1935; in particular there were fewer species of pelecypods. There were no detectable effects of pollution on the meiofauna; the numbers of organisms and total biomass were comparable with those of other temperate estuaries. (Katz)
W77-06638

TISSUE ACCUMULATION AND ENZYMATIC EFFECTS OF HEXAVALENT CHROMIUM IN RAINBOW TROUT (SALMO GAIRDNERI),
Battelle Pacific Northwest Labs., Richland, Wash.
D. R. Buhler, R. M. Stokes, and R. S. Caldwell.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 9-18, 1977. 6 tab, 1 fig, 27 ref.

Descriptors: *Chromium, *Freshwater fish, Salmonids, *Rainbow trout, *Laboratory tests, *Biochemistry, *Bioassay, Enzymes, *Water pollution effects, Path of pollutants, Toxicity, Mortality, Cooling water, *Fish physiology, Biochemistry, Columbia River.
Identifiers: *Hexavalent chromium, Whole body residues, Skeletal muscle tissue.

Two-year-old rainbow trout (Salmo gairdneri), reared for 2 yr in water containing about 0.00025 mg/l hexavalent chromium (Cr+6) (Naches trout) or between 0.002 and 0.01 mg/l Cr+6 (Hanford trout) accumulated appreciable chromium, yielding whole body residues of about 0.029 and 0.18 micrograms/g wet tissue, respectively. Highest concentrations were in the opercular bone, spleen, kidney, gastrointestinal tract, and gall bladder. Short-term exposure of Hanford trout to 2.5 mg/l Cr caused a rapid additional increase of tissue chromium, but at 22 days whole body levels were only 0.87 micrograms/g. Upon return of exposed fish to water continuing 0.002-0.01 mg/l chromium, the metal was rapidly depleted from most tissues except kidney, liver, gill, gall bladder, and bile. Chromium accumulated in tissues of trout exposed to 2.5 mg/l Cr was not distributed proportionally among the various subcellular fractions but concentrated in the cell cytosol, especially in the liver and gill. Mitochondrial cytochrome oxidase, NADH-cytochrome c reductase, and succinate cytochrome c reductase activities in liver, kidney, gill, and brain tissues of Naches trout, Hanford trout, and Hanford trout exposed to 2.5 mg/l Cr were not significantly different except for kidney NADH-cytochrome c reductase which was lower in Hanford and chromium treated fish. Microsomal nitroreductase, O-demethylase and NADPH-cytochrome c reductase and the soluble glucose-6-phosphate dehydrogenase activities in liver and kidney from Hanford trout were significantly lower than those of Naches trout. Exposure of Hanford trout to 2.5 mg/l Cr, however, did not reduce the activities of these enzymes below control levels. In vitro studies showed that trout enzymes were fairly insensitive to Cr inhibition. These results suggest that observed differences in enzyme activity between Naches and Hanford trout may be caused by factors other than chromium content of the water. (Katz)
W77-06639

STABLE ELEMENTS OF RADIOECOLOGICAL IMPORTANCE IN CERTAIN ECHINODERM SPECIES,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
For primary bibliographic entry see Field 5A.
W77-06640

EFFECTS OF PRESSURE, TEMPERATURE AND OXYGEN ON THE OXYGEN-CONSUMPTION RATE OF THE MIDWATER COPEPOD GAUSSIA PRINCEPS,
California Univ., Santa Barbara. Marine Science Inst.
J. J. Childress.
Marine Biology, Vol. 39, p. 19-24, 1977. 1 tab, 3 fig, 22 ref.

Descriptors: *Copepods, *Plankton, Marine organisms, *Oxygen requirements, California, Water properties, *Pressure, *Temperature, *Vertical migration, Diurnal, Laboratory tests, Methodology, Animal physiology.
Identifiers: Gaussia princeps, *Calanoid copepod, *Oxygen minimum layer, Anaerobic metabolism.

Gaussia princeps is a diurnal vertical migrator which spends its days below 400 m in the oxygen minimum layer and migrates to shallower depths (200 to 300 m) at night. This species' consumption was measured at 3.5, 7 and 10C and 1, 14, 28, 61, 121, and 181 atm of hydrostatic pressure (1 atm corresponds to approximately 10 m of depth). The Q10 of the oxygen consumption is higher at lower temperatures and higher pressures. Hydrostatic pressure has significant effects on the oxygen-consumption rate at pressures as low as 28 atm. At all temperature and pressure combinations, G. princeps displays a very low metabolic rate compared to shallow living copepods. The critical oxygen partial pressure for this species is about 10 to 13 mm Hg O2 at 10, 7 and 5.5C. Based on these data, a predicted relation between depth and oxygen consumption by this species off California, USA, is presented. This shows a higher oxygen-consumption rate at the nighttime depths and a much lower, partially anaerobic metabolism at the daytime depths. (Katz)
W77-06642

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF EUTROPHICATION IN SAGINAW BAY,
Bendix Aerospace Systems Div. Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W77-06665

MEASUREMENTS OF PLANKTONIC BIOMASS IN A RESERVOIR,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W77-06679

LIMNOLOGICAL AND PLANKTONIC STUDIES IN THE WATERTON LAKES, ALBERTA,
Canadian Wildlife Service, Edmonton (Alberta).
R. S. Anderson, and R. B. Green.
Canadian Wildlife Service, Occasional Paper No. 27, 1976. 41 p. 13 fig., 6 tab., 62 ref. (Published in Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 571-579, 1975).

Descriptors: *Biological communities, *Baseline studies, *Zooplankton, *Phytoplankton, Canada, Water chemistry, Winds, Water circulation, Hydrologic cycle, Histograms, Varieties, Water pollution effects, Human population, Limnology.
Identifiers: *Waterton Lakes(Alberta), Upper Waterton Lake(Alberta), Lower Waterton Lake(Alberta), Knight's Lake(Alberta).

The major lakes of Waterton Lakes National Park in southwestern Alberta (Canada), Upper and Lower Waterton and Knight's Lakes, were investigated to determine the extent of their enrichment due to their central location in the park, the townsite, and the major campground facilities on their shoes. The water renewal rate of Upper Waterton Lake is .8 times per year; lower Waterton's rate is 7.1 and Knight's Lake is 161.. A total of 164 species and subspecies of algae were identified in the lakes during 1972-1975. Zooplankton included 19 crustacean and 12 rotiferan species, and their composition appears to have remained unchanged since 1973, although aboundance has increased, as have the phytoplankton abundance and species numbers. The physical conditions and chemical constituents have remained fairly constant although some nutrient enrichment was evident. New sewage treatment facilities at the townsite, which contains a resident popultion of 120 but peaks to 510,086 annually, are expected to eliminate the cultural nutrient source, although, when compared to the lake volume, it is relatively small. However, it may have been responsible for recent increases in plankton abundance. (Auen-Wisconsin).
W77-06680

STRATIFICATION OF KINETIC ORIGIN AND ITS BIOLOGICAL CONSEQUENCES IN A NEOTROPICAL MAN-MADE LAKE,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 2H.
W77-06683

A GENERAL MODEL OF MICROBIAL GROWTH AND DECOMPOSITION IN AQUATIC ECOSYSTEMS,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
L. S. Clesceri, R. A. Park, and J. A. Bloomfield.
Rensselaer Polytechnic Institute FWI Report 77-2, January 1977. 35 p. 7 fig., 4 tab., 38 ref. NSF AG-199, BMS76-00761.

Descriptors: *Mathematical models, *Computer models, *Microbial degradation, Microorganisms, Organic matter, Lakes, Detritus, Cycling nutrients, Simulations.
Identifiers: Computer model CLEANER, *Lake George(NY).

A microbial decomposition mathematical model which represents the dual role of microflora as a food source and as an agent of biogeochemical cycling in the pelgic portion of a lake has been developed as an adjunct to the ecosystem model CLEANER. The model represents microbial processes with greater realism than most existing ecosystem models and shows promise of applicability under varying conditions. The model conceptualizes the microbial growth and decomposition compartments by WRDOM-refractory dissolved organic matter in water; WLDOM-labile dissolved organic material in water; WDEC-decomposers in water; DDEC-decomposers of detritus; DDOM-dissolved organic material or detritus: POM-particulte organic material; and

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DIM-dissolved inorganic material. It is amenable to detailed inspection for holistic relationships that are not evident when each process is considered separately under experimental conditions, and is most useful in simulating ecosystem responses to environmental perturbations, and in determining the sensitivity of the ecosystem to variations in the components and processes that constitute the microbial decomposition subsystem. For example, it can be used to consider the availability of various classes of dissolved organic matter and the differential rates of uptake by decomposing micro-organisms as modified by natural environmental variations throughout the year. Sensitivity analyses can be readily performed using the interactive capability of the model on a time-sharing computer system. (Auen-Wisconsin)
W77-06684

DYNAMICS OF PHYTOPLANKTON BIOMASS IN TWO LAKES OF DIFFERENT LIMNOLOGICAL CHARACTER,
Instytut Przyrodniczych Podstaw, Lubin (Poland). Produkeji Roslinnej AR.
W. Wojciechowska.
Ekologia Polska, Vol. 24, No. 2, p. 237-252, 1976. 6 fig., 1 tab., 35 ref.

Descriptors: *Phytoplankton, *Biomass, *Trophic level, Europe, Eutrophication, Mesotrophy, Seasonal, Temporal distribution, Productivity, Foreign countries, Nannoplankton, Lakes.
Identifiers: *Lake Piaseczno(Poland), *Lake Bikcze(Poland).

Seasonal dynamics of phytoplankton biomass were investigated during 1971-1972 in alpha-mesotrophic Lake Piaseczno and in eutrophic Lake Bikcze in Poland. Biomass values were lowest in winter and highest in summer with qualitative seasonal variability primarily expressed by changes in the communities' taxonomic structure. Cyanophyta and Baccilariophyceae dominated in spring and summer; in the other seasons Cryptophyceae, Baccilriophyceae, of the phytoplankton were also similar in both lakes. The nannoplankton biomass and its contribution to total biomass were highest from late autumn till early spring. The different trophic levels of the lakes were reflected in the biomass variations, as biomass concentration in a water volume unit was usually higher in Lake Bikcze. The frequently observed biomass concentration in the metalimnion of Lake Piaseczno is characteristic for lakes in the oligotrophic range. The species diversity and nannoplankton contribution to biomass were higher in the mesotrophic lake. The range of biomass changes within a year was higher in both lakes in 1971 than in 1972. In Lake Piaseczno it was 1:59 in 1971 and 1:7 in 1972 and in Lake Bikcze 1:1057 and 1:74, respectively. (Auen-Wisconsin)
W77-06685

THE MINING FAUNA IN FOUR MACROPHYTE SPECIES IN MIKOLAJSKIE LAKE,
Polish Academy of Sciences, Warsaw. Lab. of Ecological Bioenergetics.
E. Urban.
Ekologia Polska, Vol. 23, No. 3, p. 417-435, 1975. 5 fig., 10 tab., 15 ref.

Descriptors: *Aquatic plants, *Parasitism, *Insects, *Oligochaetes, Diptera, Worms, Varieties, Mode of action, Europe, Foreign countries, Lakes.
Identifiers: *Borer fauna, Lepidoptera, Hydrocarina, Potamogeton, Elodea canandensis, Myriphyllum spicatum, Glyptotendipes, Mikolajskie Lake(Poland).

Research in Poland's Mikolajskie Lake details composition, distribution, seasonal variation, and effects of mining fauna infesting Potamogeton lucens, P. perfoliatus, Elodea canadensis and Myriophyllum spicatum. Of 22 borers identified, the dominant group in P. perfoliatus and P. lucens was Chironomidae; the dominant borers of E. canadensis and M. spicatum were the larvae of Lepidoptera and Glyptotendipes gripekoveni. Clear differences were observed in the mining rate between the individual parts of plants. In P. lucens and P. perfoliatus the highest infestation rate was recorded in the stems, then in the leaf veins, with the leaf blades showing the lowest infestation rate. In E. canadensis and M. spicatum mining was restricted to the stems with lower infestation rates in the pondweed stems. Infestation rates in plants of the same species growing in different depths differed. The fauna lived in mines differing in shape and number of openings. The loss of stem tissue due to the mining activity for P. perfoliatus was 13.2%, in P. lucens 6.5%, in E. canadensis 1.2% and in M. spicatum 0.3% of wet weight. (Auen-Wisconsin).
W77-06688

LAKE RESTORATION BY BOTTOM WATER SIPHONING (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland). Marine Research Lab.
For primary bibliographic entry see Field 5G.
W77-06689

THE INFLUENCE OF ACROLEIN AND HYDROCRYLE ON THE DEVELOPMENT DYNAMICS OF AQUATIC BACTERIA,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
A. Starzecka.
Acta Hydrobiologica, Vol. 17, No. 4, p. 391-403, 1975. 4 fig., 3 tab., 6 ref.

Descriptors: *Toxicity, *Aquatic bacteria, Bacteria, Lethal limit, Cooling water, Cooling towers, Streams, Thermal powerplants, Pseudomonas, Pipe flow, Fouling.
Identifiers: *Acrolein, *Hydrocryle, Trzebunka Stream(Poland), Achromobacter-Alcaligenes.

Acrolein and hydrocryle were used to control the excessive, objectionable development of bacteria in the condenser pipes at a power station. This study analyzes the influence of these toxic substances on the development of bacteria occurring in the clean water of the Trzebunka Stream and the polluted water flowing through the thermal power station condensers. It was concluded that: (1) Pure strains of bacteria were less resistant to the action of acrolein than mixed populations; (2) nutritive enrichment of the water decreased the influence of acrolein and hydrocryle; (3) bacteria from clean water was more sensitive to the toxic substances than populations from polluted waters; (4) hydrocryle was more toxic to bacteria than acrolein; (5) acrolein underwent a biological as well as chemical degradation in an aquatic environment; (6) doses of 1000 mg/l of acrolein and 580 mg/l of hydrocryle caused a lethal effect on mixed populations of bacteria in the condenser water; (7) non-lethal concentrations introduced a temporary inhibition of the bacterial growth; (8) non-lethal concentrations should be applied every 24 hours in order to decrease the number of bacteria in the cooling system water; and (9) the use of too low concentrations was angerous since it could induce the formation of resistant populations. (Luedtke-Wisconsin)
W77-06690

THE SHARE OF ALGAE WITH DIFFERENT DIMENSIONS IN THE PLANKTON OF TWO LAKES OF DIFFERENT TROPHIC CHARACTER IN THE ANNUAL CYCLE,
Instytut Przyrodniczych Podstaw, Lubin (Poland). Produkeji Roslinnej AR.
W. Wojciechowska.
Acta Hydrobiologica, Vol. 18, No. 2, p. 127-138, 1976. 3 fig., 1 tab., 13 ref.

Descriptors: *Lakes, *Phytoplankton, *Biomass, Trophic level, Algae, Nannoplankton, Seasonal.
Identifiers: *Lake Piaseczno(Poland), *Lake Bikcze(Poland).

The seasonal variations of the numbers and biomass of the phytoplankton in two lakes, a eutrophic, pond type lake and a deep, alpha-mesotrophic lake, are presented along with the changes of the share of different fractions of phytoplankton in total numbers and biomass. Phytoplanktonic organisms were divided into 3 fractions according to linear size: less than 20 micrometers, 20-60 micrometers and greater than 60 micrometers. It was found that the microplankton decided the total biomass even if the nannoplankton appeared in superior numbers. In Lake Piaseczno the smallest algal fraction had a significant share in the total biomass only during spring. The biomass of algae less than 20 micrometers decreased during the summer and autumn which caused a predomination of the greater than 20 micrometer fractions. It was found that the range of changes in the total phytoplankton biomass of the lakes confirmed the estimation of their tropic type. In the rich pond-like Lake Bikcze the extreme annual values of biomass was 1:1.057 whereas similar values for the alpha-mesotrophic Lake Pieseczno were only 1:60. The significant quantity of nannoplankton in Lake Piaseczno showed that the lake was poor and almost oligotrophic. A much smaller share of nannoplankton was found in Lake Bikcze during the warm seasons. (Luedtke-Wisconsin)
W77-06692

PRESENTING TRENDS IN LAKE EUTROPHICATION,
CBA Engineering Ltd., Vancouver (British Columbia).
S. Hershman, and S. O. Russell.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers. Vol. 102, No. EE6, p. 1281-1285, 1976. 2 fig., 2 tab., 2 ref.

Descriptors: *Eutrophication, *Methodology, *Projections, Forecasting, Estimating, *Canada, Decision making, Water quality, Phosphorus, Nutrient removal, Lakes, Risks.
Identifiers: *Skaha Lake(British Columbia), Phosphorus loading.

A procedure developed to define probable trends in water quality in Skaha Lake, British Columbia, is presented. The method, based on the concepts of Bayesian decision theory, takes into account uncertainty, provides a way of combining information obtained from individual experts, and presents the results in a way that can be generally understood. It allows the vast amount of available quantitative and qualitative information to be condensed into a form that could be understood and used as a basis for action by decision makers. Skaha Lake has a surface area of 5000 acres, a mean depth of 85 ft, an average flushing time of 1.2 yr, and is becoming eutrophic. Because of the direct relationship between phosphorus loading and water quality in the lake, the procedure for predicting future water quality under alternative management schemes was relatively straightforward. It involved categorizing the water quality into seven discrete trophic states; establishing a relationship in the form of a probability bond between nutrient loading and water quality; and combining it with nutrient forecasts under various management alternatives to obtain estimates of probable future water quality states. Results are presented in a probability matrix assuming a skew normal distribution for the case where sewage treatment continues at the 1971 level and for an alternative where 80% of the phosphorus is removed. (Luedtke-Wisconsin)
W77-06693

ECOLOGICAL RELATIONS BETWEEN INVERTEBRATES AND SUBMERGED MACROPHYTES IN THE LAKE LITTORAL,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
G. J. Soszka.
Ekologia Polska, Vol. 23, No. 3, p. 393-415, 1975. 7 fig., 4 tab, 50 ref.

Descriptors: *Invertebrates, *Littoral, *Lakes, Oligochaetes, Submerged plants, Pondweeds, Aquatic plants, Plant growth, Food habits, Reproduction, Aquatic animals.
Identifiers: *Macrophytes, *Mikolajskie Lake(Poland), Potamogeton perfoliatus, Potamogeton lucens, Myriophyllum spicatum, Elodea canadensis, Relationships.

The ecological relations between the invertebrates and submerged macrophytes, Potamogeton perfoliatus, P. Lucens, Myriophyllum spicatum, and Elodea canadensis, in the littoral zone of Mikolajskie Lake are studied, with emphasis on feeding of invertebrates, use of macrophytes by fauna during reproduction and development, and influence of invertebrates on submerged macrophytes. Results indicated that the invertebrates most strongly related to the plants were the Lepidoptera larvae, Limnephilus sp., Phryganea grandis, and to a lesser extent the Chironomidae larvae and Radix ovata. The Oligochaeta which are very abundant on macrophytes were weakly associated with plants. Macrophytes were used by invertebrates more as a life substrate than as food. The relations of the majority of invertebrates with macrophytes were not permanent and the macrophytes could be substituted by another substrate. The life activity of invertebrates caused varying damage to the macrophytes, with pondweeds destroyed to a much greater extent than E. canadensis or Mspicatum. P. perfoliatus and P. lucens were used more by fauna than E. canadensis and M. spicatrum. These interrelations revealed a dynamic character and changed over the year. (Luedtke-Wisconsin)
W77-06694

A STUDY ON THE ROLE OF HERBIVOROUS ZOOPLANKTON COMMUNITY AS PRIMARY CONSUMERS OF PHYTOPLANKTON IN DUTCH LAKES,
R. D. Gulati.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1202-1210, 1975. 2 fig., 3 tab., 27 ref.

Descriptors: *Lakes, *Zooplankton, *Phytoplankton, *Food chains, Trophic level, Food pyramids, Digestion, Primary production, Respiration, Animal physiology, Biomass, Standing crops, Foreign research, Foreign countries, Water chemistry.
Identifiers: *Lake Vechten(Netherlands), *Lake Tjeukemeer(Netherlands).

As a counterpoint to most field studies of zooplankton productivity that are oriented toward population dynamics, research is offered on the trophic relationship of zooplankton with algae, bacteria and detritus in aquatic environments. The study is the first attempt to compare the ingestion, assimilation, respiration and production rates of the herbivorous zooplankton in Lake Vechten and Lake Tjeukemeer during 1972-73. Lake Vechten, a 4.7 hectare, isolated deep dug-out pit that exhibits hypolimnetic oxygen depletion and nutrient accumulation, has nutrient-poor epilimnetic waters, high transparency, and a great diversity of phytoplankton species despite relatively moderate production and biomass. Lake Tjeukemeer is a 21 sq km shallow lake connected to the Friesian water system, with water rich in dissolved humic compounds and low transparency. Tjeukemeer is nutrient rich and the sharp seasonal oscillations in the water chemistry are governed by the hydrological regime in the area. Sampling on both lakes was done at fortnightly intervals. Ingestion and assimilation rate experiments were made with lake phytoplankton as carbon-14 tracer food. Standing crop biomass and total zooplankton were estimated, and the biomass of filter feeders was obtained indirectly from the zooplankton data. Zooplankton oxygen consumption rates were measured by potentiometer. All other parameters--physicochemical conditions of the water, chlorophyll, primary production, etc.--were measured in a laboratory as part of ongoing studies of two lakes. (Harris-Wisconsin)
W77-06695

SOME EFFECTS ON INTEGRAL PHOTOSYNTHESIS OF ARTIFICIAL CIRCULATION OF PHYTOPLANKTON THROUGH LIGHT GRADIENTS,
D. H. Jewson, and R. B. Wood.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1037-1044, 1975. 5 fig., 16 ref.

Descriptors: *Photosynthesis, *Laboratory tests, *Light penetration, Phytoplankton, Limnology, Foreign countries, Measurement.
Identifiers: Bottle tests(Photosynthesis), Spirulina platensis, Lough Neagh(Northern Ireland), Lake Aranguadi(Ethiopia).

Photosynthesis studies with light and dark bottles suspended at a single depth throughout exposure time often fail to duplicate conditions found in shallow lakes in windy area where complete water column mixing prevails for long periods. To assess the effect on integral photosynthesis of cases where the phytoplankton may be circulated through a strong light gradient by this mixing, preliminary experiments were carried out on Lough Neagh, Northern Ireland and on laboratory cultures of Spirulina platensis (Gom.) Geitl. isolated from Lake Aranguadi in Ethiopia. The former lake has a photosynthetic zone of 1-3 m and the latter's photosynthetic zone may fall as low as 0.15 m. Light measurements in the laboratory were made using an ISCO spectroradiometer and remote probe. Changes in oxygen level were determined by the Winkler method with the endpoint detected amperometrically. In the circulation experiments oxygen determinations, gross photosynthesis was obtained by adding to the oxygen increase in the circulator an amount of oxygen equivalent to that consumed in the dark bottles. Experiments in the laboratory, using S. platensis isolated from Lake Aranguadi, measured the effect of circulation, at speeds of 1 cm/sec and 4 cm/sec, on the photosynthetic rate. The obtained rates obtained were consistent with rates derived from stationary bottles. (Harris-Wisconsin)
W77-06696

THE USE OF REMOTE SENSING TO DETECT HOW WIND INFLUENCES PLANKTONIC BLUE-GREEN ALGAL DISTRIBUTION,
A. J. Horne, and R. C. Wrigley.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 784-971, 1975. 4 fig., 13 ref.

Descriptors: *Cyanophyta, *Remote sensing, *Photometry, *Winds, Algae, Spatial distribution, Anabaena, Aerial photography, California, Pollutant identification.
Identifiers: *Clear Lake(Calif), *Multispectral scanning, Aphanizomenon.

Biological and physical aspects of cyanophyta movements in relaton to prevailing winds over a summer in Clear Lake, California were measured in aerial pictures taken with a multispectral camera with four 100 m F. L. lenses and Kodak Type 2424 film. Images were recorded simultaneously in the near-infrared (730-900)nm), red (590-690 nm), green (470-590 nm) and blue (400-470 nm) bands. Winds were measured using a recording anemometer standing some 50 m above the lake surface on a peninsula adjacent to all three arms of the lake. Water samples for phytoplankton and turbidity measurement were collected by simple dip in the upper few centimeters of lake water. Chlorophyll-a was measured using 90% methanol extraction. Results of the study showed that the role of the wind dominates in the production of blue-green algal concentration patterns and together with high light intensities, provides a possible explanation for the seasonally bimodal blooms of Aphanizomenon and Anabaena. Very light nocturnal winds permit surface films which are killed by high sunlight in summer. In the lower light of autumn these films can be windblownk to areas of higher photic zone nutrient concentrations. (Harris-Wisconsin)
W77-06697

REGULATING ACTIVITIES WITH CATASTROPHIC ENVIRONMENTAL EFFECTS,
California Univ., Riverside. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-06703

THE HISTORIC AND PRESENT RELATIONSHIPS BETWEEN PHYTOPLANKTON, LIMITING NUTRIENTS, AND SEDIMENT-WATER GEOCHEMICAL PROCESSES IN SELECTED MAINE LAKES,
Maine Univ. at Orono. Land and Water Resources Inst.
R. B. Davis, and S. A. Norton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 024, Price codes: A08 in paper copy, A01 in microfiche. Completion Report, December 1976. 164 p. OWRT A-026-ME(3).

Descriptors: Diatoms, Diffusion, Interstices, Lakes, *Maine, Paleolimnology, Pollen, Sedimentation rates, *Sediment-water interfaces, Watersheds(Basins), Organic matter, *Trophic level, Systematics, Nutrients, *Nutrient requirements, History.
Identifiers: Chronology, Cultural disturbance, Environmental tolerances, Historical records, Sediment chemistry, Sediment cores, Vertical variations.

A paleolimnological study was undertaken for a group of Maine lakes in an attempt to demonstrate the historical influence of man on lake trophic conditions. Pollen analyses, in combination with historical records for each lake watershed, were used to determine chronology and sedimentation rates within the sediment cores. Diatom analyses revealed that major shifts in the relative abundance of specific diatom toxa have occurred in several lakes over the past 200 years. However, detailed interpretation of these shifts is frustrated by the lack of knowledge of present-day environmental tolerances of the toxa. Vertical variations in sediment chemistry also correlate with the onset of European man's activity within the watershed, but behavior of individual elements seems to be unique for each lake. K2O was the most consistent indicator of cultural disturbance; CaO was the least. Also, organic content of precultural sediments was generally lower than that of cultural sediments. Interstitial water chemistry profiles indicated that sediment-water interfaces were enriched in Fe, Mn, P, and Si because of upward diffusion of the dissolved species. General levels of K, Na, Ca, Mg, and Si in the interstitial waters were not directly related to bulk chemistry of the solid sediment. (Hutchins-Maine)
W77-06741

AMMONIA CONCENTRATION IN RELATION TO AMMONIA TOXICITY DURING A RAINBOW TROUT REARING EXPERIMENT IN A CLOSED FRESHWATER-SEAWATER SYSTEM,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
B. L. Hampson.
Aquaculture, Vol 9, p 61-70, 1976. 1 fig, 2 tab, 13 ref.

Descriptors: *Salmonids, *Rainbow trout, *Nitrogen compounds, *Ammonia, *Fish hatcheries, Fish physiology, Laboratory tests, Water chemistry, Toxicity, Hydrogen ion concentration, Aquiculture, Monitoring.
Identifiers: Un-ionized ammonia, *Ammonia toxicity.

The daily monitoring of total ammonia, un-ionized ammonia, pH and temperature during a 10-month rainbow trout rearing experiment in fresh and sea water, in which fingerlings were brought up to market size in a closed circuit system, is described. The results show that high feeding, high stock intensity conditions which favour rapid growth and economic rearing, are also conditions which produce extremely low concentrations of un-ionized ammonia, and hence complete safety in respect of the ammonia toxicity hazard. Un-ionized ammonia concentration was consistently between 0.0001 and 0.1 ppm nitrogen, i.e. between 1/3000 and 1/3 of the toxic threshold. After the establishment of populations of ammonia bacteria in the sand filters, un-ionized ammonia concentrations were normally below 0.002 ppm nitrogen in fresh water and 0.0005 ppm in sea water, i.e. less than 1/150 and 1/500 of the toxic threshold. (Katz)
W77-06743

FISH DISEASES AND PARASITES IN RELATION TO THE ENVIRONMENT,
Fish Farming Experimental Station, Stuttgart, Ark.
G. L. Hoffman.
Fish Pathology, Vol 10, No 2, p 123-126, 1976. 1 tab, 23 ref.

Descriptors: *Fish diseases, *Environmental effects, *Pathogenic fungi, *Water temperature, *Oxygen requirements, *Fish physiology, Fish parasites, Nutrition requirements, Water chemistry, Eutrophication, Epizootiology, Pathogenic bacteria viruses, Protozoa.
Identifiers: Environmental conditions, Neoplasias, Helminths.

Although some diseases are not affected by subtle environmental changes, others are. Factors which may influence infection or the course of disease are: temperature, gaseous supersaturation, oxygen deficiency, mechanical and physiological trauma of the fish, malappropriate water chemistry, pollution, eutrophication, media for spore retention, and presence of intermediate hosts. Avitaminoses and neoplasias are often related to environmental changes. (Katz)
W77-06744

CHANGES IN THE BLOOD CHEMISTRY OF COHO SALMON EXPOSED TO MALACHITE GREEN,
Fish and Wildlife Service, La Crosse, Wis. Fish Control Lab.
T. D. Bills, and J. B. Hunn.
The Progressive Fish-Culturist, Vol. 38, No. 4, p. 214-216, 1976.

Descriptors: *Salmon, *Fish physiology, *Fungicides, Salmonids, Chemical analysis, Bioassay, Fish parasites, Fish hatcheries, Toxicity, Biochemistry.
Identifiers: Blood samples, *Malachite green, Starvation, *Hematology, *Histology, Leukopenia, *Coho salmon.

Two groups of Coho salmon, one group fed and one starved, were exposed to a sublethal concentration (0.1 mg/l) of malachite green for up to 28 days to determine the fungicide's effect on blood chemistry, hematology and histopathology. The study found no discernible differences except an increase in plasma potassium and fewer macrophages in the spleen and kidney of the treated fish. (Katz)
W77-06746

FIELD TESTS OF ISOBORNYL THIOCYANOACETATE (THANITE) FOR LIVE COLLECTION OF FISHES,
Fish and Wildlife Service, Warm Springs, Ga. Southeastern Fish Control Lab.
R. M. Burress, P. A. Gilderhus, and K. B. Cumming.
Investigations in Fish Control, United States Department of the Interior, Washington, D.C. No. 71, 1976. 13 p, 11 tab, 18 ref.

Descriptors: *Sampling, Fish, *Catfish, *Carp, *Insecticides, *Fish behavior, Fish harvest, *Mortality, *Bass, *Ponds, Freshwater fish, Methodology, Pest control, Chemicals, Fish management, Fish control agents, Agriculture.
Identifiers: *Isobornyl thiocyanoacetate, *Thanite, Live-collecting(Fish), Sedatives, *Lepomis ssp.

Eight ponds containing a total of 28 species of fish were treated with isobornyl thiocyanoacetate (Thanite) to test its efficacy for the live collection of fish. Twenty-six species were collected alive after 1 to 4 microliters per liter applications of Thanite. Most scalefishes except carp (Cyprinus carpio) were relatively easy to collect, and catfishes (Ictaluridae) were generally the most resistant to effects of the chemical. With the exception of northern pike (Esox lucius), most fish recovered quickly after being placed in fresh water. Most fish collected within 1.5 h after treatment survived, but survival rates decreased with time of exposure. The concentrations effective for collection of live fish did not routinely eliminate all fish; small numbers of at least eight species of fish survived treatments of 1.5 microliters per liter or more. The high percentages of fish (of most species) collected alive demonstrated that Thanite is effective for the intended purpose. (Katz)
W77-06747

TOXICITY OF ROTENONE TO FISH IN STANDARDIZED LABORATORY TESTS,
Fish and Wildlife Service, La Crosse, Wis. Fish Control Lab.
L. L. Marking, and T. D. Bills.
Investigations in Fish Control, United States Department of the Interior, Washington, D.C. No. 72, 1976. 11 p, 11 tab, 1 fig, 26 ref.

Descriptors: *Toxicants, *Toxicity, *Fish eggs, *Atlantic salmon, *Bioassay, *Mortality, *Rotenone, *Pesticides, *Laboratory tests, *Rainbow trout, *Resistance, Water temperature, Hydrogen ion concentration, Fish control agents, Salmonids, Pesticide residues, Persistence, Channel catfish.
Identifiers: *Noxfish, *Carassius auratus.

Noxfish, which contains 5% rotenone, was toxic to a variety of freshwater fish at concentrations ranging from 21.5 to 497 micrograms per liter in 96-h laboratory exposures. Goldfish (Carassius auratus) and black bullheads (Ictalurus melas) were the most resistant species and the Atlantic salmon (Salmo salar) was the most sensitive. Toxicity was influenced little by temperature of 7 to 22 C, by water hardness of 10 to 300 mg/l, or by pH's of 6.5 to 9.5. In exposures of rainbow trout (Salmo gairdneri), newly fertilized eggs were much more resistant than fingerlings. Noxfish detoxified in water solutions: the half-life of biological activity was 22 days at 12 C and 13 days at 17 C. Potadsium permanganate was an excellent detoxifier; chlorine was less efficient. Noxfish was consistently more toxic in static tests than in flow-through tests. (Katz)
W77-06748

THE INFLUENCE OF EFFLUENT HEATED WATERS ON THE BOTTOM FAUNA OF LAKES IN THE VICINITY OF KONIN I. QUANTITATIVE RELATIONS AND QUALITATIVE COMPOSITION OF THE BOTTOM FAUNA OF THE KONIN LAKES COMPLEX, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
L. Leszczynski.
In: Roczniki Nauk Rolniczych, Seria H, Rybactwa Vol 97(3), p. 7-27, 1976. 5 tab, 6 figs, 12 ref.

Descriptors: *Water pollution effects, *Thermal pollution, Water temperature, Diptera, *Benthic fauna, Littoral, On-site data collections, Bottom sampling, *Biological communities, Aquatic organisms, Larvae, *Biomass, Lakes.
Identifiers: Morphometry, *Poland(Konin area lakes).

Investigations were conducted on the bottom fauna of the littoral and mid-lake area during the period 1965-1969 in a complex of lakes with an artificially created horizontal thermic gradient. Heating of the water caused a drop in numbers and of the biomass, a change in the qualitative composition of the bottom fauna, and especially development of preying forms. Average length of Chironomidae was also lower. (See also W77-06750 and W77-06751) (Katz)
W77-06749

THE INFLUENCE OF EFFLUENT HEATED WATERS ON THE BOTTOM FAUNA OF LAKES IN THE VICINITY OF KONIN II. CHANGES IN TIME OF BOTTOM FAUNA, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
L. Leszczynski.
In: Roczniki Nauk Rolniczych, Seria H, Rybactwo Vol 97(3), p. 29-47, 1976. 3 tab, 8 fig, 2 ref.

Descriptors: *Water pollution effects, *Thermal pollution, *Water temperature, *Benthic fauna, On-site data collections, *Biological communities, Seasonal, Productivity, Diptera, *Oligochaeta, Littoral, Lakes, Diptera.
Identifiers: Seasonal fluctuations, Morphometry, Poland(Konin area lakes).

During the investigations on bottom fauna conducted during the period 1965-1969 on a complex of lakes with an artificially created horizontal thermal gradient, no influence was noted of heating the environment on the seasonal changeability scheme of the fauna. This influence did occur, however, in the transition of seasonal phenomena in time. Changes in the bottom fauna during successive years of the study showed a lack of influence of heating the environment on the range of relative fluctuations in the level of average numbers, but was evident in fluctuations of the size of individuals, qualitative composition, and rate of domination resulting from changed thermal conditions. (See also W77-06749 and W77-06751) (Katz)
W77-06750

THE INFLUENCE OF EFFLUENT HEATED WATERS ON THE BOTTOM FAUNA OF LAKES IN THE VICINITY OF KONIN III. AN EFFORT TO EXPLAIN THE CAUSES AND RESULTS OF CHANGES IN THE BOTTOM FAUNA OF LAKES AS INFLUENCED BY THE INFLOW OF HEATED WATERS, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
L. Leszczynski.
In: Roczniki Nauk Rolniczych, Seria H, Rybactwo Vol 97(3), p. 49-68, 1976. 63 ref.

Descriptors: *Water pollution effects, *Thermal pollution, Water temperature, *Benthic fauna, Biological communities, Epilimnion, Seasonal, Mixing, *Diptera, *Oligochaeta, Lakes.
Identifiers: Annual fluctuations, Chaoborus, Accelerated development, Mobility, Tanypodinae, Ceratopogonidae, Polycentiopinae, Morphometry, *Poland(Konin area lakes).

Results obtained on an investigation of bottom fauna conducted on lakes with an artificially created horizontal thermic gradient were compared with data contained in literature. The obtained indices for changes resulting in the water environment as a result of increasing the temperature were verified on the basis of literature, and consideration also given to the causes (primary and secondary) and effects of changes in the bottom fauna. (See also W77-06749 and W77-06750) (Katz)
W77-06751

PRIMARY AND SECONDARY PRODUCTION OF PLANKTON IN HEATED LAKES, (IN POLISH),
Polish Academy of Sciences, Warsaw. Inst. of Ecology; and Polish Academy of Sciences, Warsaw, Dept. of Hydrobiology.
A. Hillbricht-Ilkowska, B. Zdanowski, J. Ejsmont-Karabinowa, A. Karabin, and T. Weglenska.
In: Roczniki Nauk Rolniczych, Seria H, Rybactwo Vol 97(3), p. 69-88, 1976. 6 tab, 2 fig, 28 ref.

Descriptors: *Primary productivity, *Secondary productivity, Phytoplankton, *Zooplankton, *Water pollution effects, *Thermal pollution, Water temperature, Biological communities, Crustaceans, Eutrophication, Flow, On-site data collection, Lakes.
Identifiers: Summer stagnation, Water transparency, Predatory zooplankton, Non-predatory zooplankton, Ecological output index, Morphometry, Poland.

Measurements of phyto- and zooplankton production were carried out during the peak of summer stagnation in 1973 on three lakes heated by a thermal power plant. Results were compared with those obtained in 1966. Raising the water temperature around 4C resulted in an increase of primary production, high growth of numbers, biomass and production of non-preying zooplankton, as also in an increase in the effectiveness of the non-preying link. Increasing the time of water flushing rate in the basin (to around 3.5 days) led to a drop in primary production, and to an increase in non-preying zooplankton production and growth of ecological effectiveness in the non-preying link. As concerns the preying link, a drop in production and ecological effectiveness was noted. (Katz)
W77-06752

THE INFLUENCE OF HEATED EFFLUENT WATERS ON THE WATER CHEMISM OF KONIN LAKES, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
A. Korycka, and B. Zdanowski.
In: Roczniki Nauk Rolniczych, Seria H, Rybactwo Vol 97(3), p. 89-107, 1976. 5 tab, 4 fig, 31 ref.

Descriptors: *Water pollution effects, *Thermal pollution, *Water temperature, *Electric power production, Water chemistry, Chemical analysis, *Electrolytes, *Conductivity, Phosphates, Nitrogen, Flow augmentation, Mine drainage, Industrial wastes, Lakes.
Identifiers: Mineral salts, Morphometry, *Poland(Konin area lakes).

the study deals with the evaluation of changes in the water chemism of lakes, heated by effluent heated waters from an electric power plant, and differentiated from a morphometric and trophic point of view. The studies were conducted over the period 1965-1974. A constant increase in the content of some mineral salts in the lakes was noted, as also in electrolytic conductivity. These changes were linked to the industrialization of the drainage basin of the lakes under study. (Katz)
W77-06753

OCCURRENCE AND GROWTH OF DREISSENA POLYMORPHA PALL. IN LAKES INCLUDED IN A COOLING SYSTEM, (IN POLISH),
Polish Academy of Sciences, Warsaw. Inst. of Ecology; and Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
A. Stanczykowska.
In: Roczniki Nauk Rolniczych, Seria H, Rybactwo Vol 97(3), p. 109-122, 1976. 2 tab, 9 fig, 15 ref.

Descriptors: *Mollusks, *Larvae, *Growth rates, Zooplankton, Destratification, Water pollution effects, *Thermal pollution, *Water temperature, On-site data collections, Thermal stratification, Lakes.
Identifiers: *Age classes, *Life span, *Oxygen stratification, Shell size, Shell weights, *Poland(Konin area lakes).

Similar numbers of Dreissena polymorpha were noted in the five lakes of the Konin lakes complex, characterized by various water temperatures. However, the period of occurrence of larvae in the plankton is longer, and growth of adult individuals more rapid, in heated than in cool lakes. Snails from the warmer lakes grow more rapidly. Size and weight of Dreissena from the Konin lakes complex were less than those in the lakes of the Mazurian lakes complex. Life span in the most highly heated canal was shorter by one year than those in the other lakes of the Konin lakes complex. (Katz)
W77-06754

LONG-TERM CHANGES OF THE PELAGIC PRIMARY PRODUCTION IN HEATED LAKES, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
B. Zdanowski.
In: Roczniki Nauk Rolniczych, Seria H, Rybactwu Vol 97(3), p 123-139, 1976. 3 tab, 3 fig, 38 ref.

Descriptors: *Primary production, *Phytoplankton, Water pollution effects, *Thermal pollution, *Water temperature, *Electric power production, *Eutrophication, Mesotrophy, Flow augmentation, Cycling nutrients, On-site data collections, Lakes, Measurement.
Identifiers: *Poland.

Measurements of the primary production of phytoplankton were carried out during the period 1967-1973, in the pelagic waters of two lakes heated by thermal effluents discharged by an electric power plant. Heating of waters resulted in an increased primary production (by about 50%), changes of its vertical distribution, and changes in the share of respiration in gross primary production. Decrease of the detention time in the lake (exchange of the total volume of water in lakes 3.5 days) restricted the intensity of production. (Katz)
W77-06755

THE INFLUENCE OF HEATED EFFLUENT WATERS ON THE THERMAL-OXYGEN RELATIONS AND WATER TRANSPARENCY IN THE KONIN LAKES COMPLEX, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Hydrobiologii.
B. Zdanowski, and A. Korycka.
In: Roczniki Nauk Rolniczych, Seria H, Rybactwu Vol 97(3), p 141-164, 1976. 2 tab, 12 fig, 21 ref.

Descriptors: *Water pollution effects, *Thermal pollution, *Water temperature, *Electric power production, *Cooling water, Epilimnion, Stratification, Thermal stratification, Oxygen, Seasonal, Primary productivity, Lakes.
Identifiers: Morphometry, Water transparency, Summer stagnation, Reverse stratification, Surface inflow, Cascade inflow, Oxygen stratification, *Poland(Konin area lakes).

Results of seasonal observations on thermal-oxygen relations and water transparency of five lakes heated by an electric power plant are given. Heating of three lakes (1965-1969) resulted in considerable thermal variability between them, which decreased following inclusion of the whole lake complex in the cooling system of the power plant (1970-1973). Apart from the influence of the absolute amounts of heated effluents and air temperature, morphometric factors were decisive for the temperature level of the lakes, such as their maximal and average depths, and their surface. The influence of high temperature in shallow lakes was noted throughout the volume of the water body, while in deep ones only the epilimnion layers were affected. (Katz)
W77-06756

ADSORPTION OF POLYCHLORINATED BIPHENYL (AROCLOR 1254) ON SHRIMP,
Louisiana State Univ., Baton Rouge. Dept. of Food Science.
M. A. Khan, R. M. Rao, and A. F. Novak.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 4, p 503-504, 1976. 1 tab, 2 ref.

Descriptors: *Crustaceans, *Shrimp, *Shellfish, *Path of pollutants, *Adsorption, *Aroclor, *Polychlorinated biphenyls, Food chains, Pesticides, Chlorinated hydrocarbon pesticides.

Peeled, deheaded and deveined shrimp and unpeeled shrimp were dipcoated in 100 ppm solution of Aroclor 1254 for one minute. Values of adsorbed PCB averaged 33.2 and 26.3 micrograms per 100 grams solids for unpeeled and peeled shrimp, respectively, showing a significant statistical difference. This indicates a possible site of PCB accumulation, especially in shrimp and possibly in other marine animals with outer shells. It also suggests a careful utilization of shrimp waste as feed for fish or other animals. (Katz)
W77-06758

INDUCTION OF HEPATIC MICROSOMAL ENZYMES BY AROCLOR 1254 IN ICTALURUS PUNCTATUS (CHANNEL CATFISH),
Texas A and M Univ., College Station. Dept. of Veterinary Physiology and Pharmacology.
D. W. Hill, E. Hejtmancik, and B. J. Camp.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 4, p 495-502, 1976. 2 tab, 16 ref.

Descriptors: *Respiration, *Bioassay, *Absorption, *Aroclor, *Polychlorinated biphenyls, *Channel catfish, *Cytological studies, *Metabolism, *Enzymes, *Pesticides, *Fish physiology, Chlorinated hydrocarbon pesticides, Freshwater fish, Water pollution effects.
Identifiers: *Mitochondria, *Sublethal effects.

Aroclor 1254, a polychlorinated biphenyl, concentrates in the liver and brain of channel catfish, with signs of liver disfunction. After exposure to 2 ppm Aroclor 1254 for 24 hours and 48 hours, examination of test fish showed maximum concentration of PCBs was obtained in all tissues after 12 hours. The level of PCB was maintained for 480 hours with no apparent change in tissue distribution. The effect of Aroclor 1254 on hepatic microsomal enzyme activity and mitochondrial respiration was tested after exposure of test fish to 1 ppm Aroclor 1254 for 96 hours. Both aminopyrine N-demethylase and aniline hydroxylase activities were significantly increased over the control fish by 68.4% and 47.5% respectively. No inhibition of mitochondrial respiration was observed. It must be concluded that Aroclor 1254 at moderate concentrations does not affect electron transport or oxidative phosphorylation in liver mitochondria and therefore, does not interfere with the aerobic synthesis of ATP. (Katz)
W77-06759

UOKANT U. OF I. URBANA-CHAMP. ...

NOTES ON THE NESTING SUCCESS AND FECUNDITY OF THE ANEMONEFISH AMPHIPRION CLARKII AT MIYAKE-JIMA, JAPAN,
Tatsuo Tanaka Memorial Biological Station, Tokyo (Japan).
L. J. Bell.
Japanese Journal of Ichthyology, Vol. 22, No. 4, p 207-211, March 1976. 1 fig, 1 tab, 8 ref.

Descriptors: *Reproduction, Biological properties, *Fecundity, Spawning, Incubation, Hatching, Fish, Asia, Water pollution effects, Islands.
Identifiers: *Anemonefish, *Japan(Miyake-jima).

At Miyake-jima, Amphiprion clarkii spawns from May to September with a nesting frequency of 6-8 times/year. The incubation period varied from 6 1/2 days to 12 1/2 days. In the seven 6 1/2 day examples, temperatures ranged from 26.5-27.5C. The 12 1/2 day period was in the midst of a long period of cold water which varied from 19-23C for the first ten days of incubation, then rose abruptly to 26C, after which the eggs quickly developed and hatched. Egg counts resulted in an estimated fecundity of approximately 1,100-2,500 eggs per spawning. 94.8% of nests under observation were successful. (Chilton-ORNL)
W77-06763

THE MEASUREMENT OF TEMPERATURE TOLERANCE: VERIFICATION OF AN INDEX,
Maryland Univ., Baltimore County, Baltimore. Dept. of Biological Sciences.
B. P. Bradley.
Limnology and Oceanography, Vol. 21, No. 4, July 1976, p 596-599, 2 tab, 7 ref.

Descriptors: *Environmental effects, *Temperature, Resistance, Measurement, Forecasting, Copepods, *Pollutant identification, *Bioassay, *Bioindicators, Water pollution effects.
Identifiers: Shock-recovery assay, Eurytemora affinis.

A shock-recovery assay for temperature tolerance is demonstrated to predict survival of Eurytemora affinis at high temperatures. It is possible to modify the assay to allow comparisons between widely divergent treatment groups. Time to succumb (TS) and time to recover (TR) were observed over a 30-min period at a temperature of 34.5C (about 15C above the temperature at which the animals were raised and about 5C higher than any temperature normally encountered. The index of temperature tolerance was 30 plus TS minus TR, since time to succumb was positively related and time to recover was negatively related to temperature tolerance. The repeatability of the index was measured by testing animals and then retesting after a 1-h period at room temperature. The correlation between index values on the same animal was a measure of the reliability of the index. (Chilton-ORNL)
W77-06764

ENVIRONMENTAL FACTORS AFFECTING SURVIVAL AND GROWTH OF VIBRIO PARAHAEMOLYTICUS. A REVIEW,
Georgia Univ., Experiment. Div. of Food Science.
L. R. Beuchat.
Journal of Milk Food Technology, Vol 38, No 8, August 1975, p 476-480, 48 ref.

Descriptors: *Environmental effects, *Mortality, *Animal growth, Temperature, Salinity, Hydrogen ion concentration, Dehydration, Drying, Resistance, Water pollution effects.
Identifiers: *Vibrio parahaemolyticus.

The response of V. parahaemolyticus was found to be dependent upon interactions between chemical and physical forces. The organism is sensitive to both heat and cold, generally displaying more resistance to freezing than chilling. Its resistance to potentially lethal extremes in temperature is greatly affected by the chemical makeup of the medium in which the organism is treated. It is sensitive to desiccation and grows best in a medium containing about 3% sodium chloride. It prefers an alkaline pH for growth, but is most resistant to heat at pH 7.0. (Chilton-ORNL)
W77-06765

GROWTH AND MOVEMENT OF FISH IN THE VICINITY OF A THERMAL DISCHARGE,
Aquinas Coll., Grand Rapids, Mich.
R. S. Benda.
Indiana Academy of Science Procedings, Vol 83, 1974, p 185-191, 5 tab, 19 ref.

Descriptors: *Environmental effects, *Thermal pollution, Water pollution, Thermal stress, Powerplants, Discharge(Water), Fish, Movement, Growth rates, *Indiana, Rivers.

During the two year study, average temperature elevation ranged from less than 1F the first year to 3F the second year. During normal plant output (2 units operating) a temperature change of 20F with a rate flow of 675 cubic feet/second was found. Maximum discharge temperatures reached over 100F and cooled gradually downstream. Data indicated that a majority of the centrachids remained in the same areas as originally found and moved away from rather than towards the heated water. No significant difference were observed in the growth rates of longear sunfish, green sunfish, bluegill, spotted bass, white crappie, and black crappie from separate areas. A comparison of the growth rates of these species with the same species in other areas in the midwest showed tht the White River specimens fit within the range of established growth rates for the region. (Chilton-ORNL)
W77-06766

TEMPERATURE RELATIONS OF PUGET SOUND THAIDS IN REFERENCE TO THEIR INTERTIDAL DISTRIBUTION,
Western Washington State Coll., Bellingham. Dept. of Biology.
M. D. Bertness, and D. E. Schneider.
The Veliger, Vol 19, No 1, July 1976, p 47-58, 9 fig, 2 tab, 33 ref.

Descriptors: *Environmental effects, *Distribution patterns, Temperature, *Snails, Intertidal areas, *Washington.
Identifiers: Thais lamellosa, Thais emarginata, Puget Sound(Wash).

Populations of Thais lamellosa and Th. emarginata were found to exhibit intraspecific shore-level size gradient patterns which place the smaller individuals at the top of each species vertical range. The Th. emarginata population was found higher in the intertidal zone than the Th. lamellosa population. The lethal thermal limits of the 2 thaids revealed inter- and intraspecific differences in their tolerance with the Th. emarginata showing the greatest thermal resistance. Within the Th. lamellosa size classes the small snails had the highest thermal limits. Humidity was an important factor in the thermal limits. Respiratory response to temperature increase indicated that the Th. emarginata and the small size class within each species displayed the most pronounced temperature independence. It was concluded that the adaptations of both species to thermal stress which were shown in this paper probably do not play a major role in directly creating the observed distributional patterns. (Chilton-ORNL)
W77-06767

SEASONAL CHANGES IN THE RESPIRATION OF PUMPKINSEED, LEPOMIS GIBBOSUS, CORRELATED WITH TEMPERATURE, DAY LENGTH, AND STAGE OF REPRODUCTIVE DEVELOPMENT,
Massachusetts Univ., Amherst. Dept. of Zoology.
J. R. Burns.
Physiological Zoology, Vol 48, No 2, April 1975, p 142-149, 2 tab, 3 fig, 21 ref.

Descriptors: *Environmental effects, *Seasonal, *Temperature, Photoperodism, Reproduction, *Respiration, Fish, Physiology.
Identifiers: Lepomis gibbosus, *Pumpkinseed.

Seasonal changes in the respiratory rate of pumpkinseed, Lepomis gibbosus, measured at environmental temperature and photoperiod indicated that temperature, day length and reproductive state affected respiration. Temperature coefficients were calculated for the changes in respiration of adjacent months. Higher coefficients were observed at lower temperatures. A zone of relative temperature independence of the respiratory rate was observed between 14.2 and 19.7 C, minimally. During the reproductive season, respiration remained high in contrast to the expected effect of long day lengths, suggesting an influence of reproductive hormones on the respiratory rate. An effect of photoperiod was seen only for a short interval following spawning. Seasonal acute respiration at 17.5C was measured and showed inverse relationship between acclimatization temperature and respiratory rate except at the onset of the reproductive season when the respiration increased sharply. (Chilton-ORNL)
W77-06768

EFFECT OF TWO REARING CONDITIONS ON GROWTH AND BODY COMPOSITION IN CARP (CYPRINUS CARPIO L), (INFLUENCE DE DEUX MODES D'ELEVAGE SUR LA CROISSANCE ET LA COMPOSITION CORPORELLE DE LA CARPE COMMUNE),
Toulouse-3 Univ. (France). Laboratoire d'Ecophysiologie des Animaux.
G. Bouche, J. P. Parent, and A. Serfaty.
Journal of Physiology, Paris, Vol 70, 1975, p 659-668, 3 tab, 1 fig, 12 ref.

Descriptors: *Environmental effects, *Metabolism, Temperature, Seasonal, *Carp, Carbohydrates, Nitrogen, Animal growth, Fish.
Identifiers: RNA, DNA.

Carp were studied in natural ponds to determine the influence of seasonal changes on nitrogen and carbohydrate metabolism. Carp receiving industrial dried foods showed no measureable growth while those in natural habitats did exhibit growth. It was concluded that rebonucleic activity and protein metabolism were correlated with seasonal variations in water temperatures. (Chilton-ORNL)
W77-06769

THE ALGAL FLORA IN THE THERMAL BATHS OF MONTEGROTTO TERME (PADUA). ITS DISTRIBUTION OVER ONE-YEAR PERIOD,
Padova Univ. (Italy). Istituto di Botanica e Fisiologia Vegetale.
C. Andreoli, and N. Rascio.
Int. Revue ges. Hydrobiol. Vol. 60, No. 6, 1975, p 857-871, 1 tab, 2 fig, 28 ref.

Descriptors: *Environmental effects, *Temperature, *Thermal springs, *Algae, Distribution, Seasonal.
Identifiers: *Italy(Padua).

The algal microflora of a thermal spring and of thermal baths were studied to ascertain the existence of a seasonal succession, on the base of number and frequency qualitatively evaluated, of algal species. The pH and temperature of waters and muds as well as algae samples were collected from seven stations monthly. The thermal spring temperatures ranged from 65-75 C. Temperatures of the mud cisterns varied (euthermal 40-60 C, hypothermal 13-18 C, hyalothermal 18-30 C, eurithermal 30-50 C, and acrothermal over 50 C). Three Cyanophyceae species were quantitatively

more abundant the 64 species of Diatomeae. Among the most frequent species were found Melosira sol, M. granulata, Cocconeis placentula, Nitzschia denticula, Denticula elegans and D. tenuis. Other species were found irregularly. (Chilton-ORNL)
W77-06770

HEAT RESISTANCE OF GAMETES OF MARINE INVERTEBRATES IN RELATION TO TEMPERATURE CONDITIONS UNDER WHICH THE SPECIES EXIST,
Akademiya Nauk SSSR, Leningrad. Lab. of Comparative Cytology.
V. B. Andronikov.
Marine Biology, Vol. 30, 1975, p 1-11, 1 tab, 6 fig, 51 ref.

Descriptors: *Environmental effects, *Distribution patterns, Reproduction, Resistance, Heat resistance, Spawning, *Invertebrates, Marine animals, Temperature.
Identifiers: *Poikilotherms, Gametes.

A review is presented of known data on the heat resistance of gametes of marine invertebrates as well as presenting some new data. The heat resistance of gametes is concluded to be correlated with the degree of thermophily of the species concerned. Eggs, zygotes, and early stages of embryonic development of poikilotherms were found to be most susceptible to heat injury. The upper thermal limit for the normal development of eggs and embryos was found to be only 1-3C higher than ambient temperatures. It was concluded that the heat resistance level of gametes and embryos represents an adjustment to temperatures at which spawning, fertilization and earlier embryonal development occur. Temperatures which exceed the upper or lower thermal limits throughout the year act as limiting factors for species distribution. (Chilton-ORNL)
W77-06771

EFFECT OF SALINITY ON SPORE GERMINATION OF TERRESTRIAL AND MARINE FUNGI,
Portsmouth Polytechnic (England) Dept. of Biological Sciences.
P. Byrne, and E. B. G. Jones.
Trans. Br. Mycol. Soc., Vol. 64, No. 3, 1975, p 497-503, 2 fig, 2 tab, 16 ref.

Descriptors: *Environmental effects, *Salinity, *Temperature, *Spores, Germination, *Fungi, Aquatic fungi, *Marine fungi, Freshwater, Terrestrial habitats, Water pollution effects.

Eleven terrestrial, freshwater, and marine fungi were investigated to determine the combined effect of salinity and temperature on spore germination. Spore germination in terrestrial fungi was found to decrease with increasing salinities with the effect being greater at low temperatures. The freshwater hyphomycete T. setigerum exhibited a broad tolerance to salinity at 20 and 25 C although increasing salinities caused a slight reduction. The marine fungi exhibited a wide tolerance to salinity at each temperature. It was suggested that the percentage spore germination decrease with increasing salinities for terrestrial fungi may explain why so few terrestrial fungi are found in the sea but that the effect of salinity on vegetative growth and reproduction, temperature requirements, availability of suitable substrates for colonization and spore dispersal may also be responsible factors. (Chilton-ORNL)
W77-06772

DISPERSAL AND DISPERSION OF POND SNAILS IN AN EXPERIMENTAL ENVIRONMENT VARYING TO THREE FACTORS, SINGLY AND IN COMBINATION,
Iowa Univ., Iowa City. Dept. of Zoology; and Iowa Univ., Iowa City. Lakeside Lab.
R. V. Bovbjerg.
Physiological Zoology, Vol. 48, No. 3, July 1975, p 203-215, 9 fig, 18 ref.

Descriptors: *Environmental effects, *Distribution patterns, Dispersion, *Snails, Thermal stress, Vegetation, Laboratory tests, Water pollution.
Identifiers: Carrion.

The positions of pond snails in a laboratory environment were mapped at the end of a 1 h observation period. Experiments varied in three environmental factors: presence and absence of vegetation, of animal carrion, and a thermal gradient. In the presence of single factors, the snails responded with a kinesis to an aggregation on vegetation, a negative thermotaxis from high temperature, and a strong chemotaxis toward animal carrion. In combination, vegetation tended slightly to mask the aggregations on carrion and in the cooler water. A strong synergism was evident in aggregation on carrion in cooler water. It was concluded that this simulation supported the original assumption that animals would respond to the various factors by locomotion either away from or toward the environmental factors and would form a pattern of dispersion related to that of environmental patchiness. (Chilton-ORNL)
W77-06773

HEALTH EFFECTS OF MULTIPURPOSE USE OF WATER,
Stockholm Univ. (Sweden). Wallenberg Lab.
E. Arrhenius.
Ambio, Vol. VI, No. 1, 1977, p. 59-62, 31 ref.

Descriptors: *Environmental effects, *water pollution effects, *Public health, Water pollution control, Mercury, Cadmium, Radioisotopes, Pollutants.
Identifiers: Eternal pollutants.

Different types of contaminants which constitute health risks and the countermeasures against various pollutants are discussed. The focus is on what is termed eternal pollutants which are defined as pollutants which have their toxic properties inherent in the atoms themselves and can thus not be chemically destroyed. It is concluded that the only way in which these pollutants can be temporarily eliminated is through their being shunted into non-biological isolation where they are not recirculated. It is also concluded that the ultimate goal for handling of eternal pollutants must be to avoid any release of those which have no positive biological effects and to substitute all processes involoving these chemicals with alternative processes in which less harmful substances can be used. (Hilton-ORNL)
W77-06775

LONG-TERM LEAD ACCUMULATION IN ABALONE (HALIOTIS SPP.) FED ON LEAD-TREATED BROWN ALGAE (EGREGIA LAEVIGATA),
Scripps Institution of Oceanography, La Jolla, Calif.
J. Stewart, and M. Schulz-Baldes.
Marine Biology, Vol. 36, 1976, p 19-24, 2 tab, 4 fig, 18 ref.

Descriptors: *Environmental effects, Absorption, *Lead, Algae, Foods, Path of pollutants, Water pollution, *Phaeophyta.
Identifiers: *Abalone, Haliotis rufescens, Egregia laevigata.

Forty juvenile Haliotis rufescens were individually tagged, weighed, and apportioned into three tanks. Twenty of the abalone after 3 months and twenty after 6 months were analyzed for lead content in their total soft parts. After 3 months and twenty after 6 months were analyzed for lead content in their total soft parts. After 3 months, abalone fed on algae grown in an environment to which no lead had been added contained slightly less lead than those fed algae grown in an environment to which 0.1 mg 1(-1) PbC12 had been added. Specimens fed on algae grown in an environment to which 1.0 mg 1(-1) PbC12 had been added showed distinctly greater accumulations of lead. After 6 months, abalone fed on algae pretreated with 1.0 mg Pb 1(-1) accumulated up to 21 micrograms Pb g(-1) wet weight. The lead was selectively concentrated in the digestive gland with only negligible amounts being found in the muscle tissue. (Chilton-ORNL)
W77-06776

EFFECTS OF VARIOUS ECOLOGICAL FACTORS ON RADIOSTRONTIUM UPTAKE IN TWO EURYHALINE TELEOSTS: MUGIL AURATUS RISSO AND PLEURONECTES PLATESSAL, (INFLUENCE DE DIVERS FACTEURS ECOLOGIQUES SUR L'ACCUMULATION DU RADIOSTRONTIUM CHEZ DEUX TELEOSTEENS EURYHALINS: MUGIL AURATUS RISSO ET PLEURONECTES PLATESSA L.),
CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses (France). Departement de Protection.
J. C. Amiard.
Report No. CEA-R-4706, 1975, 73 p, 27 tab, 18 fig, 130 ref.

Descriptors: *Environmental effects, *Absorption, *Radioisotopes, Strontium radioisotopes, *Teleosts, Fish, *Age, *Salinity, *Temperature, *Sediments, Foods, Calcium, Metabolism, Water pollution effects.

The effects of age, species, salinity, temperature, sediment, calcium overload, and food on the accumulation of Sr85 in two euryhaline Teleosts were investigated. The physico-chemical and biotic factors which tend to activate metabolism caused a slight increase in radiostrontium intake. According to the concentration kinetics of Sr85, bone type tissues, soft tissues, and digestive tract were distinguished. In toto measurements showed concentrations seldom more than one. (Chilton-ORNL)
W77-06777

REPRODUCTIVE CYCLE OF TROUT AND TENCH: EFFECT OF EXPERIMENTAL VARIATIONS OF THE TEMPERATURE, (ETUDE SUR LE CYCLE REPRODUCTEUR DO LA TRUITE ARC-EN-CIEL ET DE LA TANCHE: EFFET DE VARIATIONS EXPERIMENTALES DE LA TEMPERATURE),
Institut National de la Recherche Agronomique, Jouy-en-Josas (France). Laboratoire de Physiologie des Poissons.
B. Breton, B. Jalabert, A. Fostier, and R. Billard.
Journal of Physiology, Paris, Vol. 70, 1975, p 561-564, 1 tab, 5 ref.

Descriptors: *Environmental effects, *Laboratory tests, Physiology, *Reproduction, *Temperature, *Trout.
Identifiers: Hormones, Gonadotropin, *Tench.

Temperature elevations of 3 and 6 C (in conditions where ycthemeral and seasonal rythmicity were maintained) resulted in a significant increase in fertility with the increase in temperature. The first spawning period was found to be earlier and a rise in the number of spawnings was observed. This effect of temperature was said to act at the level of the hypothalamo-pituitary system. At the time of spermatogonia divisions a rise in the plasma gonadotropin levels was found. (Chilton-ORNL)
W77-06779

MEDIAN TOLERANCE LIMITS OF SOME CHEMICALS TO THE FRESH WATER FISH CYPRINUS-CARPIO,
Andhra Univ., Waltair (India). Coll. of Engineering.
T. S. Rao, M. S. Rao, and S. B. S. K. Prasad.

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Indian Journal of Environmental Health, Vol. 17, No. 2, 1975, p 140-146, 3 tab, 6 ref.

Descriptors: *Environmental effects, *Water pollution effects, Water pollution sources, Heavy metals, Insecticides, Pesticides, Phenols, *Toxicity, Fish, Freshwater, Bioassay, *Carp, Chlorinated hydrocarbon pesticides, Pollutant identification.

Bioassay experiments were conducted to determine the toxicity of insecticides, pesticides, phenolic compounds, and metals. Of the phenolic compounds, pyridine was more toxic than xylene. Among the chlorinated hydrocarbon insecticides, chlordane was more toxic than aldrin and dieldrin. Among the metal salts, silver nitrate was highly toxic and ammonium chloride was the least toxic. Lead nitrate was more toxic than zinc sulphate and copper sulphate. (Chilton-ORNL)
W77-06780

HEAVY METAL CONCENTRATIONS IN WATER, SEDIMENTS, AND FISH FROM MEDITERRANEAN COASTAL AREA, ISRAEL,
Israel Oceanographic and Limnological Research Ltd., Haifa. Haifa Labs.
I. Roth, and H. Hornung.
Environmental Science and Technology, Vol. 11, No. 3, March 1977, p 265-269, 8 tab, 44 ref.

Descriptors: *Water pollution effects, *Environmental effects, Toxicity, Absorption, Heavy metals, Water pollution sources, Water, Sediments, Fish, Coasts, Pollutant identification.
Identifiers: Israel, *Mediterranean Coast(Israel).

The concentration of the heavy metals investigated (Cadmium, Lead, Copper, Zinc, Mickel, Chromium) both in water and sediments is similar to those found in literature for unpolluted regions. Analyses of the edible muscle tissue of the 12 most common commercial fish showed low concentration levels of the metals. The area where the investigations were conducted (Israel) is still relatively unpolluted and continued monitoring of the heavy metal concentrations is recommended. (Chilton-ORNL)
W77-06782

CORRELATION COEFFICIENTS AND CONCENTRATION FACTORS OF COPPER AND LEAD IN SEAWATER AND BENTHIC ALGAE,
Rutgers. The State Univ., New Brunswick, N. J. Dept. of Botany.
U. Seeliger, and P. Edwards.
Marine Pollution Bulletin, Vol. 8, No. 1, 1977, p 396-400, 5 fig, 24 ref.

Descriptors: *Water pollution effects, *Environmental effects, Toxicity, *Copper, *Lead, *Algae, Benthic flora, Marine algae, Correlation analysis, Bays, *New York.
Identifiers: Concentration factors, *Raritan Bay(NY).

The study was conducted along the south shore of Raritan Bay adjacent to the New York metropolitan region. Correlation coefficients of 0.98 were found for copper and 0.97 for lead. These figures indicate a high degree of correspondence between levels of both metals in water and in algal tissue. The data indicate that Raritan Bay is a highly polluted coastal environment. (Chilton-ORNL)
W77-06783

A PRELIMINARY SURVEY OF MERCURY IN FISH FROM BOMBAY AND THANA ENVIRONMENT,
Institute of Science, Bombay (India). Inorganic and Nuclear Chemistry Lab.
B. M. Tejam, and B. C. Haldar.
Indian Journal of Environmental Health, Vol. 17, No. 1, 1975, p 9-16, 4 tab, 3 ref.

Descriptors: *Environmental effects, *Water pollution effects, Heavy metals, *Mercury, Fish, Absorption, Asia, Pollutant identification.
Identifiers: India, Bombay, Thana(India), Neutron activation analysis.

A survey for mercury in thirty species from 7 locations in Bombay and Thana was conducted. Neutron activation techniques were used to analyze for mercury in muscle, bone and brain in fish samples. Concentrations were greater in brain than muscle and greater in muscle than in bone. Harpodan neheraus showed the lowest concentration while Hilsa-ilisha showed the highest concentration. Bones and muscle of Tilapia mozambique, Mugil dussumieri and some other varieties showed concentrations greater than 500 ng/g on fresh weight basis. (Chilton-ORNL)
W77-06785

LABORATORY STUDIES ON THE EFFECT OF METALS ON OXYGEN UPTAKE BY SEWAGE SLUDGE IN BRACKISH WATER,
Bristol Univ. (England). Dept. of Bacteriology.
A. J. Sylvester, and G. C. Ware.
Marine Pollution Bulletin, Vol. 8, No. 2, February 1977, p 45-48, 4 fig, 1 tab 9 ref.

Descriptors: *Environmental effects, *Laboratory tests, Heavy metals, *Sewage sludge, Water pollution effects, Water pollution sources, Industrial wastes, Cadmium, Zinc, Lead, Oxygen, Oxygenation, Respiration, *Metals, Brackish water.

All experiments showed an initial high rate of oxygen consumption by freshly diluted sewage sludge which was unaffected by the presence of 500 microg/mg streptomycin sulphate. The rate fell rapidly during the first few hours after dilution. In the absence of streptomycin the oxygen consumption rate recovered to a greater or lesser extend depending upon the concentration and type of metal ions present. When streptomycin was present no recovery in the rate of oxygen uptake was observed. After 12 h contact with the diluting water the rate of oxygen uptake of the sludge in the mixture containing 10 microg/l of cadmium was similar to the control. After this time and until completion of the experiment, the rate of oxygen uptake steadily increased. Similar results were obtained with lead. A stimulatory effect was observed in lead concentrations of 200 microg/l. At concentrations of 500 microg/l, zinc had a stimulating effect after 48 h contact. (Chilton-ORNL)
W77-06788

RESPIRATORY RESPONSE OF CUNNERS TO SILVER,
National Marine Fisheries Service, Milford, Conn. Middle Atlantic Coastal Fisheries Center.
F. P. Thurberg, and R. S. Collier.
Marine Pollution Bulletin, Vol. 8, No. 2, February 1977, p 40-41, 1 tab, 11 ref.

Descriptors: *Environmental effects, *Respiration, Heavy metals, Mercury, Cadmium, Fish, Water pollution effects.
Identifiers: *Cunners, *Silver.

After exposure to concentrations of 0.12, 0.25 and 0.50 ppm silver nitrate for 96 h, gill-tissue oxygen consumption measurements were made. Exposures to concentrations as low as 0.12 ppm resulted in significant respiratory depression. Depressed gill-tissue oxygen consumption rates was also found in cunners exposed to 50 and 100 ppb cadmium for periods of up to 60 days. Winter flounder and striped bass also show cadmium-induced depression of oxygen consumption but exposure to mercury resulted in elevated gill-tissue respiration rates. It was concluded that different metals have different effects on physiological stress indicators. (Chilton-ORNL)
W77-06789

HEAVY METALS IN MACROINVERTEBRATES AND FISH FROM THE LOWER MEDWAY ESTUARY, KENT,
Sir John Cass Coll., London (England). School of Sciences and Technology.
J. R. Wharfe, and W. L. F. Van Den Broek.
Marine Pollution Bulletin, Vol 8, No 2, February 1977, p 31-34, 1 fig, 2 tab, 10 ref.

Descriptors: *Environmental effects, *Heavy metals, Absorption, Fish, Invertebrates, Mercury, Copper, Zinc, Lead, Cadmium, Estuaries, Fish diets, Water pollution effects.
Identifiers: *Medway estuary(Eng).

Macroinvertebrates and fish were analyzed for mercury, zinc, copper, lead, and cadmium periodically from April 1973-January 1976. Levels of metals in animals from the lower Medway estuary were low, although higher values of lead and cadmium were found in the vicinity of industralized areas. Information on fish diets and the levels found in invertebrates showed little evidence of any accumulation, although it was noted that smaller size class of prey taken were not analyzed. Sediment and water samples were not analyzed. (Chilton-ORNL)
W77-06790

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. PRINCIPAL INVESTIGATORS' REPORTS JULY-SEPTEMBER 1976. VOLUME 1: MARINE MAMMALS, MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-06793

DISTRIBUTION AND INDICATORY VALUE OF THE SUBMERGED MACROPHYTES IN THE FLOWING WATERS OF THE FRIEDBERGER AU, (IN GERMAN),
Universitaet Hohenheim (Landwirtschaftliche Hochschule) (West Germany).
A. Kohler, R. Brinkmeier, and H. Vollrath.
Ber Bayer Bot Ges Erforsch Heim Flora 45, p 5-36, 1974.

Descriptors: *Calcium, *Eutrophication, Distribution, *Indicators, Water pollution effects, Plant physiology.
Identifiers: *Callitriche-Obtusangula, *Macrophytes(Submerged), West Germany(Friedberger Au), *Katharobic waters.

The waters studied were high in Ca content. Some macrophyte species were found only in pure waters; other occurred mainly in pure waters but also in eutrophic sections. Some were more evenly distributed between katharobic and lightly polluted waters and others occurred in moderately and heavily polluted but not in katharobic waters. The Friedberger Au (West Germany) contained 1 hydrophytes and the Moosach system had 21. Callitriche obtusangula was totally absent from the former area but was among the most dominant species in the latter.--Copyright 1976, Biological Abstracts, Inc.
W77-06802

COMMUNITY STRUCTURE, DISTRIBUTION AND INTERRELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA,
Oregon State Univ., Corvallis. Dept. of Zoology.
For primary bibliographic entry see Field 6G.
W77-06810

SHOREBIRD DEPENDENCE ON ARCTIC LITORAL HABITATS,
California Univ., Bodega Bay. Bodega Marine Lab.
For primary bibliographic entry see Field 6G.
W77-06811

AVIFAUNAL UTILIZATION OF THE OFFSHORE ISLAND AREA NEAR PRUDHOE BAY, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-06812

BIRDS OF COASTAL HABITAT ON THE SOUTH SHORE OF SEWARD PENINSULA, ALASKA,
College of the Atlantic, Bar Harbor, Maine.
For primary bibliographic entry see Field 6G.
W77-06813

ECOLOGY AND BEHAVIOR OF SOUTHERN HEMISPHERE SHEARWATERS (GENUS PUFFINUS) AND OTHER SEABIRDS, WHEN OVER THE OUTER CONTINENTAL SHELF OF THE BERING SEA AND GULF OF ALASKA DURING THE NORTHERN SUMMER,
Calgary Univ., (Alberta).
For primary bibliographic entry see Field 6G.
W77-06814

SEASONAL DISTRIBUTION AND ABUNDANCE OF MARINE BIRDS,
Fish and Wildlife Service, Anchorage, Alaska. Office of Biological Services and Coastal Ecosystems.
For primary bibliographic entry see Field 6G.
W77-06815

MIGRATION OF BIRDS IN ALASKA COASTAL AND MARINE HABITATS SUBJECT TO INFLUENCE BY OCS DEVELOPMENT,
Fish and Wildlife Service, Anchorage, Alaska. Office of Biological Services and Coastal Ecosystems.
For primary bibliographic entry see Field 6G.
W77-06818

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. PRINCIPAL INVESTIGATORS' REPORTS JULY-SEPTEMBER 1976. VOLUME 2: FISH, PLANKTON, BENTHOS, LITTORAL.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-06825

THE DISTRIBUTION, ABUNDANCE, DIVERSITY AND PRODUCTIVITY OF BENTHIC ORGANISMS IN THE BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-06826

SPAWNING HERRING SURVEYS IN THE BERING SEA AND FINFISH RESOURCE SURVEYS IN NORTON SOUND AND KOTZEBUE SOUND,
Alaska Dept. of Fish and Game, Anchorage. Div. of Commercial Fisheries.
For primary bibliographic entry see Field 6G.
W77-06828

PELAGIC AND DEMERSAL FISH ASSESSMENT IN THE LOWER COOK INLET ESTUARY SYSTEM,
Alaska Dept. of Fish and Game, Kodiak.
For primary bibliographic entry see Field 6G.
W77-06829

RAZOR CLAM (SILIQUA PATULA, DIXON) DISTRIBUTION AND POPULATION ASSESSMENT STUDY,
Alaska Dept. of Fish and Game, Kodiak. Div. of Commercial Fisheries.
For primary bibliographic entry see Field 6G.
W77-06830

RESOURCES OF NON-SALMONID PELAGIC FISH OF THE EASTERN BERING SEA AND THE GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-06832

BASELINE/RECONNAISSANCE CHARACTERIZATION, LITTORAL BIOTA, GULF OF ALASKA AND BERING SEA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Fisheries Lab; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-06833

PLANKTON OF THE GULF OF ALASKA - ICHTHYOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 6G.
W77-06834

INITIAL ZOOPLANKTON INVESTIGATIONS IN LOWER COOK INLET,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 6G.
W77-06835

PHYTOPLANKTON AND PRIMARY PRODUCTIVITY IN THE NORTHEAST GULF OF ALASKA,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 6G.
W77-06836

BASELINE STUDIES OF FISH AND SHELLFISH RESOURCES OF NORTON SOUND AND THE SOUTHEASTERN CHUKCHI SEA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-06839

BEAUFORT SEA ESTUARINE FISHERY STUDY,
Alaska Dept. of Fish and Game, Fairbanks. Div. of Sport Fish.
For primary bibliographic entry see Field 6G.
W77-06840

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF BENTHIC ORGANISMS IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-06841

FOOD AND FEEDING RELATIONSHIPS IN THE BENTHIC AND DEMERSAL FISHES OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-06842

RECONNAISSANCE CHARACTERIZATION OF LITTORAL BIOTA, BEAUFORT AND CHUKCHI SEAS,
Western Washington State Coll., Bellingham.
For primary bibliographic entry see Field 6G.
W77-06843

ICHTHYOPLANKTON OF THE EASTERN BERING SEA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-06845

ASSESSMENT OF PELAGIC AND NEARSHORE FISH IN THREE BAYS ON SOUTHEAST KODIAK ISLAND,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 6G.
W77-06846

DEMERSAL FISH AND SHELLFISH ASSESSMENT IN SELECTED ESTUARY SYSTEMS OF KODIAK ISLAND,
Alaska Dept. of Fish and Game, Kodiak.
For primary bibliographic entry see Field 6G.
W77-06847

TECHNICAL TRAWL SURVEY OF THE BENTHIC EPIFAUNA OF THE CHUKCHI SEA AND NORTON SOUND.
Alaska Univ., College. O.C.S. Coordination Office.
For primary bibliographic entry see Field 6G.
W77-06848

THE DISTRIBUTION, ABUNDANCE AND DIVERSITY OF THE EPIFAUNAL BENTHIC ORGANISMS IN TWO (ALITAK AND UGAK) BAYS OF KODIAK ISLAND, ALASKA,
Alaska Univ., College Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-06849

A PILOT STUDY ON THE DESIGN OF A PETROLEUM HYDROCARBON BASELINE INVESTIGATION FOR NORTHERN PUGET SOUND AND STRAIT OF JUAN DE FUCA,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
W. D. MacLeod, D. W. Brown, and R. G. Jenkins.
NOAA Technical Memorandum ERL MESA-8, November 1976. 59 p, 18 fig, 12 tab, 11 ref, 2 append.

Descriptors: *Washington, *Coasts, *Baseline studies, *Water pollution effects, *Oil pollution, *Bioindicators, Sediments, Biota, *Mussels, *Snails, Analytical techniques, Organic compounds.
Identifiers: *Puget Sound, *Strait of Juan de Fuca, *Petroleum hydrocarbons, Residual hydrocarbons, Mytilus edulis, Mytilus californianus, Thais lamellosa.

Substantially increased petroleum tanker traffic, pipeline transport, and refining operations are anticipated in the region of Northern Puget Sound and Strait of Juan de Fuca when the Alaska pipeline comes into operation. To assess the potential future environmental impact arising from these activities current hydrocarbon baseline levels must be measured. This report presents the results of the pilot study and offers recommendations for a first year Petroleum Hydrocarbon Baseline Investigation. The pilot study has demonstrated that methodology exists to detect and measure a number of hydrocarbons in sediments, mussels (Mytilus edulis and Mytilus californianus), and a snail (Thais lamellosa). Appendices identify critical intertidal sites for further study and recommends analytical procedures best suited to the particular environment. (NOAA)
W77-06875

THE NEW YORK BIGHT PROJECT - 1975; STONY BROOK, LONG ISLAND, NEW YORK.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5G.
W77-06876

IMPACT OF OIL SPILLAGE FROM WORLD WAR II TANKER SINKINGS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
B. Campbell, E. Kern, and D. Horn.
Sea Grant Program Report No. MITSG 77-4, Index No. 77-304 -Nnt, January 1977. 93 p, 12 fig, 2 tab, 65 ref, 2 append. SG-04-6-158-44081.

Descriptors: *New Jersey, *North Carolina, *Oil spills, *Water pollution effects, Coasts, Estuaries, Environmental effects, Wildlife, Beaches, Economics, Baseline studies.
Identifiers: U.S. East Coast, Cape Hatteras, Historical background, Tankers, World War II.

The overall effects of spilled oil are studied through available data on tankers sunk along the East Coast of the United States during World War II. The baseline data of ships sunk, cargo, locations and data on sinkings was established through an extensive literature and archives search. Cape Hatteras, North Carolina and its surrounding area was chosen as the primary site of the investigation on the basis of the volume of spilled oil. A computer model was developed to estimate the trajectory of oil released from each ship. In addition, the Asbury Park area of New Jersey was investigated on the merit of substantial documentation of spills in that area. Interviews were conducted in both areas to obtain first hand information on visible effects of the oil. Newspapers and records of marine activities were analyzed to determine environmental and other oil related effects for the selected regions. Results indicated that effects of the oil spills, as observed by residents of the areas under investigation, were negligible. In both cases, regional wildlife and economy survived with minimal difficulty. (NOAA)
W77-06877

EFFECTS OF ENGINEERING ACTIVITIES ON THE ECOLOGY OF PISMO CLAMS,
Moss Landing Marine Labs., Calif.
J. Nybakken, and M. Stephenson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-016 948, Price Codes: A04 in paper copy, A01 in microfiche. Coastal Engineering Research Center, Fort Belvoir, Virginia, Miscellaneous Paper No. 8-75, September 1975. 65 p, 21 fig, 9 tab, 62 ref, 1 append. Army DACW72-72-C-0016

Descriptors: *Clams, *Surveys, *Beaches, *California, Distribution patterns, Aquatic populations, Aquatic animals, Sediments, Water quality, Coastal engineering, Predation, Reproduction, Gonads, Aging(Biological), Growth rates, Marine biology, Water pollution effects.
Identifiers: *Monterey Bay(Calif), *Pismo clams.

Three aspects of the ecology of Pismo clams were investigated in Monterey Bay, California: distribution, reproduction cycle, and age and growth. Pismo clam populations were found to be restricted to bay areas between the Salinas River and Santa Cruz. Highest densities recorded wer intertidal, and subtidal clam beds were few and with low densities. Most clams appeared randomly dispersed, and different size classes did not show a vertical separation. The presence and absence of clams were shown to be correlated with beach slope and grain size. Pismo clams mature in their second year in Monterey Bay, and the primary spawning time is in September and October. The growth rate is more rapid in young clams and varies throughout the year in all size classes but is most rapid in the summer and fall. The results of this 2-year study can serve as a guide in sampling Pismo clam populations along the California coast; the density and distribution of the clam in Monterey Bay, and knowledge of spawning times can aid in project planning to avoid harming an important fishing resource. (Sims-ISWS)
W77-06886

MICROBIAL METHANE CONSUMPTION REACTIONS AND THEIR EFFECT ON METHANE DISTRIBUTIONS IN FRESHWATER AND MARINE ENVIRONMENTS,
Alaska Univ., College. Inst. of Marine Science.
W. S. Reeburgh, and D. T. Heggie.
Limnology and Oceanography, Vol. 22, No. 1, p 1-9, January 1977. 2 fig, 1 tab, 38 ref. NSF GA-19380, GA-41209.

Descriptors: *Methane, *Bacteria, *Methane bacteria, *Microbial degradation, *Water pollution sources, Gases, Microorganisms, Water pollution, Sulfates, Microbiology, Sulfur bacteria, Sediments, Microbiology, Sulfur bacteria, Sediments, Sulfur compounds, Marine bacteria, Water quality, Aquatic habitats.
Identifiers: *Methane oxidizing bacteria, *Methane producers, *Methane formation, Sulfate concentration, Sulfate reducers, Methane distributions, Marine environments, Microbial ecology, Marine systems.

A survey of reported methane distributions in sediments and the adjacent overlying water showed distinct differences between freshwater and marine environments. These differences may be explained by the activities of sulfate-reducing bacteria and appear to be the result of differences in sulfate concentration between freshwater and marine environments. (Henley-ISWS)
W77-06899

NUTRIENTS, CHLOROPHYLL, AND INTERNAL TIDES IN THE ST. LAWRENCE ESTUARY,
Laval Univ., Quebec. Department de Biologie.
For primary bibliographic entry see Field 5B.
W77-06910

A PRELIMINARY EVALUATION OF THE EFFECTS OF GAS BUBBLE DISEASE ON FISH POPULATIONS IN THE KOOTENAI RIVER BELOW LIBBY DAM,
Army Engineer District, Seattle, Wash. Seattle District.
B. May.
Presented at the 25th Annual Meeting, Western Division, American Fisheries Society, July 13, 1973, 13 p., 5 tab., 2 ref. DACW 67-73-C.

Descriptors: *Trout, Freshwater fish, *Supersaturation, Fish populations, Freshwater fish, *Fish behavior, On-site investigations, Bioassays, Mortality, *Fish disease, Fish pathology, Rainbow trout, Dams, Dam sites, *Montana.
Identifiers: Fish, Game fish populations, *Kootenai River(Mont), *Mountain whitefish, Prosopium, *Cutthroat trout, *Gas bubble disease, Libby Dam(Mont), Creel Census, Recreational fishery.

Game fish populations have been adversely affected by supersaturated gases in the Kootenai River for at least five or six miles below Libbly Dam. The spawning run of Mountain whitefish (Prosopium williamsoni) from the Kootenai River into the Fisher River was adversely affected by gas bubble disease. An unusually large drawdown of the reservoir in the winter of 1972-73 triggered the movement of large numbers of cutthroat trout (Salmo clarki) and mountain whitefish downstream out of the reservoir area. These fish provided an excellent fishery during February of 1973, but masked the effect of supersaturated gases upon fish populations in the first six miles of the Kootenai River below Libby Dam. Mountain whitefish, appear to be more sensitive than cutthroat trout to supersaturated gas conditions. Depth, cold water temperatures and the influence of tributary streams allow some fish to survive for several months or more in areas of the river where total gas concentrations are above 130 percent saturation. (Katz)
W77-06919

OCCURRENCE OF GAS-BUBBLE DISEASE IN THREE SPECIES OF BIVALVE MOLLUSCS,
Delaware Univ., Lewes. Field Station.
R. Malouf, R. Keck, D. Maurer, and C. Epitanio.
Journal of the Fisheries Research Board of Canada, Vol. 29 (1972), p. 588-589, 2 fig., 4 ref.

Descriptors: *Oysters, Commercial shellfish, Mollusks, *Diseases, Clams, Sea water, *Heated water, Atmospheric gases, *Supersaturation, *Animal pathology, *Aquiculture.
Identifiers: *Gas bubble disease, Bivalve molluscs, Conchiolin blisters, Mantle tissue, *Dissolved gas content, Crassostrea gigas, Mercenaria mercenaria.

Gas-bubble disease was observed in adult oysters and hard clams held in heated running sea water during the winter. Heating the cold sea water in closed heat exchangers caused it to become supersaturated with atmospheric gases. Exposure of the animals to this water the formation of gas-filled conchiolin blisters on the valves of the oysters. Bubbles of gas were observed in the gill gilaments of the oysters and clams and in the mantle tissue of the oysters. Any method, such as the use of baffles or an aerated head tank, that reduces the dissolved gas concentration in the water will help prevent the diseases. (Katz)
W77-06921

FIRST REPORTED INCIDENCE OF GAS-BUBBLE DISEASE IN THE HEATED EFFLUENT OF A STEAM GENERATING STATION,
North Carolina Wildlife Resources Commission, Raleigh. Div. of Inland Fisheries.
D. J. DeMont, and R. W. Miller.
In: Proceedings of the Twenty-Fifth Annual Conference, Southeastern Association of Game and Fish Commissions, October 1971, p. 392-399, 2 tab., 3 fig., 15 ref.

Descriptors: *Fish diseases, Warm water fishes, *Thermal pollution, Thermal power plants, Thermal water, Warm water fish, Freshwater fish, *Fish pathology, Industrial effluents, *Fish kill, Mortalities, *Environmental effects, Water pollution effects, White bass.
Identifiers: *Gas bubble diseases, *Steam generating stations, *Pop-eye, Threadfin shad, Bluegill, Black crappie, Gas emboli, Gills.

During the winter of 1970-71, thirteen species of warm-water fishes exhibited external symptoms of gas-bubble disease (mostly 'pop-eye') in the discharge canal and cove of a stream generation station. Peak monthly incidences were 70.8, 33.3 and 23.5 percent for white bass, threadfin shad and bluegill, respectively. Forty-nine percent of the bluegill in excess of 4 inches were afflicted whereas only 4.4 percent of those under 4 inches exhibited symptoms. Among the bluegill, the right eye only symptoms were more prevalent than were the left eye only symptoms at the 97.5 percent confidence level. Dead fish, principally black crappie, observed in the discharge in February 1971, did not exhibit external symptoms of gas bubble disease. However, autopsies of dying black crappie revealed gas emboli in the larger vessels of the gill fragments. (Katz)
W77-06922

THE SOLUBILITY OF NITROGEN, OXYGEN AND ARGON IN WATER AND SEAWATER,
Scripps Institution of Oceanography, La Jolla, Calif.
R. F. Weiss.

Deep-Sea Research, Vol. 17, 1970, p. 721-735, 11 tab., 4 fig., 24 ref.

Descriptors: *Nitrogen, *Oxygen, *Argon, *Seawater, Atmosphere, *Solubility, Thermodynamics, Temperature, Salinity, Water quality, Atmospheric pressure.
Identifiers: Distilled water, Bunsen solubility coefficient, *Solubility equations, *Nitrogen solubilities, *Oxygen solubilities, *Argon solubilities.

Recent precise data on the solubilities of nitrogen, oxygen and argon in distilled water and seawater are fitted to thermodynamically consistent equations by the method of least squares. The temperature dependence of the Bunsen-solubility coefficient is treated using the integrated van't HOff equation. It is shown that the Setchenow relation gives an adequate representation of the salting-out effect. Equations expressing the solubilities of these gases, as a function of temperature and salinity, in units of the Bunsen coefficient, ml/l, and mlkg are given along with solubility tables in each of these units. (Katz)
W77-06923

OBSERVATIONS ON GAS BUBBLE DISEASE IN ADULT COLUMBIA RIVER SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Pacific Northwest Water Lab., Corvallis, Oreg.
G. R. Bouck, G. A. Chapman, P. W. Schneider, Jr, and D. L. Stevens.
Pacific Northwest Water Laboratory, 1970, 11 p., 3 tab., 9 ref.

Descriptors: Salmon, *Anadromous fish, *Columbia river, *Fish migration, *Animal pathology, Fish disease, *Supersaturation, Laboratory tests, Bioassays, Mortality, *Nitrogen, Water quality, Water pollution effects, Methodology, *Fish diseases, *Sockeye salmon.
Identifiers: *Nitrogen, Supersaturation, *Gas bubble disease, External symptoms.

Gas bubble disease was confirmed in 1968 among wild adult sockeye salmon that were migrating upstream through the Columbia River. Adult fish had macroscopic gas bubbles in the skin and fins, and microscopic gas bubbles in the spleen and other organs. A similar survey in 1969 determined that gas bubble disease existed in at least 13 of a sample of 129 adult sockeye; 123 of these fish were randomly assigned to and then held at four temperatures in air-equilibrated water and the development of eye damage was noted. At temperatures below (10C) or at (16C) ambient river temperatures, about one-third of the fish became blinded in one or both eyes and sustained low mortality. At 20 and 22C eye damage developed in 53 percent and 66 percent of the fish, respectively, and was associated with high mortality. The authors conclude that dissolved nitrogen gas is an important water quality parameter causing significant damage to salmon in the Columbia River. (Katz).
W77-06924

DISSOLVED NITROGEN, DISSOLVED OXYGEN AND RELATED WATER TEMPERATURES IN THE COLUMBIA AND LOWER SNAKE RIVERS, 1965-1969,
National Marine Fisheries Service, Seattle, Wash.
K. T. Beiningen, and W. J. Ebel.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-71 00640, Price codes: A04 in paper copy, A01 in microfiche. April 1971. 60 p., 95 tab., 6 ref.

Descriptors: *Columbia River, *Dissolved oxygen, *Nitrogen, *Water temperature, On-site investigations, Laboratory analysis, *Water quality, Limnology, *Data collection, Data storage, Grand Coulee Dam, Spillway, Dams, Dam sites, Saturation, *Supersaturation.
Identifiers: *Lower Snake River.

Data on the dissolved nitrogen, dissolved oxygen, and water temperatures in the Columbia and lower Snake Rivers from 1965 through 1969 are presented. The data were compiled from field observations and from laboratory analysis of water samples collected at 40 stations. (Katz)
W77-06925

EFFECT OF ATMOSPHERIC GAS SUPERSATURATION CAUSED BY DAMS ON SALMON AND STEELHEAD TROUT OF THE SNAKE AND COLUMBIA RIVERS (A REVIEW OF THE PROBLEM AND THE PROGRESS TOWARD A SOLUTION, 1974),
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. J. Ebel, H. L. Raymond, G. E. Monan, W. E. Farr, and G. K. Tononaka.
Northwest Fisheries Center, Processed Report, January 1975, 111 p, 23 tab, 22 fig, 45 ref.

Descriptors: *Fish diseases, *Dams, Dam sites, *Salmon, Rainbow trout, *Columbia River, *Spillways, Fish migration, *Supersaturation, *Mortality, Animal population, Juvenile fish, Laboratory studies, On-site investigations, Spillway gates, Remedies, Nitrogen.
Identifiers: *Chinook salmon, *Steelhead trout, *Snake River, *Gas bubble disease, Nitrogen, Supersaturation, Spillway deflectors.

Dams constructed on the Columbia and Snake Rivers in the past decade have impounded most of the free flowing sections of these rivers and created a water condition that in high flow years is deadly to migrating salmon and steelhead trout. With high spills, the water becomes supersaturated with atmospheric gases to levels that are lethal to fish. In response to this problem, a major research effort is in progress which seeks to define the effects of supersaturation on fish and to develop methods of reducing supersaturation caused by dams. This report summarizes the present status of the research and the relation of our current information to the anadromous resources of the Columbia and Snake Rivers. Although our most complete information is on the salmon and steelhead runs of the Snake River, it is logical that the conclusions apply as well to the stocks of the upper Columbia River and to a lesser degree, to the runs entering the Columbia River below the Snake River. (Katz)
W77-06927

EVALUATION OF ALTERNATIVE SOLUTIONS TO GAS BUBBLE DISEASE MORTALITY OF MENHADEN AT PILGRIM NUCLEAR POWER STATION,
Yankee Atomic Electric Co., Westboro, Mass.
For primary bibliographic entry see Field 5G.
W77-06928

ALGAL SUPPLEMENT ENHANCEMENT OF STATIC AND RECIRCULATING SYSTEM,
South Carolina Wildlife and Marine Resources Dept., Charleston. Marine Resources Research Inst.
J. J. Manzi, and M. B. Maddox.
Reprinted from: Helgolander wiss. Meeresunters, Vol 28, p 447-455, 1976. 4 fig, 2 tab, 19 ref. Also as: SC Mar. Res. Ctr. Contrib. No. 65 and Brice Mar. Biol. Lab. Contrib. No. 43. SG 04-5-158-5, SG-04-6-158-44009.

Descriptors: *Monitoring, *Water quality, *Crustaceans, *Aquaculture, *Algae, Survival, Shellfish, Recirculated water, Sea water, *South Carolina.
Identifiers: *Macrobrachium rosenbergii, Phaeodactylum tricornutum, Prawns.

A comparative study of algal supplement enhancement of static and recirculating Macrobrachium rosenbergii larval culture was conducted. Algal supplements significantly increased larval survival in both static and recirculating culture systems. Algal supplements significantly increased postlarval production in both static and recirculating culture systems. There was no significant difference in either survival or postlarval production between algal supplemented static and recirculating culture systems. The rate of larval development was appreciably increased by the additions of an algal supplement. The chemical parameters of water quality monitored did not appear to be related to the algal supplement enhancement of M. rosenbergii larval culture. (NOAA)
W77-06933

MONROE RESERVOIR, INDIANA, PART I: HYDROLOGIC CIRCULATION, SEDIMENTATION, AND WATER CHEMISTRY PART II: NUTRIENT RELATIONS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
K. M. Bradbury, M. J. Graham, R. V. Ruhe, W. Y. B. Chang, and D. G. Frey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 258, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No. 87. March 1, 1977, 117 p, 39 fig, 11 tab, 48 ref. OWRT B-074-IND(1).

Descriptors: *Lakes, *Lake sediments, *Aquatic productivity, *Eutrophication, *Deficient elements, *Sedimentation rates, *Water circulation, Soil types, Mestrophy, Oligotrophy, Reservoirs, Thermocline, Nutrients, Nutrient requirements, Sediment distribution, *Indiana, Baseline studies, Post-impoundment.
Identifiers: *Lake Monroe(Ind), Inflow-outflow.

Monroe Reservoir completed in 1965 is about 10 miles south of Bloomington, Indiana on Salt Creek. The drainage area is about 432 square miles, and has a surface water area of 16.8 square miles at the low-flow regulation pool level. The watershed is on Mississippian Age bedrock. The study was to develop baseline information relative to the hydrologic circulation, sedimentation, water chemistry, and nutrient relations for this body of water. Using a inflow-outflow storage model and assuming total exchange of water by this system, the water is replaced 1.15 times in 5 months or wholly replaced in 4.3 months. With an input-output sedimentation model, the annual sediment deposition rate was found to be 10 acre feet which is 1/100 of 1% of the total storage space. The annual accumulation in the reservoir is about 0.02 acre feet on 25.5 tons per square mile and calculation for the 11 year life of the lake the average thickness of the bottom sediments is 0.13 inches. Although the chemical composition varied at the several sources of inputs, the waters of Lake Monroe are 'soft'. Lake Monroe was determined to be upper mesotrophic in its general trophic condition. No micronutrients were found to be limiting for the growth of phytoplankton and evidence indicated that phosphorus rather than nitrogen was the limiting macronutrient. (Wiersma-Purdue)
W77-06982

SOME FACTORS AFFECTING FLOC FORMATION BY ZOOGLOEA RAMIGERA, STRAIN I-16-M,
Agricultural Univ., Wageningen (Netherlands). Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W77-07042

PERSISTENCE OF POLIOVIRUS 1 IN SOIL AND ON VEGETABLES GROWN IN SOIL PREVIOUSLY FLOODED WITH INOCULATED SEWAGE SLUDGE OR EFFLUENT,
Food and Drug Administration, Cincinnati, Ohio. Virology Branch.
J. T. Tierney, R. Sullivan, and E. P. Larkin.
Applied and Environmental Microbiology, Vol 33, No 1, p 109-113, January, 1977. 3 fig, 3 tab, 23 ref.

Descriptors: *Viruses, *Sludge disposal, *Vegetable crops, *Vegetation, Sewage effluents, Drainage, Lettuce, Irrigation, Irrigation effects, Runoff, Soil types, Food chains.
Identifiers: Land disposal, *Poliovirus 1.

Studies were conducted to determine viral persistence in soil and on lettuce and radishes grown naturally in soil flooded with poliovirus-inoculated sewage. The results were compared with those from spray irrigation studies to investigate land disposal of sewage sludge and effluent. The average recovery of poliovirus from 100-gram soil samples was 82%. Plot runoff was periodically collected and monitored for virus. Data indicated that low virus levels were not detected. Laboratory studies indicated effective recovery efficiency until less than 100 PFU/100 grams were added to soil samples. No viruses were recovered at levels less than 10 PFU/100 grams of soil. A two week period was necessary before virus levels became undetectable and virus survival times determined in this study were probably minimum values. Recovery values would be different if sand or sandy soils were used at disposal sites. Other studies indicated that viruses percolate below the soil surface and that they are protected from the destructive effects of solar radiation and temperature. Results indicated that viruses may be present in soil and on crops harvested from land flooded with sewage sludge or effluent. It is possible that viruses are mechanically transmitted when these crops are harvested or consumed. Use of this method of sludge disposal might lead to contamination of the food chain but, if drainage could be controlled, use on vegetation other than in the food chain would be a beneficial disposal method. (Collins-FIRL)
W77-07050

SOLUBILITY AND PLANT UPTAKE OF CADMIUM IN SOILS AMENDED WITH CADMIUM AND SEWAGE SLUDGE,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-07055

5D. Waste Treatment Processes

ANAEROBIC DIGESTION AND MEMBRANE SEPARATION FOR THE TREATMENT OF DOMESTIC SEWAGE,
Thayer School of Engineering, Hanover, N.H.
H. E. Grethlein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 908, Price codes: A03 in paper copy, A01 in microfiche. New Hampshire Water Resources Research Center, Durham, Research Report No. 15, (1976). 26 p, 3 fig, 4 tab, 8 ref. OWRT A-034-NH(2).

Descriptors: *Anaerobic digestion, *Domestic wastes, *Waste water treatment, *Sewerage, Effluents, *Septic tanks, Membranes, E. coli, Turbidity, Phosphates, Nitrates, Biochemical oxygen demand, Nutrient removal.
Identifiers: *Anaerobic digesters.

A laboratory study was carried out on a new concept for treating domestic wastewater. It used a septic tank as an anaerobic digester, and a circulation loop which has a pump and a semipermeable membrane module. The flux was maintained by a cyclic operation for a flat sheet membrane model for 1500 hours, and 8300 hours for a Helicore Module. Not only were the turbidity and E. coli count zero in the effluent, but 85 to 95% BOD and 75% nitrate reduction were also observed. Phosphate reduction also occurred, but the reason for it is not clear. These results are encouraging enough to recommend further work.
W77-06631

MIXING AND CIRCULATION OF LAKES AND RESERVOIRS WITH AIR PLUMES,
New Hampshire Univ. Durham. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W77-06633

MEANS FOR PROTECTING THE DRINKING WATER QUALITY OF LAKE GEORGE, NEW YORK,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5G.
W77-06682

NUTRIENT REMOVAL AND SLUDGE DISPOSAL WITHIN SEPTIC SYSTEMS-PHASE III,
Rensselaer Polytechnic Inst., Troy, N. Y. Fresh Water Inst.
N. L. Clesceri.
Rensselaer Polytechnic Institute FWI Report 76-10, February 1977. 24 p. 2 fig., 8 tab., 7 ref.

Descriptors: *Septic tanks, *Nutrient removal, *Soil types, Design, Phosphorus, Sorption, *New York, Sludge treatment, Waste water treatment.
Identifiers: *Lake George(New York).

Difference were examined in phosphorus sorption among soils representative of those found in the Lake George (New York) drainage basin and a rapid soil test was developed to estimate phosphorus sorption capacities of soils. The lake's drainage basin bedrock is close to the surface and has thin soil cover in many areas. Phosphorus sorption varied considerably with both soil type and soil horizons (i.e., the B horizon of each soil had a higher sorbing capacity than the C horizon) by a reference index using sorption at an equilibrium concentration of 6.2 ppm P (the approximate concentration of soluble orthophosphate in wastewaters). Data compiled on soil types can also be examined by length of time required to saturate a soil with P, using only one solution (20 ppm P) and a 15 minute shaking period. The resultant value can be used in conjunction with data on the design and use of a septic system to obtain relative estimates of the time required for saturation of the drain field with P (or the volume of soil needed in the drain field to allow operation of the system for a given number of years). (Auen-Wisconsin)
W77-06686

ADJUSTMENT COSTS AND OPTIMAL WASTE TREATMENT,
State Univ. of New York at Albany. Dept. of Economics.
J. D. Hartford.
Journal of Environmental Economics and Management, Vol. 3, No. 3, p. 215-225, 1976. 1 fig., 7 ref.

Descriptors: *Adjusted costs, *Waste treatment, *Optimization, *Model studies, *Waste water treatment, Regulation, Water quality standards, Pollution taxes(Charges), Economics, Marginal costs, Federal Water Pollution Control Act, Water pollution, Air pollution.
Identifiers: *Adjustment costs.

A policy of generally placing stricter standards on emissions and effluents and on ambient air and water quality, standards which take effect gradually over time, might be justified by one or more considerations raised in a study of the effect of adjustment costs on optimal levels of treatment. It is proposed that adjustment costs may be of significant practical importance in determining these levels over a given period of time. It is suggested that much of the future proposed levels of standards may not be reactions to estimated future increases in waste treatment, but simply a recognition that a more rapid approach to desired levels of waste treatment would entail excessive costs of adjustment. The problem of minimizing the present value of the sum of treatment plus damage plus adjustment costs is placed in a calculus-of-variations framework and the optimal time path of waste treatment is characterized as well as the corresponding optimal tax. An example involving Euler differential equation statements is used to illustrate some features of the optimal waste treatment problem presented in the equations developed for minimization of adjustment costs. A conclusion is that the public sector in the U.S. should balance additional adjustment costs against the extra total costs of pollution caused by not being at the desired long-run level of treatment and prevention, and to decide the rate at which waste neutralization levels should be changed. (Harris-Wisconsin)
W77-06699

THE REMOVAL OF ORGANIC MATTER FROM WATER SUPPLIES BY ION EXCHANGE,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5F.
W77-06760

WATER DECONTAMINATION IN NORTHERN REGIONS BY IMPULSE ELECTRIC CHARGES, (IN RUSSIAN),
Tomskii Meditsinskii Institut (USSR).
E. G. Zhuk.
Gig Sanit. 38(10), p 8-11, 1973.

Descriptors: *Waste water treatment, *Disinfection, Industrial wastes, *Electrolysis, Microorganisms, Design, Treatment facilities.
Identifiers: *Impulse electric charges, Northern(USSR), Siberia.

Investigations were done in order to design a semi-industrial installation for water decontamination in Siberia and the extreme North (USSR) using impulse electric charges. This new method has an efficient and quick disinfection action.--Copyright 1975, Biological Abstracts, Inc.
W77-06791

SEPTIC TANK STUDY IS OFF AND RUNNING.
Water Conditioning, Vol. 10, No 11, p 8, 18, January, 1977.

Descriptors: *Water softening, *Waste water treatment, *Septic tanks, *Sewage bacteria, Soil disposal fields, Brine disposal, Saline water.
Identifiers: *Regeneration brines, Septic system bacterial fauna.

A Water Quality Association study of the effects of domestic water softeners on septic tank disposal systems is being conducted by the University of Wisconsin's Small Scale Waste Management Project. Due to the fact that nearly 60% of all water softener regeneration and backwash wastes are disposed of in septic systems this study is of some importance to both the water conditioning and septic tank industries. Analysis of septic tank effluent will be obtained either through literature search or sample analysis to determine base line salt concentrations when water softeners are used in septic systems. These concentrations will be compared with the critical levels established for septic systems. These concentrations will be compared with the critical levels established for septic tank bacterial fauna and the soil absorption bed to determine harmful effects, if any. Concentrated brines can be toxic to microorganisms necessary for the breakdown of waste organic materials within the septic system. The retardation or loss of biological treatment would allow waste solids to build up until the system fails to effectively remove particulate matter. These solids would then be washed out onto the absorption field and hasten soil clogging. Some work has already been done by the U.S.

Public Health Service and the University of California at Berkely. (Heiss-NWWA)
W77-06859

NASA DEVELOPS WATER MONITORING SYSTEM,
Boeing Aerospace Co., Seattle, Wash.
For primary bibliographic entry see Field 5A.
W77-06912

FATE OF NITROGEN AND PHOSPHORUS IN SOILS UNDER SEPTIC TANK WASTE DISPOSAL FIELDS,
Agricultural Research Service, Beltsville, Md. Biological Waste Management Lab.; Agricultural Research Service, Beltsville, Md. Soil Nitrogen Lab.; and Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W77-06914

ACTIVATED SLUDGE TREATMENT OF HIGH STRENGTH NSSC MILL EFFLUENT,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
P. H. M. Guo, W. K. Bedford, and B. E. Jank.
Technology Development Report EPS 4-WP-77-1, March, 1977, 76 p., 16 fig., 19 tab, 15 ref, 5 app.

Descriptors: *Activated sludge, Treatment, *Effluents, *Wastewater treatment, Pulp and Paper Industry, Performance, Foaming, Suspended solids, Aeration, *Pulp wastes, *Industrial wastes, Canada, Bioassay.
Identifiers: Neutral sulphite semi-chemical mills, Reactors.

Bench scale studies were carried out to investigate the feasibility of treating high strength Neutral Sulphite Semi-Chemical (NSSC) mill effluents using an activated sludge process. Wastewater from Domtar Packing Limited, Trenton, Ontario, was treated in a two-stage activated sludge system under different loading conditions. For comparison purposes, studies were conducted in a single-stage reactor operated as an extended aeration activated sludge system. Experimental results indicated that the activated sludge process was not suitable for the treatment of this wastewater. Sludge bulking, foaming and poor oxygen transfer were the major problems encountered. The high concentration of dissolved solids contributed significant error to the determination of suspended solids; however, a procedure was developed for adjusting values which were in error. Bioassay tests showed that untreated wastewater was toxic and activated sludge treatment did not significantly reduce the toxicity. (WATDOC)
W77-06945

DRYING POTATO WASTES FOR ANIMAL FEED AS AN ALTERNATIVE DISPOSAL METHOD.
Canadian Bio Resources Consultants Ltd., Surrey (British Columbia).
Economic and Technical Review Report EPS 3-WP-77-4, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, March, 1977, 85 p., 10 fig., 9 tab, 9 ref, append.

Descriptors: *Drying, *Potatoes, Wastes, *Feeds, Disposal, Food processing industry, Nutrient requirements, Livestock, Methodology, Economic feasibility, Industrial wastes, *Solid wastes, Dehydration, Waste disposal.
Identifiers: Dryers.

The solid wastes produced by the potato processing industry contribute significantly, in some cases, to pollution of the environment. This study was undertaken to evaluate the potential for dehydrating these waste solids for use as an animal feed and, thus, reduce their disposal in environmentally unacceptable ways. This evaluation consisted of determining the marketability of dried potato waste in terms of conventional feedstuffs, assessing drying technology to determine systems applicable to dry potato processing waste, and assessing the potential market for a suitable drying system. The results of the study show that potato wastes can be dried economically and that the dried product can compete in the market as a high energy feed for ruminant animals. (WATDOC)
W77-06947

ANNOTATED BIBLIOGRAPHY ON NORTHERN ENVIRONMENTAL ENGINEERING 1974-75,
Environmental Protection Service, Ottawa (Ontario).
J. J. Cameron, and D. W. Smith.
Economic and Technical Review Report EPS 3-WP-77-6, March, 1977, 154 p.

Descriptors: *Bibliographies, *Environmental engineering, Abstracts, Cold weather construction, Drainage, Municipal wastes, Municipal water, Pipelines, *Canada, Alaska, *Waste water treatment.
Identifiers: Northern Canada, Northwest territories.

The Northern Technology Centre has undertaken a program for preparing an annual bibliography of environmental engineering reports and papers. There are three parts to this document: an annotated bibliography, arranged alphabetically by author; a keyword index; and a special bibliography of conferences and other bibliographies. (WATDOC)
W77-06948

STATE-OF-THE-ART REVIEW OF PROCESSES FOR TREATMENT AND REUSE OF POTATO WASTES,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
J. P. Stephenson, and P. H. M. Guo.
Economic and Technical Review Report EPS 3-WP-77-7, March, 1977, 84 p., 3 fig., 16 tab, 65 ref.

Descriptors: *Reviews, Potatoes, *Byproducts, Reverse osmosis, Food processing industry, Bibliographies, *Waste water treatment, Effluents, Waste disposal, Sludge, *Recycling, *Water reuse, Industrial wastes.
Identifiers: *Potato processing wastes.

A review of the literature pertinent to the production and treatment of potato processing wastes is presented. The report outlines the unit operations (fluming, washing, peeling, slicing and blanching) employed in the industry with emphasis being placed on the french fry and potato chip sectors. Data on the quantity and quality of wastes generated from each unit operation were collected and analyzed. Results reported in the literature were compared with those obtained from a questionnaire survey conducted in the Canadian potato processing industry in 1973. In-plant measures for water conservation, water recycle and by-products recovery have been demonstrated as potential methods for reduction of waste loads. Biological processes such as activated sludge systems, trickling filters, aerated lagoons, waste stabilization ponds and rotating biological contactors were reported to be feasible for the treatment of the potato wastes. Land application of sludges produced from biological treatment systems has been most common for sludge disposal. (WATDOC)
W77-06949

PROCEEDINGS TECHNOLOGY TRANSFER SEMINAR ON WASTE HANDLING, DISPOSAL AND RECOVERY IN THE METAL FINISHING INDUSTRY, NOVEMBER 12-13, 1975, TORONTO, ONTARIO.
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
Economic and Technical Review Report EPS 3-WP-77-3, 158 p., March, 1977.

Descriptors: *Waste disposal, *Metals, Recycling, Effluents, Mineral industry, Conferences, *Canada, *Waste water treatment.
Identifiers: Handling and recovery(Metals), *Metal finishing industry, *Technology transfer.

The Technology Transfer Seminar 'Waste Handling, Disposal and Recovery in the Metal Finishing Industry' was co-sponsored by the Environmental Protection Service, Environment Canada, the Automotive Parts Manufacturers' Association (Canada), and the American Electroplaters' Society. Topics related to recycle disposal and centralized treatment of metal finishing wastes, as well as the current status of government regulations. These proceedings include both the original papers presented by speakers at the seminar and transcripts of the extensive panel discussions which followed the presentations. Available technologies for water reduction in plating processes and various treatment operations, such as chemical precipitation, ion exchange, distillation and reverse osmosis, were reviewed and the economic and technical feasibility of recycling treated sludges and purified effluents was discussed. Much interest was expressed in the concept of centralized treatment plants, which are operating in Europe and, in particular, in Germany. The design, operation, maintenance and cost data for such plants are outlined along with discussions of sludge disposal problems. The possibility of applying this technology in Canada was discussed in relation to the current government attitudes towards the control of effluents from metal finishing operations. These proceedings reflect a balanced grouping of inputs from government, metal finishers, and technical experts. (WATDOC)
W77-06950

LITERATURE REVIEW OF WASTEWATER CHARACTERISTICS AND ABATEMENT TECHNOLOGY IN THE WOOD AND TIMBER PROCESSING INDUSTRY.
Economic and Technical Review, Report No. EPS 3- WP-77-2, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, February, 1977, 70 p., 2 app., 4 fig., 15 tab, 155 ref.

Descriptors: *Reviews, *Bibliographies, *Waste water treatment, *Pulp and paper industry, Pollution abatement, Technology, Storage, Water pollution, Recycling, Performance, Operations, *Canada, Pulp wastes, Industrial wastes.
Identifiers: *Literature reviews.

Published information pertinent to wastewater characteristics and abatement technology in the wood and timber processing is reviewed. The function of this report is to provide a background to the pollution abatement program being conducted by Environment Canada in this field. A complete inventory of the treatment and disposal of wastewater is required for the Canadian industries in order that a detailed appraisal can be made of the situation. It would appear that research is still necessary to develop complete design criteria for the application of treatment alternatives which are based on the best practicable technology available. The report consists of four major sections: (1) Log Storage, (2) Veneer and Plywood, (3) Particleboard, and (4) Wood Preserving. Each major section is discussed in terms of: wastewater sources (the industrial use of water and generation of wastewater, identifying the source and types of contaminants), wastewater characteristics (amounts of contaminants discharged and the potential environmental problems thus created) and abatement technology (the best practicable abatement control currently available and the cur-

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rent trends in industry). The conclusions reached are aimed at a preliminary assessment of the environmental status of the industry and identification of the significant information gaps. Recommendations concern the requirements for a comprehensive appraisal of the Canadian situation. (WATDOC)
W77-06951

LONDON'S STORMWATER PROBLEM,
Greater London Council (England). Water and Wastewater Section.
R. W. Horner, L. B. Wood, and L. R. Wroe.
Journal Water Pollution Control Federation, Vol. 49, No. 1, p 103-110, January, 1977. 1 fig, 2 tab, 3 ref.

Descriptors: *Storm water, *Storm runoff, *Drainage systems, *Floods, Urban drainage, Storm drains, Intercepter sewers, Combined sewers, Water quality, Analysis, Monitoring, Water quality.
Identifiers: London(England).

London's storm water problem and methods utilized to cope with it were reviewed. Six districts (central London, north-western, northern, north-eastern, south-eastern, and south-western) were described by characteristics of population, storm water conditions, and sewerage/drainage systems. A 'standard storm' was selected to estimate storm water quantities discharged to rivers and streams for comparison of districts on a common basis. Instruments have been added at pumping stations, discharge mains, and culverts for water quality sampling. Basic principles used in controlling storm water were rapid removal of storm water from the area affected and storage for dispersal over a period greater than that of the storm at a rate close to the normal receiving stream flow. Studies indicated several effects of storm water on the Thames and its tributaries in the Greater London area. These include the depletion of dissolved oxygen in river water, where oxygen levels are dependent upon previous waterway conditions, flow quantity, and quality, and the spreading of pollution effects over a larger area when a storm occurs at rising tide. Possible control methods which were suggested included operating the sewerage system so as to contain as much of the dry weather flow within the system as possible; increasing intercepting sewer capacity to allow more storage and greater carrying capacity for storm water removal to treatment plants, storm tanks, or other areas; providing short term sedimentation or other treatment for pollution reduction; and aerating the river water to counter oxygen depletion. It was concluded that the major problem within the Greater London area was the control of storm water discharges. (Collins-FIRL)
W77-06983

CANWEL CAN DO,
H. H. Leich.
Compost Science, Vol. 17, No. 5, p 21, Winter, 1976.

Descriptors: *Waste water treatment, *Domestic wastes, *Water quality, *Treatment facilities, Water reuse, Environmental control, Sanitary engineering, Sewage treatment, Biological treatment, Chemical treatment, *Canada.
Identifiers: Ontario Research Foundation(Canada), Canwel sewerless sanitation system.

The Ontario Research Foundation has spent fifteen years developing the Canwel system of sewerless sanitation. The approach was developed under the assumption that central treatment plants cannot produce effluents which are nonhazardous to the environment and are not able to keep up with increasing demands upon them. Several avenues were investigated. Cleaning waste water to two levels, one good enough for recirculation to toilets, washing cars, and sprinkling lawns, and one pure enough for cooking and drinking, was the first step. Others were ozonation rather than chlorination for purification and incineration of sewage sludge and kitchen garbage. The heat produced was used for hot water needs. Advantages of this system would be the elimination of sewer lines and central treatment facilities, lessening of home water requirements, meeting of hot water demand without added energy input, lowered costs for refuse collection, and significant increases in the quality of effluents released to ground or surface waters. A combination of physical, biological, and chemical processes would be used to run the system. Filtration and reverse osmosis techniques would reduce contaminant levels and increase water quality. Brine concentrates from this process could be incinerated with sludge and garbage. A prototype installation has been successful and the next step will be testing of the entire system in an apartment building. (Collins-FIRL)
W77-06985

SEWERAGE FOR A RURAL RESORT AREA,
Alexandria Lake Area Sanitary District, Minn.
J. A. Sullivan.
Public Works, Vol. 108, No. 2, p 56-57, February, 1977. 1 fig.

Descriptors: *Sewerage, *Treatment facilities, *Interceptor sewers, Engineering structures, Tertiary treatment, *Waste water treatment, Construction, Costs, Financing, Planning, *Minnesota.
Identifiers: Alexandria Lake Area Sanitary District(Minn).

A tertiary waste water treatment plant, 75 miles of sanitary sewers and 48 major lift stations are being constructed to provide sewerage for a 50 square mile area in rural Minnesota. Fifteen lakes and the groundwater in the area began to show signs of pollution during the late 1960's. This project was instituted to preserve the water resources of the area. A secondary treatment plant was completed in 1971, phasing out the two plant system previously employed. A comprehensive program including an activated sludge process, followed by alum coagulation and polymer filtration, chlorination, and final aeration in ponds was accepted by government agencies responsible for pollution control. Total costs of the project including engineering, administration, land acquisition and capitalized interest is $23 million. Fourteen million dollars was obtained as grants from state and federal agencies. Operational costs are expected to be about $1.1 million annually. All properties gaining lateral sewer benefit from the system will be assessed by special levy. The treatment plant and interceptor system have a design capacity of 2.5 and 3.2 mgd, respectively. Staff is expected to total 14 full-time employees and 2 part-time employees by 1978. (Collins-FIRL)
W77-06987

CHICAGO DRIVES LARGE BORES TO CONTROL COMBINED SEWAGE FLOW.
For primary bibliographic entry see Field 8E.
W77-06988

CINCINNATI'S PREVENTIVE MAINTENANCE SEWER PROGRAM.
For primary bibliographic entry see Field 5G.
W77-06989

PREVENTIVE SEWER MAINTENANCE HELPS PRESERVE HISTORIC ANNAPOLIS.
For primary bibliographic entry see Field 8G.
W77-06990

COPPER SULFATE FIGHTS ROOT GROWTH IN SEWER SYSTEMS,
For primary bibliographic entry see Field 8G.
W77-06991

SLIPFORM PAVER, STEEL FORMS SPEED LINING OF 25,000-FOOT SEWER TUNNEL,
For primary bibliographic entry see Field 8F.
W77-06992

CONTROL SEWER CORROSION WITH H2O2,
Corpus Christi Public Utilities, Tex.
For primary bibliographic entry see Field 8G.
W77-06993

CONTRACT SERVICES STRETCH SEWER MAINTENANCE BUDGET,
Gladstone Public Utilities, Mo.
For primary bibliographic entry see Field 8G.
W77-06994

NEW PROGRAMS IMPROVE SENSITIVE AREAS OF WATER AND SEWER SYSTEMS,
Waltham Public Works, Mass.
For primary bibliographic entry see Field 8G.
W77-06995

THE USE OF OXYGEN TO TREAT SEWAGE IN A RISING MAIN,
Water Pollution Research Lab., Stevenage (England).
A. G. Boon, C. F. Skellett, S. Newcombe, J. G. Jones, and C. F. Forster.
Water Pollution Control, Vol. 76, No. 1, p 98-112, 1977. 6 fig, 11 tab, 9 ref.

Descriptors: *Oxygenation, *Sewers, *Anaerobic conditions, *Sulfur compounds, *Anaerobic bacteria, *Sulfides, Odor, Corrosion, Dissolved oxygen, Suspended solids, Biochemical oxygen demand, Physical properties, Chemical properties, Sludge treatment, Sewage treatment, Pumping plant, Treatment facilities, Filters, *Waste water treatment.
Identifiers: Oxygen injection, Rising main, Leucothrix, Bath(England).

Oxygen was used as a sewage treatment in rising and slow-flowing gravity mains to correct anaerobiosis which causes organic sulfur compounds and inorganic sulfates to be reduced to sulfide by specific bacteria growing in the sewage. Sulfide can lead to odor problems, concrete corrosion, and a sewage which is more difficult to treat at the receiving works. Testing was conducted in Bath, England. Average DO and total sulfide concentrations were 5 and 0 milligrams/liter, respectively, in the main and 0 and 8 milligrams/liter at the sewage works. Poor sludge settling characteristics at the facility were thought to be caused by Leucothrix bacteria in the raw sewage. By injecting oxygen and maintaining sewage DO concentrations above 0.5 milligrams/liter, sulfur formation was prevented. The oxygen was injected at a point on the outgoing main. The theoretical maximum of oxygen needed was 1400 kilograms/day. BOD reductions were equivalent to between 70%, in winter, and 140%, in summer, of the mass of DO injected at the foot of the main. BOD in the final treatment effluent decreased from 58 to 21 milligrams/liter; suspended solids decreased from 51 to 21 milligrams/liter. Although the total weight of the sludge produced at the plant was only slightly affected by this treatment, the consolidated sludge volume was reduced by nearly 10%. Treatment produced an almost total reduction of Leucothrix bacteria. During oxygen injection periods, there was an 8% increase in the daily power needed for sewage pumping because the flow rate decreased slightly. The annual cost of injecting oxygen to produce easily treatable sewage will be about 19,000 pounds. The alternative to this procedure, upgrading the biological filtration plant, would require an expenditure of 500,000 pounds. (Collins-FIRL)
W77-06996

ELECTRON-BEAM IRRADIATION OF WASTE PRODUCTS--E.G., FOR STERILIZATION OF SEWAGE SLUDGE AND WASTE INDUSTRIAL PRODUCTS.
French Patent FR 2298-363. Issued October 20, 1976. Derwent French Patents Abstracts, Vol. X, No. 48, p D3, January, 1977.

Descriptors: *Patents, *Equipment, *Sludge treatment, *Irradiation, Industrial wastes, Sewage treatment, Waste treatment, *Waste water treatment, Disinfection.
Identifiers: Sterilization.

A patent was issued for a sterilization process for wastes which can be stirred and mixed. The process involves irradiation of materials which flow into a chamber below an electron beam of 300-800 keV. Several parallel waste flow channels which are not transversely joined form the container. They have flat floors inclined to the horizontal and are connected by pumps and pipework. The radiation source covers the entire container and is perpendicular to the flow, producing a uniformly irradiated material. No excessive radiation is needed to treat thick layers. No protection and disposal problems are faced due to the lack of a strongly radioactive source. (Collins-FIRL)
W77-06997

SLUDGE SEPARATOR.
Australian Patent 478,919. Issued December 16, 1976. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 46, No. 47, p 4621, December, 1976.

Descriptors: *Patents, *Separation techniques, *Sludge treatment, Equipment, Sewage effluents, Sediments, *Waste water treatment, Waste treatment, *Treatment facilities.
Identifiers: *Sludge separators.

A patent was issued for a sludge separator apparatus to remove sinking and buoyant contaminants from sewage. The apparatus is cylindrical with a vertical axis, and separated into an upper and lower chamber by an insert which also produces a gap between the two chambers. Sewage flows into the lower chamber below the water level and sinking contaminants in the sewage influent are deposited on the vessel bottom while buoyant contaminants are captured on the insert surface facing the bottom. (Collins-FIRL)
W77-06998

OXIDATION AND OZONATION CHAMBER,
BDH, Inc., Rome, Ga. (Assignee).
J. H. Bowen.
United States Patent 4,007,120. Issued February 8, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 2, p 582, February, 1977. 1 fig.

Descriptors: *Patents, Equipment, *Oxidation, *Ozone, Oxygen, Liquid wastes, Waste treatment, *Waste water treatment, Chemical treatment.
Identifiers: Electrostatic charge, *Ozonation.

A patent was issued for an oxidation and ozonation chamber to treat liquids. The combined treatment chamber is composed of several compartments. These compartments contain a rotatable axle with a blade which creates an electrostatic charge by liquid agitation and mixes oxygen and ozone with the liquids. (Collins-FIRL)
W77-06999

HYDROCARBON PRODUCTS MANUFACTURE--BY CARBONISATION OF COAL, SCRAP RUBBER OR PLASTIC OR DOMESTIC SEWAGE UNDER REDUCED PRESSURE.
French Patent FR 2300-124. Issued October 8, 1976. Derwent French Patents Abstracts, Vol. X, No. 50, p D5, January, 1977.

Descriptors: *Patents, *Organic compounds, Equipment, *Domestic wastes, Resources development, *Waste treatment, Sewage treatment, Coal, Carbon, Natural resources, Oxygen, Chemical reactions.
Identifiers: Hydrocarbon products.

A patent was issued for a process to make hydrocarbon products from organic raw materials with coal or an analogous carboniferous material. The process can be applied to domestic sewage. The operation involves circulating the material through an elongated tubular element at a temperature of 425-98 C in the absence of oxygen at a reduced pressure of 50-150 mm Hg. The raw material is agitated as it enters the tube to increase surface area contacting the inner surface of the element. Reduced pressure in the process assures the removal of liquid and gaseous hydrocarbons before secondary reactions occur. (Collins-FIRL)
W77-07000

SEWAGE AERATION IMPELLER-WITH AUTOMATIC DE-ICING AND ANTI-CLOGGING SYSTEM,
K. Tofaute.
Soviet Patent SU-504-472. Issued April 30, 1976. Soviet Inventions Illustrated, Vol. X, No. 51, p D5, February, 1977. 1 fig.

Descriptors: *Patents, *Aeration, Equipment, *Sewage treatment, Biological treatment, Cleaning, *Waste water treatment, Oxygen, Waste treatment, Sewage effluent.

A patent was issued for a sewage water surface aerator employed in biological cleaning. Contamination of external surfaces is prevented by connecting tubes to these surfaces and the volume of the transport channels. The mechanism consists of a conical body with corrugated internal walls and external caps connecting the outer surface with the transporting channel volume. It is fixed to a drive shaft and, when rotated, the liquor is sucked into the transporting channel, mixed with air, and ejected by centrifugal forces. Oxygen from the air further aerates the dispersed liquor. (Collins-FIRL)
W77-07001

METHOD OF WASTE TREATMENT AND ALGAE RECOVERY,
California Univ., Berkeley. (Assignee).
W. J. Oswald.
United States Patent 4,005, 546. Issued February 1, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 1, p 30, February, 1977. 1 fig.

Descriptors: *Patents, *Algae, *Sewage treatment, *Ponds, *Aerobic treatment, Air, Water purification, *Waste water treatment, Sewage effluent, Treatment facilities, Waste treatment.
Identifiers: *Algae recovery.

A patent was issued for a method of waste treatment and algae recovery involving three ponds. Sewage containing algae is retained in a pond open to light and air under natural conditions for 10 to 20 days. A portion is transferred to another pond open to light and air which is agitated for 3 to 6 days. Then a portion of the water in the second pond is transferred to a third that is substantially closed to light and remains quiescent for 1 1/2 to 3 days while algae settles. Settled algae is removed from this last pond. (Collins-FIRL)
W77-07003

RENOVATION OF WASTE WATER,
Ontario Research Foundation, Sheridan Park. (Assignee).
F. Besik.
United States Patent 4,008,159. Issued February 15, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 3, February, 1977. 1 fig.

Descriptors: *Patents, *Water purification, Suspended solids, Organic matter, Inorganic compounds, Nitrogen compounds, Odor, Adsorption, Biological treatment, Chemical treatment, Filtration, Coagulation, Microorganisms, Phosphates, *Waste water treatment.
Identifiers: Waste water renovation.

A patent was issued for a process to renovate waste water containing contaminates such as suspended solids, dissolved organic material, organic nitrogen-, ammoniacal nitrogen-, nitrite nitrogen-, and nitrate nitrogen-containing materials, phosphate material, odor-producing matter, and turbidity-producing material. The process subjects waste water to primary treatment for partial removal of dissolved organic matter, nitrogenous and phosphate matter, and turbidity-causing matter, followed by effluent removal to a second treatment zone where adsorption-biological treatment using activated carbon and microorganisms takes place. The effluent from this stage is treated with chemical coagulants, and then treated with ozone and oxygen. After the filtration of solids, renovated water is removed. (Collins-FIRL)
W77-07004

WASTE TREATMENT APPARATUS,
Ecolotrol, Inc., Bethpage, N.Y. (Assignee).
J. S. Jeris.
United States Patent 4,009,105. Issued February 22, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 4, p 1264, February, 1977. 1 fig.

Descriptors: *Patents, Equipment, *Biochemical oxygen demand, *Biological treatment, *Oxidation, Microorganisms, Filters, Oxygen, Carbon dioxide, *Waste water treatment, Organic matter.

A patent was issued for a treatment apparatus to biologically remove BOD from waste water. The equipment is composed of an elongated vertical container with a manifold near the bottom for control of waste water passage through the container, and an inlet for waste water that will be treated. Above the manifold is a fluidized bed of a solid particulate carrier with a layer of cultured microorganisms for BOD oxidation. There are means for adding oxygen to the bed which is arranged to receive the waste water and biologically convert most of the BOD to be removed to carbon dioxide, water, and cellular material. The waste water and carbon dioxide are continuously removed through an outlet, and the excess cellular material is removed from the particulate carrier. (Collins-FIRL)
W77-07005

PROCESS FOR THE TREATMENT OF WASTE WATER BY HETEROGENEOUS PHOTOSENSITIZED OXIDATION,
Temple Univ., Philadelphia, Pa. (Assignee).
J. R. Williams.
United States Patent 4,008,136. Issued February 15, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 3, p 929, February, 1977.

Descriptors: *Patents, *Light, *Oxidation, *Polymers, *Liquid wastes, Sewage effluents, Oxygen, Water purification, *Waste water treatment, Treatment.
Identifiers: *Photolysis.

A patent was issued for the treatment of waste water by heterogeneous photosensitized oxidation. This process is especially for waste water containing organic materials. A water insoluble polymer-based photosensitizer is added to the waste effluent in the presence of oxygen. The suspension is photolyzed by light with a wavelength between 320 and 800 nm. (Collins-FIRL)
W77-07006

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METHOD OF APPLYING OZONE AND SONIC ENERGY TO STERILIZE AND OXIDIZE WASTE WATER,
TII Corp., Lindenhurst, N.Y. (Assignee).
A. D. Henderson, and J. M. Periale.
United States Patent 4,003,832. Issued January 18, 1977. Official Gazette of the United States Patent Office, Vol. 954, No. 3, p 1203, January, 1977. 1 fig.

Descriptors: *Patents, *Ozone, *Sound waves, *Cavitation, *Oxidation, Water purification, Suspended solids, Coagulation, Polyelectrolytes, *Waste water treatment, *Sterilants.

A patent was issued for a method employing ozone and sonic energy to sterilize and oxidize waste water. A coagulating agent is added, followed by a polyelectrolyte to form a floc. The water is passed through a lamina to remove suspended solids, and is then passed in a counter-flow through a gravity gradient stand of water. The water is pre-treated with ozone and sonic energy to cause cavitation. Further treatment by ozone and sonic energy produces additional cavitation for effective oxidation and sterilization. (Collins-FIRL)
W77-07007

APPARATUS AND PROCESS FOR REMOVING AMMONIA NITROGEN FROM WASTE WATER,
Ecolotrol, Inc., Bethpage, N.Y. (Assignee).
J. S. Jeris.
United States Patent 4,009,099. Issued February 22, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 4, p 1262, February, 1977. 1 fig.

Descriptors: *Patents, Equipment, Water purification, Biological treatment, Oxygen, Ammonia, *Nitrogen, *Ammonia compounds, Microorganisms, Temperature, Oxidation, *Waste water treatment, Aerobic conditions.
Identifiers: Fluidized bed, Ammonia nitrogen.

A patent was issued for an apparatus and biological process to remove ammonia nitrogen from waste water. The process includes a fluidized bed of a solid particulate carrier with a cultured layer of nitrifying microorganisms. Waste water continuously passes through this bed, to which oxygen is added, and retained at a controlled temperature and length of time under aerobic conditions. This biologically converts most of the ammonia nitrogen to be removed from the waste water to oxidized forms of nitrogen, water and cellular material. These oxidized nitrogen forms and the water are continuously removed from the bed, as the excess cellular material is removed from the particulate carrier. (Collins-FIRL)
W77-07008

EXPANSION COMES QUICKLY TO AWT PLANT,
Connell/Metcalf and Eddy, Coral Gables, Fla.
G. M. Lockward.
Water and Wastes Engineering, Vol. 14, No. 1, p 26-27, January, 1977. 1 tab.

Descriptors: *Treatment facilities, *Waste treatment, *Tertiary treatment, *Activated sludge, Equipment, *Waste disposal, *Waste water treatment, Design, Underground waste disposal, Automatic controls, *Florida.
Identifiers: *Miami-Dade(Florida) Water and Sewer Authority.

The Miami-Dade (Florida) Water and Sewer Authority has expanded a waste water treatment facility so that it can handle a 200% increase from 2.0 mgd to 6.0 mgd of influent. The additions were: new contact stabilization activated sludge units with minor modifications, rapid sand filtration units, expanded phosphorus removal equipment, expanded chlorination treatment with automatic dosing, new flow measuring devices, conversion from outfall disposal to subsurface disposal, expanded sludge drying beds, added air blowers, added standby power capacity, expansion of the laboratory, and new office space. The activated sludge units can be easily altered to a conventional process involving aeration, but would require additional digestion tanks. This would also allow single-stage nitrification. When this change is effected, sodium aluminate will be used for phosphorus removal instead of alum. Though operating at 65% of capacity, the plant has proven successful in its effluent treatment. (Collins-FIRL)
W77-07009

THE PLIGHT AND PROMISE OF ON-SITE WASTE WATER TREATMENT,
Interstate Electronics Corp., Arlington, Va.
A. Hershaft.
Compost Science, Vol. 17, No. 5, p 6-12, Winter, 1976. 3 fig, 2 tab, 36 ref, 2 append.

Descriptors: *Waste water treatment, *Sewerage, *Municipal wastes, *Domestic wastes, *Septic tanks, *Cesspools, Treatment facilities, Pollution abatement, Water pollution sources, Planning, Costs, Treatment, Water conservation.
Identifiers: *On-site waste water treatment.

The problems faced in the development of on-site domestic sewage treatment stem from the assumption that such treatment is primitive and unenlightened. However, it is being proposed as a viable alternative to centralized treatment systems. Prototype sewer systems were used as early as 3750 B.C. in an Indian culture. New York City, in 1805, built the first American sewer system and added a treatment plant in 1870. The present American system is basically the same as the Roman design with the addition of treatment facilities. Several drawbacks seen in the system of centralized sewerage are pollution of ground and surface waters, dispersal of toxic substances, groundwater depletion, induced development of communities, and high construction costs. These involve eutrophication and drawing water from aquifers to surface waterways. In 1973, the total cost for building municipal treatment and collection facilities which were eligible for Federal Funding was $60 billion. On-site treatment usually involves some type of water conservation and effluent discharge into soil. Two types of on-site treatment are cesspools, and septic tanks. Studies are being made of the applicability of aerospace and advanced technologies to the improvement of on-site treatment. (Collins-FIRL)
W77-07010

TREATMENT OF SEWAGE BY ELECTRONS AND GAMMAS,
Physics Today, Vol. 29, No. 12, p 20, December, 1976.

Descriptors: *Waste water treatment, *Sewage treatment, *Irradiation, *Ionization, Electronic equipment, Sludge treatment, Disinfection, Heat treatment, Toxicity, Viruses, Bacteria, Chemical wastes, Costs.
Identifiers: *Electron treatment, *Gamma ray treatment.

High energy electron and gamma ray treatment of sewage sludge for use as fertilizer was studied. MIT designed a facility to treat 100,000 gpd. A sludge slurry (2-5% solids) flows through an electron beam from a high-voltage accelerator which disinfects and destroys bacteria. Ionization may possibly break up toxic chemical pollutants such as PCB's and pesticides. Advantages of this system are the availability and controlability of the ionizing energy and the lack of radioactivity introduction into the treated matter. Economic analysis suggests the system may be practical. Sludge with 5% solids could be treated for approximately $16/dry ton of sludge processed. Capital costs would be about $500,000 and operational costs would be about $120,000. A 400,000 rad exposure eliminates coliforms and salmonella and reduces bacteria and viral counts. Sandia Laboratories, Albuquerque, New Mexico, investigated gamma ray sewage treatment. The system uses heat and radiation to produce liquid sludges suitable for soil conditioning and restoring depleted soils. Studies indicated possible restoration of treated wastes to the food chain as animal feed. A major advantage is the high penetrating capability of gamma rays. Economic feasibility has been projected for this system. Other experiments attempted to remove the curing process to allow treatment of larger waste volumes. Costs are estimated as $3-5 per ton. (Collins-FIRL)
W77-07012

NEW VISIBILITY FOR ON-SITE WASTE TREATMENT SYSTEMS,
S. Smyser.
Compost Science, Vol. 17, No. 5, p 12-14, Winter, 1976. 2 tab.

Descriptors: *Waste treatment, *Sewerage, *Treatment facilities, Sewage treatment, Domestic wastes, Industrial wastes, *Waste water treatment, Planning, Costs, Sewage disposal, Project planning, Projects, Economics.
Identifiers: *On-site waste water treatment.

A review was presented of EPA involvement in on-site waste treatment development and demonstration projects. This is an emphasized area because the economic and environmental costs of sewerage has greatly increased. Past EPA performance in this respect has been criticized as being inadequate and slow. Prohibitive costs make alternative developments a great need in many communities. It was revealed that the most detailed comparative cost information was from industry sources. One study indicated that individual composting toilets could produce a 79% saving over central sewerage in two small Massachusetts towns. Another study in Sterling, Connecticut, showed that the use of on-site composting units would eliminate annual operating costs, reduce water consumption by 40%, cut garbage disposal and chlorine costs, and make a zero discharge situation possible. The lack of reliable information on composting systems is the major hindrance. Other studies and investigations reviewed were water recycling for garden fertilizing and the several far sighted efforts in Maine, New Hampshire, and Oregon relative to environmental planning: separated waste water systems, water use reduction schemes, and evaluation of self-contained sewage treatment systems. (Collins-FIRL)
W77-07013

UNOX SYSTEM FOR WASTE WATER TREATMENT,
Union Carbide Corp., Tonawanda, N.Y. Linde Div.
D. E. Braunscheidel, and R. G. Gyger.
Chemical Engineering Progress, Vol. 72, No. 11, 71-72, November, 1976. 1 fig.

Descriptors: *Waste water treatment, *Nitrification, *Bacteria, *Growth rates, *Toxins, *Ammonia, Temperature, Hydrogen ion concentrations, Dissolved oxygen, Biomass, Biochemical oxygen demand, Sludge treatment, Model studies, Economics.
Identifiers: UNOX, Monod model.

Various aspects of nitrification in waste water treatment were investigated. The Monod model was used as a convenient means of describing ammonia substrate removal and bacterial growth of nitrifying organisms. Specific cell growth rate is proportional to substrate concentration until a maximum is reached and it becomes independent of this factor. Nitrifying bacteria growth rates are determined by evaluating effects of temperature, pH, and dissolved oxygen levels. Mass balance for ammonia and bacteria are determined relati

to the activated sludge system. A relationship is formed between system sludge residence time (SRT) and the above parameters. A pH between 7.0 and 8.0 has been found preferable for nitrifying bacteria. Toxins and inhibitory substances suppress or inhibit bacteria growth. Experiments supported data predictions of the model. Single and two-step systems were described. The first system performs carbonaceous removal and nitrification in the same reactor at low organic loadings and long retention times. With low loadings, solids production per unit BOD5 is low and oxygen use per BOD5 unit is higher than in conventional carbonaceous systems. The two-step systems separate the two processes and carbonaceous removal is not as efficient as in the one step system. However, high food to biomass ratios allow low SRT's and small tank volumes. Influent is fed to the second step, low in BOD, allowing low food/biomass ratios and short SRT's. Total oxygenation tank volume of the two-step method is less or equal to that of the one step system. Oxygen consumption is higher and sludge production is lower in the one step process. Economics and waste water characteristics should determine the system used. (Collins-FIRL)
W77-07014

DESIGN AND CONTROL OF SECONDARY SETTLEMENT TANKS,
Water Pollution Research Lab., Stevenage (England).
M. J. D. White.
Water Pollution Control, Vol. 75, No. 4, p 459-467, 1976. 8 fig, 2 tab, 17 ref.

Descriptors: *Settling basins, *Sedimentation, *Design criteria, *Suspended solids, Sludge treatment, Nitrification, Denitrification, Flow, Equipment, *Waste water treatment, *Control.
Identifiers: Stirred specific volume, Stirred sludge density, Solids loading, Filamentous organisms.

The determination of settled volume at one solids concentration was studied as a parameter of the design and control of secondary settlement tanks. Solids loadings (mass flux) has two components - that of floc settling under gravity and that of sludge withdrawal from the tank bottom. Plotting the solids loading curve against that for solids concentration reveals the maximum solids loading. A method was given to make these determinations by assaying settled volume of mixed liquor in a stirred cylinder and dividing by the solids concentration to give the stirred specific volume (SSV) in milliliters/gram. The reciprocal of the resultant figure multiplied by 100, converting the units to percent, reveals the stirred sludge density (SSD). This experimental data measured the settling characteristics which were used to predict maximum solids loadings. Calculations made at a suspended solids concentration of 3.5 grams/liter were found adequate for these determinations. Results indicated that a low sludge return rate was best for design purposes. The concern was to decide on a SSV value. Design-related SSV predictions showed that SSV may be 80-140 milliliters/gram for partial-treatment plants with a sludge age less than 1.5 days with no nitrification; SSV of 100 milliliters/gram is good for plants with fully nitrified effluents and sludge age greater than 5 days; and SSV of 120-160 milligrams/gram is sufficient for plants with sludge age between 1.5 and 5 days. For settlement tank control, SSV calculations ensure a better determination of maximum solids loading. Maximum MLSS concentrations at a given flow rate or the maximum flow rate for a given MLSS can be calculated. In nitrifying plants, denitrification in the final tank and filamentous organism growth can be prevented by employing an anoxic zone. (Collins-FIRL)
W77-07015

FAST-TRACKING CUTS COSTS 16% ON ADVANCED WASTE WATER PLANT.
Engineering News-Record, Vol. 197, No. 26, p 47-48, December, 1976.

Descriptors: *Treatment facilities, *Construction, *Construction costs, *Sewage treatment, Sludge treatment, *Waste water treatment, *Tertiary treatment, Economics, Equipment.
Identifiers: Fast-tracking, Hillsboro(OR).

The construction of a 15 mgd advanced waste water treatment plant near Hillsboro, Oregon, involved the first application of fast-tracking in treatment plant building practices. This method resulted in a $3.8 million saving and a completion date nine months earlier than with conventional methods. Savings were also realized by bidding the project in small packages, eliminating general contractor markup of subcontractor bids, and eliminating equipment markup. Forty-one of forty-eight contracts have been awarded and the project is 54% complete. Construction packages included excavation, raw sewage pump station, and construction of primary treatment facilities. Some consideration should be given to the fact that project approval time-lag might negate any time savings from fast-tracking. One advantage is that the owner will probably know more about the facility after construction, which may aid more effective operation. The plan involved a 10-year plan to replace six smaller and less efficient plants which will be dismantled. Salvageable equipment will be sold. The plant will be able to handle a 45 mgd peak flow. Primary treatment facilities include a raw sewage pump station, comminution basin, grit basin, four 100-foot diameter primary clarifiers and a primary sludge pump station. There is a pure oxygen activated sludge system and waste water will be treated with alum and polymers to remove phosphorus and remaining settleable organic matter. Advanced treatment sections will only be used during summer, and waste sludge will be used as fertilizer. Methane gas from sludge digesters will be used by the plant. (Collins-FIRL)
W77-07016

ACID SOLUBILIZATION OF SEWAGE SLUDGE AND ASH CONSTITUENTS FOR POSSIBLE RECOVERY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5E.
W77-07017

FLUOSOLIDS INCINERATOR COMMISSIONED AT ESHER,
For primary bibliographic entry see Field 5E.
W77-07018

WASTE WATER SYSTEM USES MICROWAVES,
Chemical Engineering, Vol. 84, No. 3, p 77-78, January, 1977. 1 fig.

Descriptors: *Waste water treatment, *Microwaves, Water purification, Solid wastes, Liquid wastes, Treatment facilities, Coagulation, Filters, Polyelectrolytes, Disinfection, Ozone, Sewage effluents, Dewatering, Fertilizers, Landfills.
Identifiers: Watertek.

Sterilized, dry solids which are ready for disposal are produced by the six-step Watertek waste water treatment system that employs a microwave oven. The process produces liquid discharges which are clear, odor-free, and meet EPA 1983 waste water effluent standards. Settling ponds, digesters, and sludge beds are eliminated by this process. A more compact design is possible because liquid and solid wastes can be fully treated in 60 minutes. A 250,000 gpd system uses a space of about 30 x 40 feet, with a height of about 15 feet. Each step of the process forms a module of the system. In the first step solids are passed through a micro-screen filter and then to the oven, while liquid passes to a pressure vessel for the addition of air. A cationic polyelectrolyte polymer is added to the liquid and the mixture moves to an air float chamber where micro-bubbles form. The polymer acts as a coagulant for solids which collect in the bubbles. A rotating skimmer collects the bubbles and they are fed to a vacuum filter and/or centrifuge and, then, to the oven. Water moves to an ozone disinfection cell for sterilization and is passed out of the carbon filter as a clear and contaminant-free solution. Solids are dewatered before entering the microwave oven and, depending on feed composition, can be used for fertilizer or landfill. (Collins-FIRL)
W77-07019

SLUDGE INCINERATION AT ESHER.
For primary bibliographic entry see Field 5E.
W77-07020

WASTE WATER TREATMENT PLANT BUILT IN WET HOLE,
G. Svenson.
Western Construction, Vol. 52, No. 1, p 32, 34, January, 1977.

Descriptors: *Treatment facilities, *Construction, *Construction costs, *Construction equipment, *Construction materials, Excavation, Concrete, Steel, Cranes, Fabrication, Tertiary treatment.

A $16,630,000 tertiary waste water treatment plant is being constructed in an excavation. The completed facility will be entirely underground. Various stages of construction are carried on at the same time. Several interesting construction techniques are employed. Pre-fabrication of steel piping, a point-of-need warehouse system, and a 70-ton crane, capable of reaching all parts of the structures, contribute to cost savings. Vertical trenching was specified for all underground piping and, because the site is below groundwater levels, it is constantly dewatered. Steel piping was coated, lined and prefabricated at one plant, allowing piping delivery before schedule. Most concrete is to be below water levels and wells were scattered about the site to allow building below grade. Specifics of construction and transport methods were presented. (Collins-FIRL)
W77-07021

THE OPERATIONS SECTION OF LINCOLN SEWAGE DIVISION,
K. G. Pullen.
Surveyor, Vol. 148, No. 4411/4412, p 11-12, December, 1976.

Descriptors: *Water districts, *Operation and maintenance, *Personnel, *Budgeting, Mechanical equipment, Power operation and maintenance, Engineering personnel, Scientific personnel, Maintenance, Sludge treatment, Sludge disposal, Sewers, *Treatment facilities.
Identifiers: *Anglian Water Authority(England).

The personnel and management structure of the Operations Section of the Anglian Water Authority, England, was described. The headquarters staff consists of the operational services officer and the scientific officer and three area managers. The services officer is responsible for such activities as transport, communications, electrical and mechanical maintenance, and health and safety. The science officer advises on works performance and assists on process design. The lower personnel structure is described, as is the policy decision-making process. Maintenance staffs and their respective duties are outlined relative to sludge treatment and disposal, electrical and mechanical engineering, and sewerage. (Collins-FIRL)
W77-07023

ENERGY CONSERVATION AND HEAT RECOVERY IN WASTE WATER TREATMENT PLANTS,
Pirnie (Malcolm), Inc., White Plains, N. Y.
F. S. Pallio.

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Water and Sewage Works, Vol. 124, No. 2, p 62-65, February, 1977. 4 fig, 7 tab.

Descriptors: *Energy, *Conservation, *Heat, *Heat pumps, Heating, Resource development, Refrigeration, Temperature, Performance, Costs, Equipment, Waste water treatment, Sludge treatment, *Treatment facilities.
Identifiers: Energy wheel.

Heat recovery has been considered as a useful approach to energy conservation in waste water treatment. Heat pumps, heat exchangers, and the energy wheel have been evaluated. Using processed waste water or other warm water sources for the heat pump provides a higher temperature source than that of ambient air. The Coefficient of Performance (COP) defines heat pump efficiency and is the ratio of useful heating output to the power input. The use of warm waste water results in a higher COP than air or water. Using heat pumps would allow recovery of available energy from waste water; provide 3 to 5 times more Btu/hr/kw than direct electric resistance heating units; have an economic advantage above oil-fired heating systems; and conserve energy resources. The energy wheel is a rotary air-to-air heat exchanger consisting of a revolving cylinder packed with coarse knit metal mesh. The cylinder rotates through an exhaust air stream, picks up heat, is purged of contaminated air, and finally, rotates through the outside air stream giving off the collected heat. Incoming cold air can be pretreated by using heat from the contaminated exhaust air stream. Other advantages are the reduction of cross contamination to less than 1%, and the availability of materials that allow moisture transfer from the exhaust to the incoming air stream, aiding recovery of sensible and latent heat from air-conditioned spaces. The use of the energy wheel can reduce the size of heating equipment, as well as the fuel and energy consumption. Both concepts can reduce annual heating costs. (Collins-FIRL)
W77-07024

MUNICIPAL WASTE WATER TREATMENT AS AN INDUSTRIAL OPERATION,
Environmental Quality Systems, Inc., Rockville, Md.
D. L. Guthrie.
Water and Sewage Works, Vol. 124, No. 2, p 60-61, February, 1977. 1 fig, 2 tab, 16 ref.

Descriptors: *Treatment facilities, *Operation and maintenance, *Municipal wastes, *Industrial wastes, *Costs, Legislation, Tertiary treatment, Pollution abatement, *Waste water treatment, Capital costs, Construction costs, Comparative costs.
Identifiers: Federal Water Pollution Control Act Amendments, 1972(PL 92-500).

More advanced treatment processes, upgraded facilities, and better operation and maintenance procedures will be needed to comply with the treatment goals of PL 92-500. The costs involved require that facilities be operated as efficiently as possible to offset increased construction and operation costs. The capital investment in a municipal waste water treatment facility may reach $10 million. The suggestion that municipal treatment facilities be operated on a basis similar to that of industrial plants was reviewed. These are operated for the most cost-effective and satisfactory results and can involve higher capital costs than municipal treatment plants. A comparison was suggested with a sulfuric acid plant. Variables involved in such a comparison were initial investment, amortization, plant age, number of employees, volume of production, dollar price of the end product, and raw material cost. For municipal waste water facilities, production volume is the combined volume of sludge and effluent and the dollar price of the end product is the cost to the taxpayer. It was concluded that water quality laws will not be successful unless municipal waste water treatment is considered a profit-making operation rather than a burden. The final product is 'clean water' for the consumer. (Collins-FIRL)
W77-07025

PLUG-IN CONCEPT FOR PILOT SEWAGE TREATMENT PLANT,
J. Pullin.
Water and Sewage Works, Vol. 124, No. 2, p 52-53, February, 1977.

Descriptors: *Oxygenation, *Pilot plants, *Treatment facilities, *Tertiary treatment, *Biological treatment, *Chemical treatment, Construction, Design, Domestic wastes, Industrial wastes, Equipment, Personnel, *Waste water treatment.
Identifiers: Coleshill(England), NATO Committee on the Challenges of Modern Society(CCMS).

Waste water treatment by use of oxygenation is being studied at the advanced waste water treatment facility at Coleshill, England. The project is a pilot project for the NATO Committee on the Challenges of Modern Society (CCMS). The oxygenation is combined with conventional biological processes. The Coleshill facility has two treatment streams with a dry weather flow of 100,000 gallons/day. Treatment of both industrial and domestic flows and combination flows are being tested. Fixed facilities include a service gantry, inlet works, reagent preparation plant, sludge dewatering plant, laboratory and workshop, and a substation and office buildings. Mobile treatment units may be added at either side of the gantry to allow maximum flexibility at the works. These allow the combining of laboratory functional flexibility and full scale operation. Mobile units provide chemical flashmixing tanks; chemical flocculation tanks; settling tanks; recarbonation tanks; surface aeration tanks; biological filters; screw pumping units; multimedia filters; and granular activated carbon columns. Fixed facilities provide lime, ferric sulfate alum, polyelectrolyte, acid and carbon dioxide dosing; pilot scale multimedia filters; granular activated-carbon columns; storage tanks for biological and chemical sludges; and a sludge treatment house. Results have produced 99% phosphorus removal, 90% suspended solids reduction, 70% BOD removal and 65% COD reductions with the addition of 400 milligrams/liter of lime slurry. Portable sensors monitor all plant performance. (Collins-FIRL)
W77-07026

FAIL-SAFE WASTE TREATMENT SYSTEM,
CH2M/Hill, Reston, Va.
G. A. Gunn.
Water and Sewage Works, Vol. 124, No. 2, p 12, February, 1977.

Descriptors: *Treatment facilities, *Planning, *Waste water treatment, *Tertiary treatment, Chemical treatment, Environmental control, Water quality, Reservoirs, Natural resources, Construction, Automatic controls, Sewerage, Virginia.
Identifiers: Occuquan Sewage Authority(Va).

In order to prevent pollution of its water supply by sewage effluents, the Occuquan Sewage Authority, Virginia, has begun construction of an advanced waste water treatment system. This system will eliminate eleven treatment plants and will have many redundancy features to ensure operation under most foreseeable conditions. Funding of the project was aided by the EPA, the state of Virginia, and local government. A regional treatment facility will handle the loads now treated by the eleven facilities, and will employ a 15 mgd capacity, five raw sewage pump stations, and 150,000 lineal feet of interceptor sewers and force mains. Treatment will consist of primary and secondary treatment, chemical treatment for phosphorus removal, ion exchange for ammonia nitrogen removal, carbon absorption and multimedia filtration for residual organics removal, and chlorination for disinfection and residual ammonia removal. Effluent quality should have a BOD of less than 1 mg/liter, zero suspended solids, a COD of less than 10 mg/liter, less than 2 coliform bacteria per 100 milliliters, and less than 0.1 mg/liter of phosphorus. The duplication of facilities includes two alternate off-site power sources and an on-site standby power generation system; an automatic by-pass of incoming raw sewage to an emergency retention basin during total power failure; and piping and valves designed to accommodate any failure. (Collins-FIRL)
W77-07027

PLASTIC SPHERES FOR WASTE WATER TREATMENT.
Water Services, Vol. 80, No. 970, p 737-738, December, 1976.

Descriptors: *Plastics, *Waste water treatment, *Industrial wastes, Biochemical oxygen demand, Equipment, Filters, Organic matter, Sewage effluent, Waste water treatment, Sewage treatment.

Mechanicl purification systems have been developed using modifications of the activated sludge process which are more easily adapted to variations and shock loads. The Euro-Matic Bio-Drum was developed to combine the advantages of mechanical and natural purification processes. A pair of open mesh drums, filled with hollow plastic spheres which revolve around a shaft suspended by a 'swinging arm' attached to the side of the treatment tank are the basic mechanisms. This combines the trickling filter and activated sludge processes. The plastic balls are alternately dipped in liquor to take in organic matter, and exposed to the atmosphere, to absorb oxygen and generate biological activity. Results with hydraulic loads of 6 to 25 cu m/cu m/day and BODs from 1.2 to 4.7 kg/cu m/day showed reductions of 90% at lower loadings and 40% at higher loadings. With activated settled sludge returned to thicken the mixture in the tank, at 25 cu m/cu m/day and BOD of 5.5 kg cu m/day, a 90% BOD reduction was evidenced. Operation costs of a unit with a small single motor drive are minimal as is the installation cost. (Collins-FIRL)
W77-07028

SCREENINGS DEWATERING PRESS.
Water Services, Vol. 80, No. 970, p 737, December, 1976.

Descriptors: *Dewatering, *Screens, *Sludge treatment, Equipment, Treatment facilities, Incineration, Solid wastes, Waste treatment, *Waste water treatment.
Identifiers: *Dewatering press.

The Temact screenings dewatering press was developed to be used with sewage screens. It is made of a hydraulically operated press with a power and hydraulic control unit and an electrical control panel. Only interconnecting wiring, washing-down, and drainage facilities are necessary. Compression separates rags, paper, and like solids from liquid and fine matter which are subject to usual treatment processes. About two-thirds of the water is removed from screenings and weight and volume are reduced 55 to 60%. Discharged dewatered screenings are compact, relatively dry, and can be automatically bagged, if desired. They have a caloric value amenable to economical incineration. (Collins-FIRL)
W77-07029

SLUDGE DEWATERING ON ALASKA'S NORTH SLOPE.
Industrial Wastes, Vol 23, No 1, p 19, January/February, 1977.

Descriptors: *Dewatering, *Centrifugation, Separation techniques, Sludge treatment, Sewage

treatment, Flocculation, Polyelectrolytes, Biochemical oxygen demand, Disposal, Incineration, *Alaska, Arctic, Biological treatment, *Waste water treatment.
Identifiers: *North Slope(Alas).

Modern treatment methods that meet EPA regulations are being used in Alaska to replace traditional sewage disposal which usually involved ocean dumping. Techniques used on the North Slope are described. Two oil companies, Atlantic Richfield and BP Alaska, use a biological aerated sludge treatment system and a combined biological and physical-chemical system, respectively. Both, however, use continuous decanter centrifuges for sludge dewatering. Dewatering reduces the volume of sludge and improves its handling characteristics prior to disposal. Less consumption of water in the arctic lifestyle produces sewage with a high BOD or solids level. The ARCO base camp treatment system produces 450-500 pounds of cake concentrate and 5,000 gallons of clarified water per day from a waste water flow of 6 gpm containing 1-3% solids. The clarified water is recirculated to the sewage plant primary stage. Flocculation is induced in the sludge by the addition of polyelectrolytes just prior to centrifugation. This increases the rate of solids separation. The BP process handles feeds of 1-3% solids at 6 to 8 gpm, and 1% solids at 3 to 6 gpm. After dewatering, the cake concentration has 15-20% solids. The BP process reduces fuel costs for incineration, provides for continuous unmanned operation and an overload device to prevent serious breakdowns, and uses a closed system installation having operational flexibility. The De Laval decanter/centrifuges consist of a cylindrical bowl inside of which is a screw conveyor, both rotating in the same direction, though the conveyor moves at a different speed to transport separated solids to the solids discharge area. Solids and clarified water are simultaneously discharged. (Collins-FIRL)
W77-07030

SINGLE P/C UNIT REMOVAL OF NUTRIENTS FROM COMBINED SEWER OVERFLOWS,
O'Brien and Gere Engineers, Inc., Syracuse, N.Y.
C. B. Murphy, Jr., O. Hrycyk, W. T. Gleason, R. Field, and E. Fan.
Journal Water Pollution Control Federation, Vol 49, No 2, p 245-255, February, 1977. 8 fig, 2 tab, 7 ref.

Descriptors: *Overflow, *Combined sewers, *Nutrients, Separation techniques, Treatment facilities. Phosphorus, Ammonia, *Waste water treatment, Polymers, Design criteria, Aluminum, Lakes, Reservoirs, Surface waters, Tributaries.
Identifiers: Alum, Clinoptilolite.

An investigation, beginning with a pilot scale program and concluding with demonstration-scale facilities, was conducted to determine design criteria for the construction of a system to remove nutrients from combined sewer overflows. The unit developed was a high rate combined process using primary screening, in-line alum addition and coagulation, and contact with clinoptilolite. Alum dosages which produce an aluminum: phosphorus molar ratio of 1.2 to 1.8 removed 90-95% of the phosphorus. Phosphorus removal was not enhanced by excessive alum treatment. Polymer doses for removing solids depended upon the level of solids in the overflow waste water and on the solids generated by the alum. This system could be used to partially treat lake and reservoir tributaries with an algae problem during dry weather conditions, and to treat receiving streams immediately following a storm. Ammonia removal depended upon the NH3N concentration in the influent, the volume of clinoptilolite used, and the waste water application rates. Ammonia removals of 0.36 meq/gram (5.0 milligrams NH3N/gram of clinoptilolite) were achieved. Three contractors in a series are necessary to optimize the use of clinoptilolite. This system is ideal for conditions where treatment of a point source combined sewer overflow discharge is necessary, where space limitations do not allow conventional treatment, and where conveying waste water is impractical. (Collins-FIRL)
W77-07031

INFLUENCE OF PHOSPHORUS REMOVAL ON SOLIDS BUDGET,
Michigan Technological Univ., Houghton. Dept. of Civil Engineering.
C. R. Baillod, G. M. Cressey, and R. T. Beaupre.
Journal Water Pollution Control Federation, Vol 49, No 1, p 131-145, January, 1977. 4 fig, 13 tab, 16 ref.

Descriptors: *Phosphorus, *Activated sludge, *Aerobic digestion, Chemical treatment, Biological treatment, Suspended solids, Sludge treatment, Dewatering, Physical properties, Chemical properties, *Waste water treatment, Economics.
Identifiers: Alum, Phosphorus removal.

A study was conducted to determine the influence of phosphorus removal on the solids budget of an activated sludge plant equipped with aerobic digestion. Specific objectives were the determination of the quantity, solids content, digestibility, and dewatering properties of the excess sludge produced, and the determination of the effect of alum addition on solids transformations within the activated sludge and aerobic digestion processes. An 81% total phosphorus removal was achieved with liquid alum doses of 1.7 moles of aluminum/mole of influent phosphorus. The same system without any chemical addition produced a 27% phosphorus removal. Chemical-biological activated sludge processes gave 50% more excess sludge on a dry weight basis and 16% more excess sludge on a volumetric basis. There was a marked net conversion or solubilization of the solids and phosphorus components to a dissolved form. In the control this was greater than in the alum unit. Volatile and fixed dissolved solids in both units showed net productions, and total solids, total fixed solids and phosphorus seemed to be conserved in each. Similar material balances for aerobic digesters showed the alum-biological sludge to be less amenable to aerobic digestion, but the alum sludge thickened much better than the control sludge. Alum-biological sludge total suspended solids reduction was low at about 12%. It was concluded that the aerobic digestion of chemical-biological sludge would be best for sludge storage and thickening. Dewatering studies indicated that both sludges were amenable to conventional processes. Two stage aerobic digestion followed by basket centrifugation seemed to be the most economical means of dewatering for the alum-biological sludge. (Collins-FIRL)
W77-07032

THE USE OF POLYMERS FOR IMPROVING CHEMICAL SLUDGE DEWATERING ON SAND BEDS,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
J. T. Novak, and M. Langford.
Journal of the American Water Works Association, Vol 69, No 2, p 106-110, February, 1977. 13 fig, 3 tab, 8 ref.

Descriptors: *Dewatering, *Polymers, Drying, *Sludge treatment, *Waste water treatment, Solid wastes, Vacuum filters, Physical properties, Chemical properties, Economics.
Identifiers: Sand bed, Chemical sludges.

An evaluation was conducted of the effect of polymers on the improvement of sand bed dewatering of chemical sludges. Polymer conditioning was found to produce a sludge satisfactorily dewaterable on sand beds. Bed penetration was the condition which most frequently rules out sand bed use. Sludges of low cake solids and high specific resistance are considered most difficult to dewater by mechanical means, but they are susceptible to sand-bed dewatering. The long period needed for air drying makes other methods more economical for dewatering dense sludges such as lime-softened sludges. Most sludges with a substantial CaCO3 content have a relatively low resistance and can be dewatered by vacuum filter without added polymers. Specific characteristics of the sludge determine bed-surface requirements and the need for polymer conditioning. (Collins-FIRL)
W77-07033

TREATMENT OF COMBINED SEWER OVERFLOWS VIA THIN FILM CHEMISTRY,
New England Interstate Water Pollution Control Commission, Boston, Mass.
A. E. Peloquin, S. E. Poole, and F. K. Schauffler.
Journal Water Pollution Control Federation, Vol 49, No 2, p 206-215, February, 1977. 4 fig, 5 tab, 3 ref.

Descriptors: *Combined sewers, *Overflow, *Storm water, Water purification, Disinfection, Equipment, Polymers, Chlorine, Sludge disposal, *Waste water treatment, Costs, Rural areas, Septic tanks, Treatment, Ozone.
Identifiers: *Thin film chemistry, Sodium hypochlorite.

A new treatment system was described for combined sewer overflows and/or storm water discharges. Influent for the system is pumped from a manhole by two submersible screened-inlet pumps. It is discharged above the water line in a zone where mixing with lime and ferric chloride occurs. It is further mixed, an anionic polymer is added to aid floc growth, and then it is pumped into a high rate settler (HRS-1). Clarified waste water overflows to a flow equalization unit, and is pumped to a disinfection area, where it is disinfected by sodium hypochlorite using thin film technology. Disinfected waste water is pumped into HRS-2 and the effluent from HRS-2 is discharged into the river through a by-pass sewer. Sludge produced during treatment is discharged to the sewer line downstream of the influent manhole. This method is well-suited to treating overflows and an additional benefit would accrue from treating storm water mixed with the waste water. Cost reductions are expected from replacing chlorine with ozone, modifying chemical doses, and creating a new mixing system in the influent tank. Potential applications include treating small rural area waste water, septic tank pumpings, and holding tank wastes. (Collins-FIRL)
W77-07034

THE FABRIC-LINED PURIFICATION BASIN.
Journal of Coated Fabrics, Vol. 6, No. 3, p 137-138, January, 1977.

Descriptors: *Settling basins, *Linings, *Water purification, *Waste water treatment, Industrial wastes, Domestic wastes, Sewage effluents, Construction, Construction materials, Economics, Costs, Sealants, Roofing materials, *Plastics, *Treatment facilities.
Identifiers: Polyvinyl chloride(PVC), Diolen fabric.

The development of economical small and medium-sized waste water treatment facilities in Germany has become a major concern. This is primarily because waste water from nearly 50% of households and industries is still discharged unpurified. Excavated basins with feces-retaining membranes provide an economical solution to the problem. These basins may be covered or uncovered. Covered versions would allow placement nearer communities, thus eliminating expensive pipelines and odors, while providing a nonobjectional landscape. The prefabricated liner can be coated with polyvinyl chloride (PVC) as a sealant, and a PVC-coated high tenacity Diolen fabric can be used as a roofing material. (Collins-FIRL)
W77-07035

BACKWASHING OF GRANULAR FILTERS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. L. Cleasby, J. Arboleda, D. E. Burns, P. W. Prendiville, and E. S. Savage.
Journal of the American Water Works Association, Vol 69, No 2, p 115-126, February, 1977. 10 fig, 3 tab, 53 ref, 1 append.

Descriptors: *Filters, *Cleaning, *Filtration, *Waste water treatment, Sewage treatment, Design criteria, Soil filters, Treatment facilities, Water purification.
Identifiers: *Backwash techniques.

Known practices and associated concerns for the backwashing of granular filters were summarized. This has become a field of interest due to the growing variation of practices used in the United States and abroad. The use of backwash techiques requires an awareness of potable water filtration technology since some backwashing methods involve full or partial fluidization of the filter media. High-rate backwashing is with full-bed fluidization and 20-50% bed expansion. Backwashing methods include: high-rate backwash; low-rate backwash; water backwash with surface-wash auxiliary; water backwash with air auxiliary; air scour followed by low-rate backwash with single-medium filters only; air scour followed by high-rate water backwash with single and multimedia filters; simultaneous air scour and low-rate water backwash followed by low-rate water backwash alone for single-medium filters only; and simultaneous air scour and low-rate water backwash followed by high-rate water backwash alone with single and multimedia filters. The choice of backwash method is partially dependent upon the type of filter medium selected. The various methods were described and further research was recommended. (Collins-FIRL)
W77-07037

EVALUATION OF IN-LINE AND SIDE-LINE FLOW EQUALIZATION SYSTEMS,
Johnson and Anderson, Inc., Pontiac, Mich.
G. W. Foess, J. G. Meenahan, and D. Blough.
Journal Water Pollution Control Federation, Vol 49, No 1, p 120-130, January, 1977. 6 fig, 6 tab, 9 ref.

Descriptors: Flow characteristics, *Flow control, *Flow rates, *Waste water treatment, Costs, Evaluation, Biochemical oxygen demand, Suspended solids, Filters, Performance, Phosphorus, Organic loading, Sludge treatment.
Identifiers: *Flow equalization, Side-line equalization, In-line equalization.

Experiments were conducted to evaluate flow equalization waste water treatment systems. Flow equalization has been considered a means of improving treatment processes and potentially lowering costs. One plant studied used a side-line equalization system where only above average flow was diverted through the equalization basin; the other used ab in-line system where all plant flow passes through the equalization basin. Both were very effective in smoothing influent flow variations and producing a uniform flow rate to plant processes. Their effectiveness was limited in leveling concentrations. Mass leveling was more a result of flow equalization than waste water blending. A five percent BOD reduction was noticed in the in-line basin. Operational variables such as organic loadings, intensity, mixed liquor settleability, and wind and current densities were more important to effluent quality than flow equalization. Similarly, BOD5, suspended solids, and soluble phosphorus removals resulted with and without flow equalization. Filter performance with flow equalization was superior to that with a diurnal flow. Power cost estimates indicated a less than 2% increase with flow equalization. (Collins-FIRL)
W77-07041

SOME FACTORS AFFECTING FLOC FORMATION BY ZOOGLOEA RAMIGERA, STRAIN I-16-M,
Agricultural Univ., Wageningen (Netherlands). Dept. of Microbiology.
J. M. Krul.
Water Research, Vol 11, No 1, p 51-56, 1977. 7 fig, 1 tab, 13 ref.

Descriptors: *Flocculation, *Activated sludge, *Salts, *Growth rates, *Bacteria, Sewage treatment, *Waste water treatment, Biological treatment, Sludge treatment, Treatment.
Identifiers: *Zoogloea ramigera.

Studies were conducted to determine factors which influence floc formation by Zooglea ramigera because it was long considered the major floc-forming organism of activated sludge. Floc formation was studied after resuspending pre-cultivated cells in fresh medium. The addition of NaCl or Na2HPO4/NaH2PO4 stimulated floc formation. FLocs of highly active cells were achieved because formation occured within 1-2 hours. Results of this study indicated that adding CaC12 or Na2SO4 to fresh medium with resuspended precultivated cells has no effect on floc formation. No explanation was found for the stimulation differences. Stimulated cell aggregation after resuspension of pregrown strain I-16-M cells was not generally characteristics of floc-forming bacteria. Ten floc forming strains, isolated from activated sludge and tested in the same manner, similarly failed to exhibit strongly stimulated cell aggregation. (Collins-FIRL)
W77-07042

THE EFFECT OF HIGH PURITY OXYGEN ON THE ACTIVATED SLUDGE PROCESS,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
L. D. Benefield, C. W. Randall, and P. H. King.
Journal Water Pollution Control Federation, Vol 49, No 2, p 269-279, February, 1977. 17 fig, 1 tab, 12 ref.

Descriptors: Analytical techniques, *Model studies, *Kinetics, *Activated sludge, *Oxygen, Air, Sludge treatment, Microorganisms, Growth rates, Treatment facilities, *Waste water treatment, Suspended solids, Evaluation.
Identifiers: Biochemical analysis, Substrate utilization.

An experimental design was developed to provide a valid comparison of substrate utilization and growth kinetics between air and oxygen activated sludge systems operated over a range of sludges found in normal plant operation. This design also included a biochemical analysis of sludge at various specific growth rates. Research indicated that differences in substrate utilization and cellular growth values for the two activated sludge systems occur when accepted methods are used for coefficient evaluation. The kinetic differences of the systems are due to the operational characteristics associated with small volume, high solids systems normally used with oxygen-aerated facilities. The failure of the volatile suspended solids test to distinguish between proliferating, active but non-proliferating, and inactive cellular material also contributes to this kinetic difference. (Collins-FIRL)
W77-07043

DRUGS AND DRUG METABOLITES AS ENVIRONMENTAL CONTAMINANTS: CHLOROPHENOXYISOBUTYRATE AND SALICYLIC ACID IN SEWAGE WATER EFFLUENT,
Veterans Administration Hospital, Kansas City, Mo.
For primary bibliographic entry see Field 5A.
W77-07045

PLANT DATA ANALYSIS OF TEMPERATURE SIGNIFICANCE IN THE ACTIVATED SLUDGE PROCESS,
New Brunswick Univ., Fredericton. Dept. of Civil Engineering.
K-C. Lin, and G. W. Heinke.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 286-295, February, 1977. 4 fig, 3 tab, 18 ref, 1 append.

Descriptors: *Temperature, *Activated sludge, Design criteria, Performance, Evaluation, Treatment facilities, Biochemical oxygen demand, Suspended solids, Sedimentation, Aeration, *Waste water treatment, Monitoring, Illinois, Canada.
Identifiers: Chicago(IL), Toronto(Canada).

Research was conducted to determine the importance of temperature in the activated sludge process, to demonstrate the effect of temperature on activated sludge performance, and to evaluate the use of temperature data in the design and control of activated sludge. Data was gathered from plants in Chicago and Toronto. Results indicated that temperature was second to raw waste water BOD5 and suspended solids concentrations in explaining BOD5 and suspended solids removals. Analysis of 26-year plant data proved the adverse effects of low temperature on activated sludge performance. The effect of temperature on primary sedimentation alone has not been determined. A larger aeration tank volume is needed with low temperatures. Reactor volume varies inversely as the square root of reaction rate. Temperature drops may occur in process water in primary and secondary settling tanks, but a maximum temperature can be found in aeration tanks when hot compressed air is used. Raw waste water temperature should be monitored continuously, as well as mixed liquor temperature. Temperature control would increase BOD5 removal. The use of hot compressed air in diffused aeration is preferred to mechanical surface aeration for maintaining high mixed liquor temperatures. (Collins-FIRL)
W77-07046

THE CHEMICAL CHARACTERISTICS OF THE CITY OF WINNIPEG WASTE WATER,
Winnipeg Waterworks, Waste, and Disposal Div. (Manitoba).
For primary bibliographic entry see Field 5A.
W77-07047

STUDY ON SEWAGE FLOW DYNAMICS THROUGH DORR TYPE CLARIFIER ON STREAM, (SYNOPSIS),
Technical Univ. of Warsaw (Poland). Inst. of Chemical Engineering.
A. Selecki, K. Zwolinski, A. G. Chmielewski, S. Babczynski, and K. Wild.
Chemie Ingenieur Technik, Vol. 49, No. 1, p 67, 1977. 2 fig, 3 ref.

Descriptors: Flow characteristics, *Dynamics, *Flow separation, *Sewage treatment, Tracers, Separation techniques, *Waste water treatment, Model studies, Effluents.
Identifiers: *Dorr type clarifier.

Results were presented from flow dynamics research with a Dorr type clarifier. With this apparatus, sewage enters a middle column under the liquid surface, sludge exits via outlets at the column bottom, and clear fluid reaches the sewer through the overflow. Radioactive tracers were added to the stream by an impulse method. Dynamic characteristics were studied by observations of residence time distribution function in response to the introduced pulse. Flow models were developed for an overcharged clarifier and for a normally charged clarifier. With an overall sewage flow rate of 750 cu m/hour, the clear liquid flow is nearly equal to plug flow with the occurrence of a sludge short circuit. No short circuiting occurred in the overcharged flow model. This may

be due to the fact that, at the given flow rate, streams outflowing from the diffusion cells in the column have significantly greater energy when compared to that at a flow rate of 451 cu m/hour. Experiments were conducted under severe conditions with results which were debatable. However, they may be considered a useful diagnostic method. (Collins-FIRL)
W77-07048

PHOSPHATES IN SOILS TREATED WITH SEWAGE WATER: I. GENERAL INFORMATION ON SEWAGE FARM, SOIL, AND TREATMENT RESULTS,
Agricultural Univ., Wageningen (Netherlands).
For primary bibliographic entry see Field 5G.
W77-07052

PHOSPHATES IN SOILS TREATED WITH SEWAGE WATER: II. FRACTIONATION OF ACCUMULATED PHOSPHATES,
Agricultural Univ., Wageningen (Netherlands).
For primary bibliographic entry see Field 5B.
W77-07053

PHOSPHATES IN SOILS TREATED WITH SEWAGE WATER: III. KINETIC STUDIES ON THE REACTION OF PHOSPHATES WITH ALUMINUM COMPOUNDS,
Agricultural Univ., Wageningen (Netherlands).
For primary bibliographic entry see Field 5B.
W77-07054

UNDERFLOW FROM SLUDGE-IRRIGATED CROPLAND,
Springfield Sanitary District, Ill.
For primary bibliographic entry see Field 5B.
W77-07056

AGRICULTURAL DISPOSAL OF AEROBIC WASTEWATER SLUDGES IN AN URBAN COUNTY,
Clermont County Water and Sewer District, Batavia, Ohio.
A. B. Clark.
Deeds and Data, p D-1, D-8, D-9, January, 1977.

Descriptors: *Sludge disposal, *Fertilizers, Odor, Agricultural chemicals, Crops, Farms, Equipment, Waste water treatment, Sludge treatment, Aerobic treatment, *Ohio, Waste disposal.
Identifiers: Clermont County(OH).

Agricultural disposal of aerobic sludges in Clermont County, Ohio, was reviewed. The county is rapidly developing from a rural area to a suburban one, mainly in the western portion. The eastern area is still largely agricultural. Gaining the acceptance of farmers for the use of their lands is a major obstacle. Once their concern for their property is allayed, the economics of commercial fertilizer use makes sludge application an attractive alternative. Any odor problem with this sludge type is relatively negligible, but application near the farmhouse is generally avoided. It is suggested that application be made first to grass crops because of the high nitrogen and water content which produces rather dramatic improvements. The most satisfactory application system developed involved using a rain gun designed for agricultural irrigation. It is mounted on a two wheel trailer and fitted with a 3.2 centimeter orifice. The gun throws a full or part circle and the sludge is evenly distributed. Four to twelve 7.5 cu m loads may be discharged in one setting. The system has been used on dry frozen fields after crop removal, wet fields in the process of thawing, soggy pasture land, dry plowed fields, and fields of growing corn. No indication of herbicide failure has been noticed. (Collins-FIRL)
W77-07057

CONDITIONING AND LAND APPLICATION OF AEROBICALLY DIGESTED SLUDGE,
Montgomery County Sanitary Dept., Dayton, Ohio.
T. Yates.
Deeds and Data, p D2-D-3, January, 1977.

Descriptors: *Sludge disposal, *Sludge digestion, *Aerobic treatment, Metals, Liquid wastes, Economics, Equipment, Soil disposal fields, Waste water treatment, *Ohio, Waste disposal.
Identifiers: Montgomery County(OH).

Many consider sludge conditioning and disposal to be the most difficult phases of waste water treatment. This is especially true of aerobically digested sludge. More efficient plants and increased industrial sludges add to the problem, as does the refusal of farmers and land owners to allow sludge application because of concern over metals and other sludge components. It is usually the most expensive portion of treatment, involving collection, transportation, procesing, and final disposal. Gravity thickening of sludge is the most common process used in treatment plants. It is simple and inexpensive, unless there is a great distance to be traveled to the disposal site. The sludge produced is not as highly concentrated as that from other processes, causing more sludge to be transported. Most of the conditioning is done by wasting sludge gravity flow or pumping to aerobic digesters. The operation at the Montgomery County, Dayton, Ohio, plant was described. Because the plant has no sludge thickening equipment, polymers were added to a secondary settling tank to concentrate waste sludge. Methods of land application for sludge were discussed. Tank trucks may be used for transporting the sludge and spreading it on plowed farm land and pasture land, or it may be pumped from the side through a hose onto the land, if the area is not too wet to drive upon. A tractor with a vane-type vacuum-pressure pump can be used if disposal land is located near the treatment plant. More research was proposed to develop improved methods and equipment for sludge disposal. (Collins-FIRL)
W77-07058

ELIMINATION OF ANAEROBIC DIGESTER SUPERNATANT,
Envirex, Inc., Milwaukee, Wis.
N. A. Mignone.
Water and Sewage Works, Vol. 124, No. 2, p 48-49, February, 1977. 1 fig, 1 tab, 6 ref.

Descriptors: *Sludge digestion, *Anaerobic digestion, *Design criteria, *Sewage effluents, Sludge treatment, Dewatering, Heat treatment, Mechanical equipment, Treatment facilities, Separation, *Waste water treatment.

Secondary digesters are used to provide solid-liquid separation, thus reducing downstream sludge handling cost. Primary high rate anaerobic digestion combined with mechanical sludge dewatering may be more expedient. Present design practices produce a supernatant liquid stream that has a relatively poor quality. It has been felt that elimination of secondary digesters, and substitution of the above method, would not be detrimental to the treatment process. High rate anaerobic digestion and mechanical dewatering would not produce a variable supernatant stream, but one having a low solids content treatable by recycling to the influent of the secondary treatment process. Storage facilities to handle excess mechanical dewatering capacity would be unnecessary and primary digesters would provide enough non-sludge dewatering storage by using floating covers. Less land would be required. Raw sludge could be dewatered easily if the primary digester failed and a constant, predictable cake concentration would be produced for ultimate sludge disposal. (Collins-FIRL)
W77-07059

DESIGN CRITERIA FOR WASTE WATER AERATOR DRIVES,
P. Van Gelder.
Water and Sewage Works, Vol. 124, No. 1, p 66-69, January, 1977. 1 fig, 2 tab.

Descriptors: *Design criteria, *Aeration, Mechanical equipment, *Aerobic treatment, *Oxygenation, Water quality control, Treatment facilities, Legislation, Electrical equipment, Design, Corrosion control, *Waste water treatment.
Identifiers: *Aerator drives.

Because of stricter pollution control laws, industrial firms are beginning to develop new water treatment facilities with technology often beyond their normal spheres of operation. One important area is that of aerator drives. Mechanical aerators oxygenate ponded waste water to quicken aerobic digestion. Two basic aerator types are the fixed-platform and the floating aerator. An engineering survey is necessary to determine the one best suited for any application. Several considerations are presented, although the most important is the definition of application conditions. It has been found that a totally enclosed fan-cooled motor is the only one suited for aerator drives. Concern should be given to the choice of voltage, factors of insulation and service, corrosion-proofing, and other protective devices. The latter include temperature and overload protectors, condensation protection, and vibration protection. Safety factors relative to motor operation require that lifting devices withstand forces five times the weight of the motor; that excessive motor speeds be eliminated; and that there is proper grounding. Various factors affecting gear reducer and driver operation were considered, including gear case design, lubrication, and loading. (Collins-FIRL)
W77-07060

PURIFYING WATER,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
In: CSIRO (Australia) Annual Report, No. 28, p 37-40, 1975/76. 2 fig.

Descriptors: *Water quality, *Water purification, *Water reuse, *Polymers, *Chemical treatment, Desalination, Sewage effluents, Industrial wastes, Heat treatment, Ion exchange, Resins, Pollution abatement, *Waste water treatment, *Australia, Water treatment.

Australian needs to purify water of poor quality for domestic and industrial use are expected to become urgent in the next 10 years. Desalination will be one of the processes used on a large scale for this purpose. Water from sewage and industrial effluents will also be recycled. Investigations are being made to study the use of polymers in water purification. Desalination with heat-regenerable resins used with polymer particles was thought to be economical, but micro-particles caused some handling problems. Techniques have been developed for the combination of acidic and basic micro-particles into conventional-sized composite beads which can be handled normally. Resins have successfully reduced water salt content from 3000 milligrams/liter to as low as 50-100 milligrams/liter. A desalination plant at Adelaide removes 80% of water salinity and produces 600 cubic meters of purified water per day. Modified polymers have been used for a great range of ion-exchange processes. Bicarbonate, calcium, magnesium ions, and heavy metals have been removed by these processes and they have been used to soften and decolor water. The use of resins has made possible a relatively continuous purification process since they are added at one end of a column and withdrawn and regenerated at the other. Magnetic polymers have been used as filter aids. Physical and chemical treatment processes studied include the use of lime treatment, ammonia stripping with air, coagulation with iron salts, sand filtration, chlorine disinfection, and activated carbon treatment. (Collins-FIRL)

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W77-07061

UPGRADING BIOLOGICAL SEWAGE TREATMENT PLANTS TODAY,
Environmental Science and Technology, Vol. 11, No. 2, p 124-125, February, 1977.

Descriptors: *Treatment facilities, *Biological treatment, *Municipal wastes, *Chemical treatment, Aerobic treatment, Anaerobic conditions, Sludge digestion, Alkalinity, Hydrogen ion concentration, Nitrification, Lime, Settling basins, *Waste water treatment.
Identifiers: Sodium bicarbonate, Alum, Sodium hydroxide, Buffering.

Sodium bicarbonate has become a viable treatment chemical alternative. It is useful in adjusting pH, providing reserve alkalinity, and increasing efficiencies of aerobic and anaerobic processes. In a water treatment plant it can be added at any point giving access to the system. In secondary treatment plants, it can be added at the influent inlet of an aerobic system, at the primary settling tanks, or at the vacuum break of a digester. Sodium bicarbonate is most useful in plants with 5 mgd flow with mostly low pH or acidic wastes. The treatment is uneconomical with facilities having a flow less than this. It is safe to handle, a natural buffer, and cannot be overdosed. No amount of dosing produces a pH greater than 8.1 to 8.3. Sodium bicarbonate was not widely used in municipal sewage treatment because lime, alum, and other chemicals had been successful over the years. With stricter requirements for effluent quality and monitoring, evaluation of sodium bicarbonate and its subsequent use increased. The relative ease and safety of sodium bicarbonate use make it an attractive alternative, especially where pH levels above 6.5 are required. (Collins-FIRL)
W77-07062

STABILISATION LAGOONS INCLUDING EXPERIENCE IN BRAZIL. PART 1,
R. M. Bradley, and M. O. S. Alvares Da Silva.
Effluent and Water Treatment Journal, Vol. 16, No. 12, p 619-622, 624-625, December, 1976. 1 fig, 6 tab, 40 ref.

Descriptors: *Design criteria, *Oxidation lagoons, *Aerated lagoons, *Anaerobic treatment, *Aerobic bacteria, Sewage lagoons, Photosynthesis, Sludge treatment, *Waste water treatment, Industrial wastes, Methane, Temperature, Hydrogen ion concentration, Biological treatment.
Identifiers: Aerobic lagoons, Facultative lagoons, Polishing lagoons.

Design criteria for stabilization lagoons are summarized. Under discussion are anaerobic, aerobic facultative, aerated, and polishing lagoons. Because numerous factors are involved in algal-bacterial processes, a rational design procedure is difficult to establish and many different methods are used. Principal factors which affect anaerobic lagoon purification efficiencies are temperature, pH, liquid detention time, and solids retention. Efficient methane production is ensured in a pH range of 6.8 to 7.2; BOD reduction is usually about 50% to 70%. The use of aerobic lagoons requires a knowledge of the density of algal cells and a method of relating oxygen production to light conversion efficiency and light intensity. A rational design procedure has been developed specifically for aerobic lagoons. Falcultative lagoons achieve purification of organic wastes by aerobic and anaerobic processes in inter-related reactions, and many are designed on the basis of organic loading rates. Polishing lagoons are designed on the basis of detention time for the purpose of improving effluent which has received a high degree of purification by previous biological treatment. Increased algal growth and higher suspended solids levels and turbidity in the final effluent must be balanced against the increased reduction of bacteria and viruses resulting from longer detention times. Specific design criteria, based on experience with stabilization lagoons, were presented. (Collins-FIRL)
W77-07063

THE CURRENT ROLE OF WASTEWATER DISINFECTION,
K. L. Murphy.
Water and Pollution Control, Vol. 115, No. 1, p 13-16, 36, January, 1977. 5 fig, 4 tab.

Descriptors: *Disinfection, *Waste water treatment, *Municipal wastes, *Chlorination, Coliforms, Pathogens, Water utilization, Infection, Environmental sanitation, Ammonia, Organic compounds.
Identifiers: Hypochlorous acid, Amino groups.

Disinfection has become a unit process in municipal waste water treatment, primarily because of the success of chlorination. This process reduces disease-causing enteric pathogens which would otherwise impair potable water sources, shellfish harvesting areas, and recreational resources. The number of coliforms in water for certain uses has been limited by law. Studies have been conducted to determine the relationship of water quality to risk of infection, but no concise conclusions have been drawn. In addition to chlorine, hypochlorous acid (hypochlorite ion), which reacts with ammonia and amino groups to form chloramines, is also used as a disinfectant. Studies relating to disinfection of waste water by these substances and their effects on pathogenic organisms are reviewed. Because effluent toxicity may be increased by chlorination, careful monitoring should determine whether overall benefits exceed negative environmental effects. (Collins-FIRL)
W77-07064

FUEL GAS AND ELECTRICITY FROM MUNICIPAL SEWAGE,
R. D. Bargman, and J. M. Betz.
In: Symposium on Clean Fuels from Biomass, Sewage, Urban Refuse, and Agricultural Wastes, January 27-30, 1976, Orlando, Florida, p 115-121. 4 tab.

Descriptors: *Fuels, *Methane, *Gases, *Activated sludge, Sludge treatment, *Biological treatment, Methane bacteria, Energy, Electricity, Treatment facilities, Microorganisms, *Waste water treatment, California.
Identifiers: Hyperion Treatment Plant, Los Angeles(Calif).

Methane gas can be a useful by-product of activated sludge treatment. This aspect of waste water treatment has gained interest since a federal law now requires secondary treatment of waste water before disposal. Methane gas is formed by a biological process during which micro-organisms decompose organic matter during sludge treatment. The City of Los Angeles, California, operates the Hyperion Treatment Plant which has produced methane by this process for 25 years. In this, as in most instances, methane gas production is insignificant in comparison to community needs, but is usually quite enough to operate machinery at the plant with the possibility of some excess as production. In addition to providing gas for diesel engines for driving compressors or producing electricity, this plant also provides energy for the start-up process of a nearby power plant in emergency cases. The total electrical energy produced by the plant is 140,000 kwh/day at a cost of $.0120/kwh. The gas produced contains 65% methane and 35% carbon dioxide and provides about 94% of the fuel requirements of the plant's diesel engines. (Collins-FIRL)
W77-07065

SHORT COURSE PROCEEDINGS: APPLICATIONS OF STORMWATER MANAGEMENT MODELS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-07066

EXPERIENCE IN TREATING WASTE WATERS FROM THE DONETSK MINES, (IN RUSSION),
Donetsk Municipal Sanitation Epidemiology Station (USSR).
V. I. Solov'ev, N. V. Grin', E. A. Rodoshkevich, and I. I. Maiboroda.
Gig Sanit 3, p 95-97, 1976.

Descriptors: Bacteria, *Waste water treatment, Mines, Settling basins, Filters, Electrolysis, Electrothialysis, *Mine wastes, Water pollution.
Identifiers: *Donetsk(Ukranian SSR), USSR.

Means of treating the 173,000 m3 daily waste water discharge containing bacteria from the Donetskugol' mines into the open reservoir of the city of Donetsk (Ukrainian SSR, USSR) are described. In the past 10 yr an extensive project was completed to replace horizontal settling basins with fountain ponds, rock filters, underground pressurized sand filters with electrolysis and an electrodialysis installation. Laboratory tests conducted between 1962-73 indicated substantial progress in reducing suspended particles in the Donetsk discharge waters.--Copyright 1977, Biological Abstracts, Inc.
W77-07068

HYGIENIC EFFECTIVENESS OF MEASURES FOR DECONTAMINATING EFFLUENTS AT PETROCHEMICAL PLANTS, (IN RUSSIAN),
Kazanskii Gosudarstvennyi Meditsinskii Institut (USSR).
F. F. Dautov.
Gig Sanit 4, p 102-103, 1976.

Descriptors: *Waste water treatment, Public health, *Industrial wastes, Water purification, Effluents, Chemical wastes.
Identifiers: *USSR(Kazan), *Petrochemical wastes.

The achievements of improved purification methods at Kazan Plant of Organic Synthesis (USSR), which include changes in technical processes, utilization of effluents and closed water cycles are outlined.--Copyright 1977, Biological Abstracts, Inc.
W77-07069

ADVANCED WASTE TREATMENT SEMINAR SESSION III, REMOVAL OF SOLIDS AND ORGANICS, HELD AT SAN FRANCISCO, ON OCTOBER 28-29, 1970.
Federal Water Quality Administration, San Francisco, Calif. Pacific Southwest Regional Office.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 050 Price codes: A04 in paper copy, A01 in microfiche FWQA Report, (1970). 69 p, 23 fig, 5 tab, 31 ref.

Descriptors: *Conferences, *Solids contact processes, *Design criteria, *Organic matter, Separation, Sedimentation, Filtration, Performance, Economics, Sludge treatment, Sludge disposal, Waste treatment, Waste disposal, Oxidation, Dewatering, Chemical treatment, Activated carbon, Oxygen, Oxygenation, Treatment, *Waste water treatment.

A report of a seminar on the removal of solids and organics in waste treatment was presented. Design criteria were presented for removal processes such as horizontal and vertical-upflow sedimentation tanks, and tube and lamella settlers. Dissolved air flotation, screening devices, in-depth filtration, ultrafiltration, and activated sludge processes

were evaluated from performance and economic viewpoints. New developments in sludge handling and disposal were discussed, including ocean and land disposal, disposal of organic sludge, wet sludge treatment, oxidation, dewatering, and chemical treatment. Activated carbon treatment and the use of pure oxygen in solids removal were also evaluated. (Collins-FIRL)
W77-07074

ADSORPTION, COAGULATION AND FILTRATION MAKE A USEFUL TREATMENT COMBINATION-PART 2,
Rensselaer Polytechnic Inst., Troy, N.Y.
L. K. Wang, R. G. Ross, and V. J. Ciccone.
Water and Sewage Works, Vol. 124, No. 1, p 32-36, January, 1977. 2 fig, 5 tab, 17 ref.

Descriptors: *Waste water treatment, *Adsorption, *Coagulation, *Filtration, *Domestic wastes, Domestic water, Activated carbon, Polyelectrolytes, Sludge, Design criteria, Treatment.

The use of a mobile water purification unit in waste water treatment has been investigated. The unit combines adsorption, coagulation, and filtration processes. In testing, the mobile unit was adapted for treatment of kitchen, field laundry, and shower waste waters. The unit contained three 1500 gallon collapsible storage tanks and one blending tank of the same capacity for waste water equalization. Treatment also involves using powdered activated carbon, polyelectrolytes, sludge concentration, and a diatomite filter. Another change made was the use of the raw water pump for pumping waste water from the mixing tank to the Erdlator (upflow clarifier) tank. The unit was designed for transport on rotary and fixed-wind aircraft and general purpose lightweight ground vehicles. Each waste water stream was individually treated before combined treatment proceeded. Treatment results indicated turbidity removal of 99.9%, BOD removal of 81%, and TOC removal of 92%. (Collins-FIRL)
W77-07077

ANAEROBIC FILTER TREATS WASTE ACTIVATED SLUDGE,
Loyola Univ., Los Angeles, Calif.
R. T. Haug, S. K. Raksit, and G. G. Wong.
Water and Sewage Works, Vol. 124, No. 2, p 40-43, February, 1977. 4 fig, 4 tab, 8 ref.

Descriptors: *Filters, *Anaerobic conditions, *Heat treatment, *Dewatering, Sludge treatment, Sludge disposal, Solid wastes, Pollution abatement, Disposal, Sewage effluents, Suspended solids, Activated sludge, *Waste water treatment, California.
Identifiers: Los Angeles(Calif).

The State of California has ruled against ocean disposal of waste water solids. The City of Los Angeles has studied alternate disposal schemes including treatment of liquors from thermal conditioning of waste activated sludge by anaerobic filters. This process involved thickening sludge and subjecting it to thermal conditioning at 350 F for about 30 minutes. As much as 60-70% of suspended solids were solubilized, producing a solids content of about 1.2% after conditioning. A 9% sludge was obtained with dewatering characteristics that produced a 40% cake after centrifuging without chemical additions. Thermal conditioning entailed several problems: odor control; corrosion and organic fouling of heat exchanger tubes; the need for heat energy; and necessary treatment of the decanted liquor and centrate (heat treated liquor) before disposal. The anaerobic filter was investigated for treatment of this liquor. The reactor provides an upward fluid flow through a fixed media bed. Very short hydraulic detention times and long solids retention time can be maintained easily. It cannot handle wastes with high concentrations of suspended solids. Because this heat treated liquor has low solids concentrations, it was well-suited for the process. Results indicated 85% BOD removals and 76% COD removals with a 2-day hydraulic detention time; methane production would off-set much of the process energy requirement; and disposal by heat treating, followed by dewatering and thickening with anaerobic filter treatment of the liquor, is a promising disposal method. Further research, however, is necessary. (Collins-FIRL)
W77-07078

LAND APPLICATION OF SEWAGE SLUDGE: IV. WHEAT GROWTH, N CONTENT, N FERTILIZER VALUE, AND N USE EFFICIENCY AS INFLUENCED BY SEWAGE SLUDGE AND WOOD WASTE MIXTURES,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
B. R. Sabey, N. N. Agbim, and D. C. Markstorm.
Journal of Environmental Quality, Vol. 6, No. 1, p 52-58, January-March, 1977. 3 fig, 4 tab, 18 ref.

Descriptors: *Sewage disposal, *Wheat, *Wood wastes, *Nitrogen compounds, Soil contamination, Water pollution, Growth rates, Organic matter, Inorganic compounds, Sludge disposal, *Waste water treatment, Fertilizers, Sewage sludge.
Identifiers: Land disposal.

A study was conducted to measure several parameters involving digested sewage sludge and wood waste materials and land application. These included total N and NO3-N in wheat and total N, NH4-N, and NO3-N in soil after wheat harvesting. Inorganic fertilizer was added, with and without the organic matter, to aid evaluation of fertilizer potential of various rates and mixtures of organic materials on greenhouse-grown wheat. Four rates of sewage sludge and wood wastes, ranging from 22.4 to 224 metric tons/hectare, were used. Every mixture but 50% bark-50% sludge increased wheat growth. Greatest growth occurred at the 224 metric ton rate with 50% wood-50% sludge, 25% bark-75% sludge, and 25% wood and bark-75% sludge. Highest application rates of 100% sludge, 25% wood-75% sludge and 50% bark-50% sludge caused less growth than the next lower application rates. Equations were derived to express the relationship between wheat growth and N content in the plant tissue. Amounts of total N, NH4-N, and NO3-N remaining in greenhouse pots after harvest usually increased as the application rates of treatment increased. Care was suggested for application of 112 and 224 metric tons/hectare of 100% sludge and 25% wood-75% sludge, and 224 metric tons/hectare of 25% wood and bark-75% sludge due to possible NO3-N accumulation and groundwater pollution. Ammonium N did not accumulate excessively. Estimations were that 2 to 22.7% initial N was taken up by plants during the study period of 50 days. (See also W76-10841) (Collins-FIRL)
W77-07079

APPLICATION OF MUNICIPAL REFUSE AND LIQUID SEWAGE SLUDGE TO AGRICULTURAL LAND: II. LYSIMETER STUDY,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
L. D. King, A. J. Leyshon, and L. R. Webber.
Journal of Environmental Quality, Vol. 6, No. 1, p 67-71, January-March, 1977. 1 fig, 6 tab, 6 ref.

Descriptors: *Waste disposal, *Sludge, *Liquid wastes, Wastes, *Lysimeters, Nitrogen compounds, Municipal wastes, Nitrogen compounds, Leachates, Denitrification, Chemical oxygen demand, Oxygen demand, *Waste water treatment, Anaerobic conditions, *Water reuse, *Sewage sludge.
Identifiers: Land disposal.

A lysimeter study was conducted to determine whether agricultural land could be simultaneously used for waste disposal-utilization and crop production. Liquid sewage sludge and unsorted, pulverized municipal refuse was used. Refuse was applied at 188 metric tons/hectare and a 2.3 centimeter depth of sewage sludge was applied separately and in combination. A double refuse-sludge rate and a control treatment were also studied. Results partially confirmed the assumption that the addition of refuse to sludge would create a C/N ratio which would allow enough N mineralization for crop growth but prevent excess leaching loss of NO3-N. Compared to the sludge treatment, the combined treatment reduced NO3-N by 33% and the refuse treatment caused leaching of NO3-N equal to that of the control situation. Refuse treatment produced 43% more total corn yield than the control and released more nitrogen than the leachate data suggested. There was no significang difference between refuse and control treatment soil nitrate levels. The soil environment limited NO3-N formation and favored denitrification in the combined treatment area, explaining the lack of significant NO3-N leaching in the test. COD levels were high and the leachate had a septic odor, indicating anaerobic conditions in the lysimeters from the high oxygen demand of decomposing organic material. The amount of NH4-N leached also supported this conclusion. Though the combined treatment is not a short term pollution problem relative to NO3-N, highleachate COD and high Zn and Cd levels in plant material suggest this land application of refuse alone or in combination with sludge is an acceptable utilization/disposal method. (Collins-FIRL)
W77-07080

THE ELECTROLYTIC RESPIROMETER-II. USE IN WATER POLLUTION CONTROL PLANT LABORATORIES,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. C. Young, and E. R. Baumann.
Water Research, Vol 10, No 12, p 1141-1149, 1976. 5 fig, 5 tab, 12 ref.

Descriptors: *Respiration, *Electrolysis, *Oxygen demand, *Oxygen requirements, *Biochemical oxygen demand, Evaluation, Pollution abatement, Nitrification, *Waste water treatment, Industrial wastes, Biodegradation, *Pollutant identification.

A study was conducted to determine the suitability of the electrolytic respirometer for in-plant BOD measurement, to evaluate its advantages, disadvantages, and range of use beyond single-point BOD measurement, and to collect electrolytic BOD data for comparison with standard dilution method BOD measurements. The study was in three parts, coinciding with these objectives. Conclusions and recommendations developed from resultant data were that the electrolytic respirometer provides reliable and precise measurement of BOD and should be accepted by pollution control agents as a supplement to or substitute for standard dilution; that data from a 3-day, 20 C electrolytic BOD test period are equal to that of a 5-day standard 20 C dilution test; that the ease of obtaining the complete BOD curve is a major advantage and helpful in evaluating industrial waste biodegradability; and that nitrification control should be a standard practice in BOD measurements conducted by any method. (Collins-FIRL)
W77-07081

PROCESS TECHNOLOGICAL BACKGROUND REGARDING NEW PROTECTIVE REGULATIONS OF WATER BODIES-RESULTS OF NITRIFICATION AND PHOSPHORUS ELIMINATION EXPERIMENTS IN ZURICH AND BERN. III. FILTRATION BY FLOCCULATION FOR THE ELIMINATION OF PHOSPHORUS FROM COMMUNAL WASTE WATER (VERFAHRENSTECHNISCHE UNTERLAGEN IM HINBLICK AUF DIE NEUEN GEWAESSERSCHUTZANFORDERUNGEN-ERGEBNISSE DER VERSUCHE UEBER DIE

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NITRIFIKATION UND PHOSPHORELIMINATION IN ZUERICH UND BERN. III. FLOCKUNGSFILTRATION ZUR ELIMINATION VON PHOSPHOR AUS KOMMUNALEM ABWASSER),
M. Boller.
Gas-Vasser-Abwasser, Vol 56, No 11, p 615-622, 1976. 15 fig, 4 tab, 11 ref.

Descriptors: *Filtration, *Flocculation, *Phosphorus, Analysis, Suspended solids, Costs, Cost-benefit ratio, *Waste water treatment, Performance, Evaluation, Filters, Design, Nitrification.

Advanced phosphorus removal process combinations with contact filtration as the last stage were evaluated in pilot scale experiments. The study indicated that contact filtration is especially feasible in the intake areas of lakes which are heavily loaded with phosphorus due to large point sources. The combination of contact filtration with other processes leads to very low phosphorus and suspended solids concentrations, averaging 0.1-0.4 milligrams/liter (phosphorus) and 0-5 milligrams (dry solids). An approximate calculation of annual costs for various phosphorus elimination processes and the annual costs per personn for contact filtration combined with simultaneous precipitation indicated that they were about equal to those of a pH 9 post-precipitation system. More stable elimination performance and lower sensitivity to hydraulic shock loads are added advantages which shift the cost-benefit effect further in favor of contact filtration. Conclusions are reached concerning the design of contact filters for waste water treatment. (Collins-FIRL)
W77-07082

TRENDS IN SLUDGE TREATMENT AND DISPOSAL PRACTICES IN THE UNITED STATES,
Municipal Environmental Research Lab., Cincinnati, Ohio.
J. B. Farrell.
In: Polish/U.S. Symposium on Waste Water Treatment and Sludge Disposal, February 10-12, 1976, Cincinnati, Ohio, EPA Environmental Research Center, Cincinnati, Vol 2, p 11-17. 1 tab, 11 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Waste water treatment, *Environmental sanitation, Groundwater, Water pollution, Landfills, Sewerage, Incineration, Planning, Heavy metals, Standards, Fuels.
Identifiers: Ocean disposal, Composting, Pyrolysis.

Sludge disposal in the United States was a nuisance situation resulting from waste water treatment. Until recently, most sludge treatment procedures and equipment were borrowed from existing technology with little need for innovation. No standards were developed for sludge treatment which were comparable to those of waste water treatment. Cost has been the greatest factor in sludge treatment and disposal. This situation has begun to change. Several factors which now influence disposal include: process considerations, disposal choice, site and related circumstances, and ecological considerations. Protection and conservation have become major factors in treatment and disposal during the past decade. Oceans, as well as communities, must be protected from environmental dangers of improper disposal. Odor, particulate discharge, and groundwater pollution must be controlled or eliminated. Proper safeguards should be developed relative to incineration and landfilling. Resource conservation must also be emphasized. Efforts are underway to develop methods for control of sludge composition in sewers and landfills, incinerator standards for heavy metals, and fuel conservation in sludge treatment processes. The future seems to indicate discontinued ocean disposal, coincineration and copyrolysis with solid wastes, conversion of sludge to other forms, and improved beneficial land disposal methods. (Collins-FIRL)
W77-07083

COMPOSTING OF SEWAGE SLUDGE AND SOLID WASTE MATTER,
Department of Waste Water Technology and Sludge Disposal, Warsaw (Poland). Local Economy and Environment Protection.
J. Cebula.
In: Polish/U.S. Symposium on Waste Water Treatment and Sludge Disposal, February 10-12, 1976, Cincinnati, Ohio, EPA Environmental Research Center, Cincinnati, Vol 2, p 18-32. 5 fig, 4 tab, 28 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Solid wastes, *Industrial wastes, *Municipal wastes, *Domestic wastes, *Heavy metals, Trace elements, Environmental sanitation, Organic matter, Analysis, *Sewage sludge.
Identifiers: *Composting, *Gluszyca(Poland).

Textile and chemical sludges were composted with municipal solid wastes at the Gluszyca, Poland, treatment plant to determine the value of composting in sludge management. Six areas were studied: treatment and preparation of sewage sludges for final disposal; characteristics of domestic wastes accumulated in the catchment area; joint sludge and wastes composting; role and effects of heavy metals on soils and plants; and practical aspects of sludge compost usage. Sludges were analyzed after dewatering and thickening. They contained less organic matter and essential components, in considering fertilizing and biological properties (C, H, N, P, K, Ca), than household solid wastes. The latter contained 61% fractions by weight and most of the organic matter suitable for composting. Sludge was difficult to dewater, emitted a disagreeable odor, and was greasy before composting. Afterwards the compost was not sticky and was easy to apply on soil. It stimulated plant growth. A 6 to 8% sludge content and 10 t/ha dose were considered optimum. Mathematical statistics were used to determine trace element occurrence distribution as well as the reliability of results. The variability of occurrence was found to be a useful tool in establishing the suitability of sludge for agricultural disposal and indicated the potential toxicity of soil under consideration. It was concluded that industrial composts were suitable for agricultural use. (Collins-FIRL)
W77-07084

EFFECT OF WATER WORK'S SLUDGE ON WASTE WATER TREATMENT,
Instytut Gospodarski Komunalnej, Warsaw (Poland).
J. Zakrezewski.
In: Polish/U.S. Symposium on Waste Water Treatment and Sludge Disposal, February 10-12, 1976, Cincinnati, Ohio, EPA Environmental Research Center, Cincinnati, Vol. 2, p 33-41. 3 tab.

Descriptors: *Waste water treatment, *Sludge treatment, *Municipal wastes, Biological treatment, Activated sludge, Sludge digestion, Laboratory tests.
Identifiers: Post-coagulation sludge, Sludge thickening.

Results were presented of laboratory studies which evaluated post-coagulation sludge on municipal sewage treatment and municipal sludge disposal. Results indicated a limited effect on the mechanical treatment of municipal sewage and on activated sludge treatment of municipal sewage. The presence of post-coagulated sludge in raw sewage does not provide any important effect on mechanical-biological treatment of sewage. Addition of the study sludge slightly decreases thickening and sludge digestion. Further research is suggested to verify these conclusions. (Collins-FIRL)
W77-07085

RENOVATED WATER FROM MUNICIPAL SEWAGE TREATMENT PLANTS,
Wroclaw Technical Univ. (Poland). Inst. of Environment Protection Engineering.
A. L. Kowal.
In: Polish/U.S. Symposium on Waste Water Treatment and Sludge Disposal, February 10-12, 1976, Cincinnati, Ohio, EPA Environmental Research Center, Cincinnati, Vol 2, p 141-150. 10 tab.

Descriptors: *Reclaimed water, *Trickling filter, *Activated sludge, *Coagulation, *Sedimentation, Carbon, Filtration, Sorption, Treatment facilities, *Waste water treatment, Laboratory tests, Pilot plants, Sludge treatment.
Identifiers: Renovated water, Recarbonation.

Laboratory and pilot tests were conducted to investigate the renovation of secondary effluent from a trickling filter and an activated sludge process. Coagulation, sedimentation, recarbonation, filtration and sorption were used. Trickling filter test results showed treatment efficiency as follows: 77.8% reduction of permanganate, 86.1% BOD removal, 33% ammonia nitrogen reduction, and 37.1% phosphate removal. The secondary effluent coagulated with lime or aluminum sulfate and was subjected to sedimentation, filtration on a sand bed, and passage through the activated carbon filters. Sewage was recarbonated with carbon dioxide before filtration when lime was used. A simultaneous coagulation with carbon slurry provided the best laboratory results. Pilot plant studies with aluminum sulfite or lime did not significantly remove ammonia nitrogen. Calcium oxide was reduced when filtered on a sand-anthracite bed and further reduced on a sand-carbon bed. Permanganate was significantly decreased, although sewer hardness was very high. Laboratory tests with the activated sludge reduced permanganate by about 50%, and removed phosphate and turbidity. High concentrations of either required high lime doses. Recarbonation was achieved by bringing carbon dioxide to the water and coagulating with lime, mixing rapidly, bringing pH up to 8.3, mixing slowly, settling, and decanting. The best alkalinity and hardness removal occurred with recarbonation after coagulation and sedimentation. Raised permangante values were found in all recarbonated water samples. Coagulation with ferric or aluminum sulfate resulted in increased dissolved solids concentrations. (Collins-FIRL)
W77-07086

WASTE WATER REUSE PRACTICE IN THE UNITED STATES,
Municipal Environmental Research Lab., Cincinnati, Ohio.
C. A. Brunner.
In: Polish/U.S. Symposium on Waste Water Treatment and Sludge Disposal, February 10-12, 1976, Cincinnati, Ohio, EPA Environmental Research Center, Cincinnati, Vol. 2, p 151-156. 4 tab.

Descriptors: *Water reuse, *Municipal waste water, *Water demand, *Waste water treatment, *Water conservation, *Water purification, Sewage treatment, Water sources, Groundwater, Irrigation, Domestic water, Lakes, Industrial water, Recreation.

The reuse of treated municipal waste water should be considered as an alternative plan for meeting future water demands. Present usage and future predictions of water demands make water resource conservation, renovation, and reuse of waste water imperative. Presently, waste water reuse is being applied to agricultural, industrial and recreational problems. Nonpotable domestic water applications are to be added to this group, as well as potable uses which may be practical at some future time. An EPA survey reported that 58% of water reused in 1971 was for agricultural purposes, with the great majority being used in irrigation. Forty percent was used for industrial needs. Much of this was used as cooling water. Recreational reuse programs include man-made

lakes. For these uses, water must be treated to maintain a low oxygen demand and to keep toxicity levels low. Domestic reuse schemes do not yet include potable water programs, and one problem is the necessity for a separate distribution system for the renovated water. Trace organics and pathogens, especially viruses, are the major restrictive agents in the development of water reuse programs for potable water needs. (Collins-FIRL)
W77-07087

SLUDGE DEWATERING PILOT PLANT DESIGN. PART 2,
New Jersey Inst. of Tech., Newark. Dept. of Civil and Environmental Engineering.
P. M. Cheremisinoff.
Water and Sewage Works, Vol. 123, No. 12, p 64-67, December, 1976. 2 fig, 23 ref.

Descriptors: *Sewage disposal, *Dewatering, *Sludge treatment, Filtration, *Pilot plants, On-site tests, Treatment facilities, *Waste water treatment, Pumps, Temperature.

The design of a pilot plant for on-site or laboratory pilot testing was presented. The design was for a system which would operate during the entire cycle and have integrated recorders to graph pressure and total flow for the cycle. Criteria established included: a 15 gallon capacity and a filter press; the duplication of actual treatment and process control; equipment for chemical and heat treatment before dewatering; full instrumentation and recording devices for documentation of the filtration cycle for scale-up to the actual system; easy portability and ruggedness; a 3 to 10%, by weight, range for sludge suspended solids; constant pressure filtration; and automatic system controls. Design specifications were given for sludge storage and heat treatment vessels, chemical addition pumps, and the automatic control apparatus. (Collins-FIRL)
W77-07088

METHOD OF TREATING WASTE WATER WITH JET NOZZLES,
Badische Anilin-und Soda-Fabrik A.G., Ludwigshafen am Rhein (West Germany). Landwirtschaftliche Versuchsstation. (Assignee).
K. Hess, R. Stickel, O. Nagel, and R. Sinn.
United States Patent 4,009,100. Issued February 22, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 4, p 1263, February, 1977. 1 fig.

Descriptors: *Patents, *Activated sludge, *Aeration, Equipment, Gases, Air, Oxygen, Sludge treatment, *Waste water treatment, Water purification, Waste treatment, *Jets.

A patent was issued for a treatment process for activated sludge systems with aerating nozzles submerged in the waste water and activated sludge contained in a reservoir. A gas stream of air or high-oxygen gas is propelled through the nozzles, near the bottom of this mixture, into a small impulse exchange tube. A directional flow is produced in a rotary motion by ascending bubbles to create a screw motion flow in the waste water/activated sludge mixture. (Collins-FIRL)
W77-07090

WASTE TREATMENT PROCESS,
Ecolotrol, Inc., Bethpage, N. Y. (Assignee).
J. S. Jeris.
United States Patent 4,009,098. Issued February 22, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 4, p 1262, February, 1977. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Biochemical oxygen demand, *Oxidation, Oxygen, Microorganisms, Suspended solids, Aerobic treatment, Aerobic conditions, Waste treatment.

A patent was issued for a waste water treatment process for BOD removal. Waste water passes through a bed of microorganisms which oxidizes BOD under aerobic conditions and allows suspended solids to pass through it. This produces an upflow fluidized bed of solid particulate carrier by passing waste water up at a flowrate of 6+ gallons/minute/square foot of bed. About 1.5 milligrams of oxygen per milligram of BOD removed from the waste water are provided to allow the microorganisms to reduce BOD. Specific gravity of the particles is increased by removal of excess microorganism growth from the bed to aid BOD removal. Floc produced by excess growth removal is taken from the process without any interference with operational efficiency. (Collins-FIRL)
W77-07091

CLARIFIER WITH OVERFLOW SCUM REMOVAL,
Envirex, Inc., Milwaukee, Wis. (Assignee).
G. W. Smith.
United States Patent 4,009,106. Issued February 22, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 4, p 1265, February, 1977. 1 fig.

Descriptors: *Patents, *Separation technique, *Waste water treatment, Sewage treatment, Equipment, Water purification, Sewage effluents, Treatment, Sludge.
Identifiers: Clarifier, Scum removal.

A patent was issued for a sewage treatment clarifier. The clarifier has a circular outer wall with submerged feed ports, a conical bottom defining a lower sludge collection area, a sludge return line from the lowest portion of this area, and a circular overflow launder that establishes the normal liquid level in the clarifier. A circular scum trough, a frusto-conical baffle, and a scum collection zone are other features of the system. (Collins-FIRL)
W77-07092

PROCESS FOR THE PURIFICATION OF WASTE WATERS WITH ACTIVATED CARBON,
Bergbau-Forschung G.m.b.H., Essen (West Germany).
G. Gappa, H. Juntgen, and J. Reichenberger.
United States Patent 4,007,116. Issued February 8, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 2, p 581, February, 1977. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Activated carbon, Organic carbon, Treatment facilities, Equipment, Sewage treatment, Sewage effluents, Water purification, Sanitary engineering.

A patent was issued for an activated carbon waste water treatment process. Waste water is pased upward through a column of activated carbon particles and distributed equally over the cross-sectional area. Total organic carbon is determined before water enters the column and simultaneously at a point between 30 and 70% of the carbon particles height in the column. Spent carbon particles are withdrawn from the column bottom at a rate which maintains a selected difference between total organic carbon content of water entering the column and at the above selected point. Fresh activated carbon or reactivated carbon is constantly introduced at the column top to compensate for the withdrawal. Purified water is recovered at the top of the column. (Collins-FIRL)
W77-07093

OZONE OXIDATION OF WASTE WATER,
Cubic Corp., San Diego, Calif. (Assignee).
D. F. Ciambrone.
United States Patent 4,007,118. Issued February 8, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 2, p 581-582, February, 1977. 1 fig.

Descriptors: *Patents, *Oxidation, *Ozone matter, *Bacteria, *Waste water treatment, Oxides, Equipment, Metals, Sewage treatment.

A patent was issued for an ozone oxidation treatment method for waste water containing organic contaminants and bacteria. Waste water is injected into a closed tank, submerging fluid-pervious bags containing powdered metal oxide catalyst (manganese trioxide, ferric oxide, nickel oxide or copper oxide); ozone is injected into the bags for exposure to the catalyst and reaction with waste water flowing through the bags. Purified and inert water is drawn from the tank and ozone is vented from the upper part of the tank. (Collins-FIRL)
W77-07094

INTEGRATED APPROACH TO URBAN WASTE WATER MANAGEMENT,
Florida Univ., Gainesville.
S. M. Hasan.
Available from the University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No. 77-1117. PhD Thesis, 1976, 253 p.

Descriptors: *Water management(Applied), *Urban drainage, *Storm water, *Water quality control, Cost analysis, Flow, Sewage treatment, Cost sharing, Cost allocation, Evaluation, Urban hydrology, Waste water treatment.
Identifiers: N-person cooperative game theory.

An approach was developed for urban waste water management which integrates considerations for urban storm drainage, dry-weather sewage treatment, and wet-weather quality control. There has been a change from 'least-cost' to 'cost-effective' approaches and solutions. This approach presents procedures for formulation of control strategies and their cost evaluation. Integration of these evaluations would take advantage of overlap areas which could combine several functions, and procedures are also presented for this type of evaluation. The question of cost allocation was also considered and methods for cost determinations were presented. Concepts of cost sharing/cost allocation for evaluation of multipurpose plans were reviewed in light of the N-person cooperative game theory. (Collins-FIRL)
W77-07095

FACTORS INFLUENCING THE DEWATERING CHARACTERISTICS OF SLUDGE,
Clemson Univ., S. C.
P. R. Karr, III.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No. 77-652. PhD Thesis, 1976, 245 p.

Descriptors: Analysis, *Dewatering, Physical characteristics, *Sludge treatment, *Particle size, Sludge, Activated sludge, Anaerobic digestion, Biodegradation, Filtration, *Waste water treatment.
Identifiers: Dewatering characteristics, Capillary suction time, Blinding index.

Investigations were conducted to determine factors which influence sludge dewatering characteristics. Raw, activated, and anaerobically digested sludges were studied. Results confirmed that sludge particle size greatly affects dewatering characteristics, measured by specific resistance and capillary suction time (CST). This applied to sludges of all types. Other factors (pH, biological degradation, mixing, and conditioning) affected changes in dewaterability relative to their effects on particle size. Differences in dewatering characteristics were shown to be mainly affected by differences in particle size distributions. Supracolloidal solids in a range of 1 to 100 micrometers most affected dewatering characteristics. Particles of this size range blind sludge cake and filler medium during filtration and result in a large resistance to filtrate flow. A blinding index was developed. (Collins-FIRL)
W77-07097

CONCENTRATION AND DETERMINATION OF TRACE ORGANIC POLLUTANTS IN WATER,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5A.
W77-07098

RECYCLING OF ALUMINUM USED FOR PHOSPHATE REMOVAL IN DOMESTIC WASTE WATER TREATMENT,
Florida Univ., Gainesville.
D. A. Cornwell.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No. 77-140. PhD Thesis, 1975, 225 p.

Descriptors: Aluminum, *Sludge treatment, *Phosphorus, Domestic wastes, Separation techniques, *Phosphates, Coagulation, Extraction, Chemical treatment, Filtration, *Waste water treatment, *Recycling.
Identifiers: *Aluminum recycling, *Phosphate removal.

A process was developed for the economical recovery of aluminum used as a coagulant for phosphorus removal in domestic waste water treatment. Aluminum-phosphate-organic sludge was used. It was thickened to a solids concentration four times that of raw sludge, and reacted with sulfuric acid to dissolve the aluminum and phosphate. Sedimentation produced a 93% separation. The acidified aluminum was separated from the phosphate by a solvent extraction process using a kerosene solution of alkyl phosphates. The aluminum-rich kerosene phase was contacted with 6N H_2SO_4 and the kerosene:acid volume ratio was adjusted to form a final aluminum concentration equal to that in commercial alum (about 5%). Recovered aluminum was reused as a coagulant in phosphorus precipitation and the kerosene was recycled to the extraction stages. Overall recovery of aluminum was 89-93%. (Collins-FIRL)
W77-07099

ON-LINE ADAPTIVE CONTROL FOR COMBINED SEWER SYSTEMS,
Colorado State Univ., Fort Collins.
P. D. Trotta.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No. 77-1188. PhD Thesis, 1976. 224 p.

Descriptors: *Model studies, *Storm water, *Computer models, *Storm runoff, *Combined sewers, Interceptor sewers, Waste water treatment, Overflow, Planning, Automatic control.
Identifiers: Stochastic dynamic programming.

A new approach to the problem of urban storm water management was proposed. On-line computer control of the mechanical features of a combined sewer system was investigated. These controls would aid sewer systems effectively to contain combined flows during storms. A model was developed for a system divided into subbasins. Controls for each subbasin are derived separately using a stochastic dynamic programming formulation. An upper limit for releases is determined by a master control problem, which combines te separate basin situations and determines individual interceptor and treatment capacities. An autoregressive-transfer function model is used to forecast inflows, and can respond to new information on the storm event. A part of the proposed system for San Francisco was used as a test case. Results indicated that controls based on stochastic models were superior to deterministic forecasts. The model provided a superior distribution of overflows when such overflows were unavoidable. A reactive model which was tested was able to minimize total overflows to an even higher degree. (Collins-FIRL.)
W77-07100

5E. Ultimate Disposal Of Wastes

PARTICLE CHARACTERISTICS AND DISPERSAL PATTERNS OF SUGAR CANE WASTES IN SELECTED RIVERS AND ESTUARIES OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W77-06632

CHEMICAL QUALITY OF EFFLUENTS AND THEIR INFLUENCE ON WATER QUALITY IN A SHALLOW AQUIFER,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W77-06658

POLLUTANT MOVEMENT TO SHALLOW GROUND WATER TABLES FROM SWINE WASTE LAGOONS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-06742

STUDY OF LEACHATE AT LANDFILL SITES 1975, VOLUME 1.
Holzmacher, McLendon and Murrell, Melville, N.Y.
For primary bibliographic entry see Field 5B.
W77-06851

WASTE INJECTION INTO STRATIFIED GROUND WATER BODIES,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W77-06855

SEPTIC TANK STUDY IS OFF AND RUNNING.
For primary bibliographic entry see Field 5D.
W77-06859

BURNING WASTE CHLORINATED HYDROCARBONS IN A CEMENT KILN,
St. Lawrence Cement Co., Mississauga, (Ontario).
L. P. MacDonald, D. J. Skinner, F. J. Hopton, and G. H. Thomas.
Technology Development Report, EPS 4-WP-77-2, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, March, 1977, 223 p., 31 fig., 66 tab, 28 ref, 9 append.

Descriptors: Burning, *Waste disposal, *Polychlorinated biphenyls, Chlorinated hydrocarbons, Toxicity, Disposal, Cements, Model studies, Persistence, Degradation, Safety, *Waste treatment, *Incineration, Air pollution, Pollutant identification, Canada.
Identifiers: Kilns(Cement).

An experimental program was carried out in 1975/76 at the St. Lawrence Cement Co., in which waste chlorinated hydrocarbons, containing up to about 46 weight percent chlorine, were burned in a rotary cement kiln. The chlorinated hydrocarbons were burned in three distinct phases of increasing difficulty of combustion. Materials burned included mixtures of ethylene dichloride, chlorotoluene and up to approximately 50 percent polychlorinated biphenyls (PCB). These materials were destroyed in the cement kiln with at least 99.98 percent efficiency in all cases. Emissions of high molecular weight chlorinated hydrocarbons were not detected. Three light chlorinated hydrocarbons, dichloromethane, chloroform and carbon tetrachloride, were found in the emissions in the part per billion or lower range. The quantity of precipitator dust requiring disposal, as well as emissions of particulate matter, increased during the test. The chlorine input from the chlorinated hydrocarbon waste was up to about 0.8 weight percent relative to clinker and this effectively reduced the alkali concentration of the clinker in direct stoichiometric proportion. A reduction in fossil fuels used while burning chlorinated hydrocarbons was noted. (WATDOC)
W77-06946

DRYING POTATO WASTES FOR ANIMAL FEED AS AN ALTERNATIVE DISPOSAL METHOD.
Canadian Bio Resources Consultants Ltd., Surrey (British Columbia).
For primary bibliographic entry see Field 5D.
W77-06947

PROCEEDINGS TECHNOLOGY TRANSFER SEMINAR ON WASTE HANDLING, DISPOSAL AND RECOVERY IN THE METAL FINISHING INDUSTRY, NOVEMBER 12-13, 1975, TORONTO, ONTARIO.
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.
W77-06950

WATER QUALITY MANAGEMENT AND THE DISTRIBUTION OF EMISSION RIGHTS BY SEALED TENDER MARKETS,
Geological Survey, Reston, Va. Water Resources Div.
E. D. Attanasi.
In: North-Holland TIMS Studies in the Management Sciences, Vol 3, p 113-123, 1976: North-Holland Publishing Company, New York 1976. 1 fig, 16 ref.

Descriptors: *Water quality control, *Industrial wastes, *Effluents, *Economic efficiency, Economic justification, Evaluation, Cost repayment, Water pollution, Planning.
Identifiers: Decision theory.

Economic analysis of water quality management has primarily dealt with industrial response and consequences of imposing effluent standards or changes on industrial wastes. Several writers have suggested that the River Basin Authority set a level of water quality and utilize simulated auctions to generate data which could be used set effluent charges. However, this paper investigates the possibilities of utilizing sealed tender markets for actual allocation of assimilative capacity through effluent emission rights. The paper analytically models the firm's decision process and response to alternative regulatory policies. It is from this perspective of policy analysis that certain control instruments are shown to result in inferior performance in terms of the potential effects on firm pricing decisions. (Woodard-USGS)
W77-06976

APPARATUS FOR DISPOSAL OF EFFLUENTS.
United States Patent 4,008,155. Issued February 15, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 3, p 935, February, 1977. 1 fig.

Descriptors: *Patents, *Waste disposal, *Separation techniques, Equipment, Surface waters, Pollutants, Water quality control, Water pollution control, Pollutants, Pollution abatement, Flotation.

A patent was issued for an apparatus to handle effluent disposal. The equipment is composed of two major enclosures, one within the other, and has a means for flotation on the open sea. The second chamber includes a centrally located open-bottom chamber. The second enclosure has a closed bottom for the accumulation of material separated from the treated effluent transferred to it from the

first enclosure. The bottom of the second enclosure has tapered chambers arranged side-by-side with walls that diverge upward so that material which is denser than water is separated from the remainder of the waste. (Collins-FIRL)
W77-07002

SUBSURFACE INJECTION-HOW MUCH DOES IT COST,
Black and Veatch, Denver, Colo.
C. P. Houck, and J. L. Smith.
Water and Wastes Engineering, Vol. 14, No. 1, p 35-42, January, 1977. 1 fig, 13 tab.

Descriptors: *Decision making, *Sludge disposal, *Costs, Treatment facilities, Underground waste disposal, Analysis, Planning, Waste water treatment, Sewage disposal, Ultimate disposal, *Injection.
Identifiers: *Subsurface injection, Land applications.

The cost considerations involved in subsurface injection are explored. The decision to use a land application system for sludge disposal may be either dependent or independent of in-plant sludge stabilization and handling costs. Sludge-associated costs are in-plant stabilization costs; transportation costs from plant to disposal site; and costs for subsurface injection. There are various points where these costs may merge. Other factors concerned are land area needs based on sludge quantities which, with plant size, influence costs; land preparation costs; and system hardware costs. Examples were given for calculating costs involved in the decision process. (Collins-FIRL)
W77-07011

ACID SOLUBILIZATION OF SEWAGE SLUDGE AND ASH CONSTITUENTS FOR POSSIBLE RECOVERY,
Canada Centre for Inland Waters, Burlington (Ontario).
B. G. Oliver, and J. H. Carey.
Water Research, Vol. 10, No. 12, p 1077-1081, 1976. 3 fig, 2 tab, 15 ref.

Descriptors: *Heavy metals, *Activated sludge, *Acids, *Sludge disposal, *Sludge digestion, Sludge treatment, Treatment facilities, Leachates, Resources, Incineration, Waste water treatment, Sewage disposal, Temperature, *Sewage sludge, Solubility.
Identifiers: *Acid solubilization.

The disposal of sludge incineration matter has posed a potential hazard, since its ash contains some heavy metals which are leachable. An investigation was done to determine the possibility of using acid solubilization of sludge and ash constituents to reduce the problem. Digested sludge samples were collected from eight southern Ontario activated sludge treatment facilities. A procedure was adopted, based on data from the samples, for acid extraction of sludges. H2SO4 or HCl was added to lower sludge pH to 1.5, and solids were then separated from the leachate by vacuum filtration. The residue was rinsed with an equal volume of water to restore a normal pH and the solids could be disposed on agricultural land. Leachate can be processed for recovery of valuable components. Testing revealed that toxic trace metals recovery from wet sludges does not seem economically viable. Other studies showed that soil bacteria, especially under aerobic conditions, release high percentages of heavy metals in digested sludge when applied to agricultural land. Removal and recovery of metals and phosphates from sludge incinerator ash was not proven economically attractive. Investigations on the effect of incineration parameters on leachability of ash components is needed because temperature in this process has a great effect on leachability of ash metals. (Collins-FIRL)
W77-07017

FLUOSOLIDS INCINERATOR COMMISSIONED AT ESHER,
Water Services, Vol. 80, No. 970, p 753-754, December, 1976.

Descriptors: *Treatment facilities, *Incineration, *Sludge disposal, Sludge treatment, Solid wastes, Ultimate disposal, Sedimentation, Filters, Biological treatment, Dewatering, Lime, Oxygen, Gases, *Waste treatment, Organic matter.
Identifiers: Copperas, Sulfur dioxide, *Fluosolids.

Operational aspects of the fluosolids incinerator at Esher, England, were reviewed. The plant was designed to cope with the ultimate disposal of sludge residue from treatment plants by employing incineration. The process includes a mechanically raked screen, detritor, primary sedimentation, biological filters, humus tanks, microstrainers, and sludge incineration. After thickening, conditioning by lime and copperas, and dewatering by coilfilters, the coilfilter sludge cake is fed to the fluosolids system for incineration. The sludge cake is mixed within the hot sand bed to evaporate the water content and the organic components react with oxygen in the fluidizing air to achieve complete combustion with a minimum of excess oxygen at minimum temperatures. Exit gases pass through a heat exchanger and then to a venturi scrubber with a multitray cooling section. This removes solids/particulate matter from the gas stream and adds alkali for maximum SO2 removal. Water droplets with particulate solids are removed from the gas stream in a vane separator. The fluosolids reactor operates at a temperature of 620 C. Minimal heat losses rom the refractory lined shell and the heat reservoir of the sand bed allow a short reheating time after shut down periods. The incinerators can be shut down instantly without harm or a need for quench water or cooling air maintenance. The reactor has no moving parts. (Collins-FIRL)
W77-07018

SLUDGE INCINERATION AT ESHER.
Effluent and Water Treatment Journal, Vol. 16, No. 11, p 559-560, November, 1976.

Descriptors: *Incinerators, *Treatment facilities, *Sludge treatment, Equipment, Costs, Water utilization, Evaluation, Performance, Water reuse, *Waste treatment.
Identifiers: Esher(England).

A new Fluosolids sludge incineration plant has become operational in Esher, England. The plant, now serving a population of 70,560 with a treatment capacity of 1,000 kg/hour, is capable of handling 200,000/hour, if necessary. There is no odor with this method and the sludge is reduced to a fine inert ash. After thickening, the sludge is treated with lime and copperas and transferred to coil filters for dewatering. A sludge cake is formed which can be discharged for transportation or fed into a three section reactor for incineration. Interlocking fail safe systems are provided. (Collins-FIRL)
W77-07020

ACCUMULATION OF HEAVY METALS IN SOILS FROM EXTENDED WASTE WATER IRRIGATION,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-07049

PERSISTENCE OF POLIOVIRUS 1 IN SOIL AND ON VEGETABLES GROWN IN SOIL PREVIOUSLY FLOODED WITH INOCULATED SEWAGE SLUDGE OR EFFLUENT,
Food and Drug Administration, Cincinnati, Ohio. Virology Branch.
For primary bibliographic entry see Field 5C.
W77-07050

AGRICULTURAL DISPOSAL OF AEROBIC WASTEWATER SLUDGES IN AN URBAN COUNTY,
Clermont County Water and Sewer District, Batavia, Ohio.
For primary bibliographic entry see Field 5D.
W77-07057

CONDITIONING AND LAND APPLICATION OF AEROBICALLY DIGESTED SLUDGE,
Montgomery County Sanitary Dept., Dayton, Ohio.
For primary bibliographic entry see Field 5D.
W77-07058

LAND APPLICATION OF SEWAGE SLUDGE: IV. WHEAT GROWTH, N CONTENT, N FERTILIZER VALUE, AND N USE EFFICIENCY AS INFLUENCED BY SEWAGE SLUDGE AND WOOD WASTE MIXTURES,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W77-07079

APPLICATION OF MUNICIPAL REFUSE AND LIQUID SEWAGE SLUDGE TO AGRICULTURAL LAND: II. LYSIMETER STUDY,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W77-07080

TRENDS IN SLUDGE TREATMENT AND DISPOSAL PRACTICES IN THE UNITED STATES,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W77-07083

COMPOSTING OF SEWAGE SLUDGE AND SOLID WASTE MATTER,
Department of Waste Water Technology and Sludge Disposal, Warsaw (Poland). Local Economy and Environment Protection.
For primary bibliographic entry see Field 5D.
W77-07084

5F. Water Treatment and Quality Alteration

THE REMOVAL OF ORGANIC MATTER FROM WATER SUPPLIES BY ION EXCHANGE,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
C. Anderson, and J. Maier.
Available from the National Technical Information Center, Springfield, VA 22161 as PB-266 022, Price Code: A04 in paper copy, A01 in microfiche. Minnesota Water Resources Research Center, Bulletin No. 91, University of Minnesota, Feb. 1977. 49 p, 16 fig, 16 tab, 38 ref. OWRT A-030-Minn(3).

Descriptors: *Organic matter, Pollutants, *Water pollution treatment, Carbon, *Anion exchange, *Waste water treatment, *Water treatment, Treatment facilities, Potable water, Design criteria, Resins.

This study was initiated to provide quantitative information on the use of anion exchange resins for organic removal. The organics that are present in surface water waters which currently pass through conventional treatment could be removed by anion exchange with the use of strongly basic anion exchange columns. The organics were removed to the lower limits of detection of the total organic carbon analysis with the use of the high porosity

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strongly basic resins. These resins were also easily regenerated with the use of sodium chloride. The selectivity and kinetics of the chloride versus organic exchange process was briefly investigated. The reason being that this is a new approach to this problem and no data was available in the literature to provide information which could be used for preliminary design of a full scale treatment plant. A preliminary plant design showed that the process would be economically feasible and competitive with alternate methods of organic removal, assuming that they would also be as effective at organic removal as ion exchange. So, ion exchange could prove to be an effective, reliable and economical method to provide for the removal of organics for drinking water. (Waelti-Minnesota)
W77-06760

HEALTH EFFECTS OF MULTIPURPOSE USE OF WATER,
Stockholm Univ. (Sweden). Wallenberg Lab.
For primary bibliographic entry see Field 5C.
W77-06775

ENERGY CONSERVATION AND HEAT RECOVERY IN WASTE WATER TREATMENT PLANTS,
Pirnie (Malcolm), Inc., White Plains, N. Y.
For primary bibliographic entry see Field 5D.
W77-07024

ON THE SELF-PURIFICATION OF NATURAL WATERS, (IN GERMAN),
Limnologische Station Niederrhein in der Max-Planck-Gesellschaft z.F.d.W., Krefeld (West Germany).
For primary bibliographic entry see Field 5G.
W77-07038

DESIGN CRITERIA FOR WASTE WATER AERATOR DRIVES,
For primary bibliographic entry see Field 5D.
W77-07060

PURIFYING WATER,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 5D.
W77-07061

5G. Water Quality Control

THE GROWTH SHAPERS: THE LAND USE IMPACTS OF INFRASTRUCTURE INVESTMENTS.
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6D.
W77-06601

MIXING AND CIRCULATION OF LAKES AND RESERVOIRS WITH AIR PLUMES,
New Hampshire Univ. Durham. Dept. of Chemical Engineering.
R. S. Torrest, and J. Wen.
Available from the National Technical Information Service, Springfield, VA as PB-265 909, Price codes: A07 in paper copy, A01 in microfiche. New Hampshire Water Resources Research Center, Durham, Research Report No. 13, (1976). 128 p, 2 tab, 51 fig, 92 ref, append. OWRT A-030-NH(2).

Descriptors: *Self purification, Absorption, Domestic water, Stratification, *Aeration, *Mixing, *Circulation, Eutrophication, Lakes, Reservoirs, Velocity profiles, *Dissolved oxygen, Mass transfer, Design, Currents(Water), Model studies.
Identifiers: *Air plumes, Surface currents.

Aeration of lakes and reservoirs to control eutrophication and improve water quality is widespread. However, there are few guidelines to aid in design of the aeration treatment. Here relevant fluid mechanics literature is first summarized to show that the nature of the flow of water entrained by air bubbles rising from manifolds and point sources may be well described. Experimental studies of the resulting surface flows supplement and extend previous work. Surface velocity decay is described and, for manifold ration, the circulation cell size is shown to be about four times the water depth on each side of the manifold. Detailed measurements of velocity profiles are presented for a wide range of aeration rates in channels to 1 1/2 feet wide, 4 feet high and 12 feet long. The influence of aerator design and depth is illustrated, as is the variation of circulation efficiency with aeration rate. Similar results for 'point source' aeration to 9 scfm are described. Circulation due to water injection from a manifold (i.e., jet injection) is compared with that due to aeration. Measurements of the time variation of dissolved oxygen within the primary circulation are well described by a simple mathematical model with the single parameter, the time constant, a function of aeration rate. These results should aid in the overall design of aeration treatments since the characteristics of aeration induced circulation and the resulting dissolved oxygen variation can be estimated for systems of interest.
W77-06633

AN EXECUTIVE SUMMARY OF THREE EPA DEMONSTRATION PROGRAMS IN EROSION AND SEDIMENT CONTROL,
Hittman Associates, Inc., Columbia, Md.
B. C. Becker, M. A. Nawrocki, and G. M. Sitek.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-239 333, Price codes: MF A01 in microfiche. Environmental Protection Agency Report No. EPA-660/2-74-073, Washington, D.C., June 1974. 58 p, 7 fig, 1 tab, 2 ref. EPA 68-01-0743.

Descriptors: *Maryland, *Erosion control, *Sedimentation, *Storm water, *Demonstration watersheds, Aquatic environment, Construction, Rainfall-runoff relationships, Urbanization, Watersheds(Basins), Dredging, Sediment deposition, Filtering systems, Separation techniques, Biology, Channel morphology, Retention, Ponds.
Identifiers: Guidelines, Suspended solids separation, Pond dredging, Grade control.

This report presented the highlights of three recently completed programs in the area of sediment and erosion control. These programs were a 'Joint Construction Sediment Control Project,' a 'Programmed Demonstration for Erosion and Sediment Control Specialists,' and a 'Demonstration of the Separation and Disposal of Concentrated Sediments.' The first program demonstrated and developed guidelines for erosion and sediment control in urbanizing areas; the second program produced a series of 15 presentations on sediment and erosion control; and the third program consisted of a field demonstration of a system for removing and processing sediments from pond bottoms. (Visocky-ISWS)
W77-06671

DEBRIS BASINS FOR CONTROL OF SURFACE MINE SEDIMENTATION,
Kentucky Dept. for Natural Resources and Conservation, Frankfort. Office of Planning and Research.
L. R. Kimball.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 959, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency Report No. EPA-600/2-76-108, Cincinnati, Ohio, June 1976. 58 p, 13 fig, 11 tab, 7 ref, 1 append. EPA S801276.

Descriptors: *Sediment control, *Coal mine wastes, *Drainage, *Erosion control, *Kentucky, Feasibility studies, Demonstration watersheds, Sampling, Monitoring, Soils, Slopes, Water quality, Streamflow, Sedimentation.
Identifiers: *Surface mining, *Debris basins, Sediment ponds, Steep slope mining, Total solids.

This study reported on the feasibility of demonstrating the effectiveness of debris basins in controlling solids in water discharging from surface mine operations. Two sites in Eastern Kentucky were selected for study in areas where very little erosion-causing activity has occurred, and where surface mining is to be initiated. Adjacent 'virgin' watersheds were also selected for each study site to provide background data on water quality where man's activities have been very limited. Pertinent site information, including flow and water quality data, was gathered. This study indicated the necessity for conducting the demonstration and develops a recommended procedure. (Visocky-ISWS)
W77-06672

MEANS FOR PROTECTING THE DRINKING WATER QUALITY OF LAKE GEORGE, NEW YORK,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
D. B. Aulenbach, and N. L. Clesceri.
Rensselaer Polytechnic Institute FWI Report 77-1, March 1977. 31 p., 5 fig., 3 tab., 28 ref.

Descriptors: *Water quality control, *Potable water, *Lakes, *Water pollution control, *New York, Sewage treatment, Recreation.
Identifiers: *Lake George(NY), Nutrient sources.

Homeowners around Lake George in the eastern Adirondack Mountains of New York State drink water directly from the lake with no treatment other than chlorination as required by state law. There are no restrictions on swimming, fishing, or boating other than those prohibiting waste discharges from boats. Probably the most important factor in maintaining the high quality of the waters is the lake's morphology. The narrow and deep lake has high ratio of hypolimnion-to-epilimnion which helps maintain oligotrophic conditions. Another significant factor is the relatively small drainage basin, approximately four times the total surface area of the lake. The low nutrient content of the surface soil and bed rock, and the probable uptake of nutrients by the forested areas help control nutrient inputs from tributary streams. In addition, there is active concern among all the users of the lake, both private and commercial. Phosphorus inputs have been eliminated by treatment plants which provide the equivalent of tertiary treatment to the two dense population centers; about 6% of the nitrogen entering the lake originates from the treatment plants' effluents. Habitations not readily accessible to sewers are served by septic tanks which are stringently monitored. (Auen-Wisconsin).
W77-06682

NUTRIENT REMOVAL AND SLUDGE DISPOSAL WITHIN SEPTIC SYSTEMS-PHASE III,
Rensselaer Polytechnic Inst., Troy, N. Y. Fresh Water Inst.
For primary bibliographic entry see Field 5D.
W77-06686

LAKE RESTORATION BY BOTTOM WATER SIPHONING (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland). Marine Research Lab.
R. Cachter.
Hydrologie, Vol. 38, No. 1, p. 1-27, 1976. 9 fig., 5 tab., 23 ref.

Descriptors: *Siphons, *Nutrient removal, Phosphorus, Nitrogen, Trophic level, Eutrophication, Cycling nutrients, Hypolimnion, Sediments, Nitrogen cycle, Lakes.
Identifiers: *Lake restoration, Maunsee(Switzerland), Phosphorus loading.

The effects of an artificially increased nutrient export, using a hypolimnion siphon, on the trophic state of Mauensee, a relatively small, shallow, highly eutrophic lake in central Switzerland were investigated. It was concluded that: (1) It is possible to influence a shallow lake's trophic character by siphoning off part of its bottom water; (2) phosphorus became accumulted in the very top layer of sediments due to the yearly alternation of anoxic phosphorus release and aerobic phosphorus fixation; (3) the lakes's internal phosphorus cycle accelerated as more and more phosphorus became available in the top layer of sediments causing a self-maintaining auteutrophication of a lake as soon as the external nutrient loading reached a level favoring transiently anoxic conditions; (4) the lake's internal phosphorus loading of the trophogenic layer by sediments temporarily exceeded the external loading by more than a hundred-fold; (5) during the summer stagnation period, the phosphorus export exceeded the the external supply even without siphon; (6) the same was true for nitrogen during fall and winter overturn; (7) drastically increased nutrient export caused a nutrient reduction in the top sediment layer which decreased the back diffusion rate from the sediments to water; (8) siphoning will decrease primary production as long as the nutrient supply to the trophogenic layer is the rate limiting factor; and (9) siphoning led to an improvement of oxygen conditions in the hypolimnion. (Luedtke-Wisconsin)
W77-06689

THE GENERATION OF RESIDUAL FLOWS IN NORWAY: AN INPUT-OUTPUT APPROACH,
Oslo Univ. (Norway). Inst. of Economics.
F. R. Forsund, and S. Strom.
Journal of Environmental Economics and Management, Vol. 3, No. 2, p. 129-141, 1976. 6 tab., 17 ref.

Descriptors: *Pollution abatement, *Input-output analysis, *Effluents, Economics, Foreign countries, Gross national product, National income, Consumptive use, Industries, Industrial wastes, Pulp and paper industry, Metals.
Identifiers: *Norway, Residuals.

Input-output analysis is used to study the generation of 35 different kinds of residuals for the Norwegian economy in 1970, where these residuals are treated as the joint products in consumption and production and the discharge to the air, land and water. The residuals are mercury, lead, cadmium, zinc, copper, iron, chrome, sulfur oxides, hydrochloric acid, nitrogen oxides, other acids, soda lye, other bases, fluorine, cyanide, arsenic, carbon monoxide, phosphorus compounds, nitrogen compounds, mine tailings/inorganic sludge/dust, pesticides, aliphatic halogenated hydrocarbons, bark, fiber, wood chips, plastic substances, dissolved biologically-decomposable organic substance, suspended biologically-decomposable substance, oil and oil products, dispersing agents, taste and smell-producing substances, substances with acute poisonous effects, organic solvents, other organic substances, and unspecified waste. Categories of final demand for each residual are enumerated for total export, government consumption, total gross fixed asset formation and total private consumption. A method is also derived for computing the cost of reducing discharges for each of the 35 residuals, given in cost coefficients for total supply per ton reduction of discharge. In the Norwegian 1970 economy, export, and especially export from the pulp and paper and metals and minerals sectors, was the main contributor of the flow of residuals. (Harris-Wisconsin)
W77-06698

ADJUSTMENT COSTS AND OPTIMAL WASTE TREATMENT,
State Univ. of New York at Albany. Dept. of Economics.
For primary bibliographic entry see Field 5D.
W77-06699

POLLUTERS' PROFITS AND POLITICAL RESPONSE: DIRECT CONTROL VERSUS TAXES: COMMENTS AND REPLY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for the Study of Public Choice.
J. M. Buchanan, and G. Tullock.
American Economic Review, Vol. 66, No. 5, p. 976-984, 1976. 8 ref.

Descriptors: *Pollution taxes(Charges), *Water pollution control, *Political constraints, Profit, Economics, Return(Monetary), Institutional constraints, Income.
Identifiers: *Pollution licenses.

Three reviews by environmental economists take issue with arguments raised in an earlier study which examined the political processes that led to the formulation of roles and regulations rather than taxes in the control of pollution. Whereas the original study postulated that because of regulation firms would be less than optimum size, one author argues that the regulated firms would be greater than optimum size and presents an analysis that shows firms engaging in transactions which increase profitability; this is in contrast to the earlier argument that firms are constrained to a less-than-maximum profits equilibrium. A second review claims that the explanation for the revealed preference of transactors for (equitable) direct controls (equal quotas of pollution production) lies in the probability that firms value the returns from taxes at less than the dollar amounts of paid taxes. A third review raises questions of methodology in regard to pollution control alternatives. The authors of the original study reply to the three reviewers, arguing that a quota scheme of pollution control, while not necessarily an efficient way to compensate for the problem, may represent the best politically viable alternative. (Harris-Wisconsin)
W77-06700

EFFLUENT CHARGES AND POLLUTION CONTROL: A CASE STUDY,
Royal Military Coll. of Canada, Kingston (Ontario). Dept. of Political and Economic Science.
G. Lepore.
Canadian Public Policy, Vol. II, No. 3, p. 482-491, 1976. 4 tab., 8 ref.

Descriptors: *Pollution taxes(Charges), *Water pollution control, Canada, Sulfur compounds, Estimation, Unit costs, Economics, Costs, Air pollution.

A study of the effects of pollution taxes as an instrument of environmental control argues that, aside from any other relevant considerations, a policy aimed at controlling pollution through such charges necessitates a prior knowledge of the approximate magnitude of the charges required. The study also proposes a method to estimate such magnitude, based on the derivation of cost curves of abatement for given pollutants. The estimation method assumes that many types of sources discharge any one pollutant and that the known cost of abatement per unit of pollutant is likely to be different for different sources. Therefore, by plotting cost per unit of pollutant abated against the overall reduction of pollutants, a cost function is obtained which can be used in the same manner as a true overall additional cost function. In fact, since estimates of costs usually come in the form of ranges, the result also will be an estimated range of maximum and minimum costs. The procedure was followed to estimate the minimum and maximum reduction of emissions of sulfur oxides by ten types of sources in nine industries. These industries are the source of about 75% of all emissions of sulfur oxides in Canada. (Harris-Wisconsin)
W77-06701

OPTIMAL OIL TANKER SIZE WITH REGARD TO ENVIRONMENTAL IMPACT OF OIL SPILLS,
California Univ., Los Angeles. Graduate School of Management.
R. K. Sarin, and C. R. Scherer.
Journal of Environmental Economics and Management, Vol. 3, No. 3, p. 226-235, 1976. 3 fig., 15 ref.

Descriptors: *Oil spills, Ships, *Environmental effects, *Model studies, *Optimization, Size, Water pollution sources, Oil industry, Navigation, Law of the sea, Accidents, Hazards, Harbors, Estimating scheduling, Economics, Pacific Ocean, Alaska.
Identifiers: *Oil tankers, Tradeoffs.

A model is examined which offers a probabilistic framework for investigating oil tanker size with regard to expected environmental impact of spills during accidental incidences along a coastal shipping route. The model was designed in anticipation of problems involving supertankers moving oil from Valdez, Alaska to west coast ports in the lower states. The model specifically examines tradeoffs between the local environmental impact of relatively small but frequent oil spills associated with the traffic of many small tankers, and the local environmental impact of large and relatively-infrequent spills with fewer tankers of larger size. Important relationships between tanker size, traffic density, number of accidents and spills and environmental impact are outlined and defined. A procedure is suggested to incorporate the environmental impact of oil spills in the model without quantifying them in monetary units. A closed-form solution set for optimal tanker size is obtained and some numerical results are presented. Within the model, separate expressions are developed to account for damages from three kinds of sources: (1) collision of a loaded tanker with another tanker or any other ship on the route or in harbor areas; (2) casualties enroute other than collision, e.g., grounding, fire, or structural failure of the loaded tanker; and (3) accidental releases during loading and unloading in port. (Harris-Wisconsin)
W77-06702

REGULATING ACTIVITIES WITH CATASTROPHIC ENVIRONMENTAL EFFECTS,
California Univ., Riverside. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-06703

UNCERTAINTY AND THE CHOICE OF POLLUTION CONTROL INSTRUMENTS,
Tel Aviv Univ. (Israel). Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-06704

OPTIMAL INVESTMENT IN POLLUTION CONTROL CAPITAL IN A NEOCLASSICAL GROWTH CONTEXT,
Pittsburgh Univ., Pa. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-06705

AN INPUT-OUTPUT ANALYSIS OF ENVIRONMENTAL PRESERVATION,
Manitoba Univ., Winnipeg. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-06706

TWO-GOAL REGIONAL ENVIRONMENTAL POLICY: THE CASE OF THE SANTA ANA RIVER BASIN,
Tel-Aviv Univ. (Israel). Dept. of Economics.
E. Hochman, D. Zilberman, and R. E. Just.
Journal of Environmental Economics and Management, Vol 4, No 1, p 25-39, March 1977. 7 fig, 1 tab, 11 ref, append.

Descriptors: *Water pollution control, *River basins, *Water policy, *Dairy industry, *Environmental control, Reservoirs, Local governments, *Regional development, Decision making, Standards, Efficiencies, Economics, Equations, Mathematical models, Operations research, California, *Regional analysis.
Identifiers: *Santa Ana River basin(Calif), Production, Aggregation, Conflicting goals, Los Angeles(Cal), Welfare function maximization.

In determining public policy measures, the value of information about the functional relationships between targets and instruments can hardly be understated. In this paper, these macrorelations are obtained for a competitive industry by way of aggregation over many individual firms following simple behavioristic patterns. With the exact knowledge of the macrorelations, obtaining the numerical values of the instruments becomes a simple mathematical programming problem. These principles are applied in examination of the water pollution problems generated by the dairy industry in the Santa Ana River basin where local governments face the problem of controlling environmental quality with minimum opportunity costs in terms of output. Assuming the two conflicting goals--production level and environmental quality--and two policy instruments--regulation of waste disposal technologies and level of guaranteed credit to finance antipollution investments, a model is constructed to identify the impact of these controls on the individual microunits (firms). The microimpacts are then aggregated across firms to generate a tradeoff relationship at the macrolevel between production and environmental quality goals and to determine the relationship between each of the macrogoals and the two policy instruments. Thus, the regional policymaker can determine levels of the policy variables which will maximize a regional welfare function subject to the appropriate technological and financial constraints. Results indicate that a more efficient and flexible policy can maintain higher environmental quality while causing fewer firms to relocate. (Bell-Cornell)
W77-06707

WATER CHEMISTRY AND WATER QUALITY,
Uppsala Univ. (Sweden). Dept. of Physical Geography; and Uppsala Univ. (Sweden). Div. of Hydrology.
For primary bibliographic entry see Field 5A.
W77-06778

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. PRINCIPAL INVESTIGATORS' REPORTS JULY-SEPTEMBER 1976. VOLUME 2: FISH, PLANKTON, BENTHOS, LITTORAL.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 6G.
W77-06825

STUDY OF LEACHATE AT LANDFILL SITES 1975, VOLUME 1.
Holzmacher, McLendon and Murrell, Melville, N.Y.
For primary bibliographic entry see Field 5B.
W77-06851

USGS SCIENTISTS BRING CALIFORNIA WATER SUPPLY INTO COMPLIANCE WITH FEDERAL REGULATIONS,
Geological Survey, Laguna Niguel, Calif.
L. A. Eccles, J. M. Klein, and W. F. Hardt.
Water Well Journal, Vol. 31, No. 2, p 42-45, February, 1977. 3 fig.

Descriptors: *Nitrates, *Pollution abatement, Aquifers, Fertilizers, Water pollution sources, Well screens, Water wells, *California, Water quality standards.
Identifiers: *Redlands(Calif), *San Bernadino(Calif).

In January 1976, ground water investigators of the U.S. Geological Survey began working on a solution to a high nitrate problem in the Redlands, California (San Bernardino Valley) area where wells were yielding samples double the Safe Drinking Water Act recommendations of 10 mg/l. Many years of citrus growing and concomitant use of nitrogen fertilizer had contaminated the upper of two significant water-producing zones separated by a sandy-clay interval. The primary well under investigation was screened in both zones with the pump located in the upper, and produced water with nitrate-nitrogen concentration up to 20 mg/l. By installing an inflatable packer at the bottom of the contaminated zone and resetting the pump at greater depth, the nitrate-nitrogen concentration was reduced to a constant 4 mg/l with only a 25 percent decrease in well yield. Permanent sealing of perforations in the upper zone was recommended to maintain high-yield low nitrate performance of this well. Long-term pollution abatement practices suggested for this area include minimization of downward flow of water in the aquifer, avoidance of indiscriminate perforation of wells in all water bearing zones penetrated, and pumping several wells at lower rates rather than a single well at maximum rate. (Eberle-NWWA)
W77-06853

POLLUTION PREVENTION, NOT CONTROL CALLED KEY TO A CLEAN ENVIRONMENT.
Water Conditioning, Vol 18, No 11, p 9, January, 1977.

Descriptors: *Pollution abatement, *Water pollution, *Air pollution, Taxes, Costs, United Nations, Legislation.
Identifiers: *Pollution source control, Pollution control technology, Tax incentives.

A conservation approach to industrial pollution which stresses prevention over cure has been outlined during an environmental program of the United Nations' Economic Commission for Europe. In view of the esclating costs of pollution removal, the only economic alernative may be the design of processes and products which yield little or no contaminants to air or water. The 3M Company, of St. Paul, Minnesota has initiated such a program and in the nine months of its operation has eliminated waste at an annual rate of 70,000 tons of air pollutants and 500 million gallons of waste water. At the present time this type of pollution control has not received received recognition by governments or the general public. Consequently emphasis has been placed on the traditional removal type of pollution control technology. Tax incentives which provide for the traditional removal echniques do not serve the source control methods. Some regulations limit the percentage rather than the total amount of pollutants, this prohibits using echniques that reduce the amount of pollutants even though they increase the concentration. Problems of this nature can be reduced only if the technical aspects of pollution control can be recognized by governments as much as the legal and political aspects. (Heiss-NWWA)
W77-06861

THE LEGAL RESPONSIBILITY OF WATER WELL DRILLERS,
National Water Well Association, Worthington, Ohio.
H. W. Heiss.
Water Well Journal, Vol 31, No 2, p 39-40, February, 1977.

Descriptors: *Water pollution control, *Well regulations, Sewage bacteria, Water law, Water wells, Drilling, Legal aspects.
Identifiers: *Well construction, *Well contractor liability.

Recent hydrological developments making possible the accurate location of sources of ground water pollution, in addition to increased public awareness of water resource conservation and water rights, are placing today's well contractor in new positions of liability for contamination. If faulty casing or grouting procedures result in contamination from sewage bacteria or other chemical sources, the contractor may be liable to (1) the well owner (2) the owners of adjacent property whose wells have been contaminated due to the defective well, and (3) a state or local agency whose well construction regulations have been violated. Many perplexing questions concerning liability exist, e.g., responsibility for contamination in the event of a surface spill over a shallow aquifer, negligence of a well owner or housing developer, the reasonable length of time a well should provide trouble-free service, etc, Until such issues are resolved, the contractor's strict adherence to local codes and the use of approved materials is strongly recommended. (Eberle-NWWA)
W77-06862

NEW DESIGN GIVES DENVER DISTRICT IRON-FREE WELL,
Wright Water Engineers, Inc., Denver, Colo.
For primary bibliographic entry see Field 8A.
W77-06868

HOW TO DEAL WITH PITTING AND CORROSION.
For primary bibliographic entry see Field 8G.
W77-06869

THE NEW YORK BIGHT PROJECT - 1975; STONY BROOK, LONG ISLAND, NEW YORK.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
NOAA Special Report, March 1976. 29 p, 2 fig, 1 tab, 63 ref, 3 append.

Descriptors: *Baseline studies, *Resources development, Water resources, *Water quality control, *Environmental effects, Management, Planning, Monitoring, Oceanography.
Identifiers: *New York Bight, Research projects, Environmental surveys, Oceanographic data.

The objective of the Marine Ecosystems Analysis (MESA) Program is to identify and measure the impact of man on the marine environment. This requires that we: (1) describe, understand, and monitor physical, geological, chemical, and biological processes of marine environmental systems in territorial, boundary, and international waters around the United States; (2) analyze impacts of natural phenomena or manmade alterations on marine environments; and (3) provide information and specialized support for the effective management of marine areas and for the rational use of their resources. (NOAA)
W77-06876

PROGRAM DEVELOPMENT PLAN. ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Washington, D.C.

For primary bibliographic entry see Field 6G.
W77-06878

LOSS OF 2,4-D IN RUNOFF FROM PLOTS RECEIVING SIMULATED RAINFALL AND FROM A SMALL AGRICULTURAL WATERSHED,
Southern Piedmont Conservation Research Center, Watkinsville, Ga.
For primary bibliographic entry see Field 5B.
W77-06908

DISPERSION OF LIQUID WASTE FROM A MOVING BARGE,
Alabama Univ., Tuscaloosa.
For primary bibliographic entry see Field 5B.
W77-06913

OPEN SPACE AND URBAN WATER MANAGEMENT - PHASE II: CASE STUDIES AND FINDINGS,
North Carolina Univ. at Chapel. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6B.
W77-06917

EVALUATION OF ALTERNATIVE SOLUTIONS TO GAS BUBBLE DISEASE MORTALITY OF MENHADEN AT PILGRIM NUCLEAR POWER STATION,
Yankee Atomic Electric Co., Westboro, Mass.
R. A. Marcello, Jr., M. H. Krabach, and S. F. Bartlett.
Report YAEC-1087, October, 1975. 127 p, 44 fig, 139 ref.

Descriptors: Animal physiology, Fish diseases, Bioassay, *Supersaturation, Stress, *Fish behavior, *Pathology, *Power plants, *Power operations and maintenance, Mortality, Cooling water, Engineering structures, *Thermal power, Thermal pollution, Thermal power plants, *Fish barriers, Fish repellant, Nuclear power plants, *Massachusetts.
Identifiers: *Menhaden, Bubbler system, *Submerged offshore diffuser, *Degassing techniques, Effluent dilution, Plant operating restrictions, *Pilgrim Nuclear Power Station(Mass).

The objective is to determine the feasibility and potential application of various fish diversion and deterrent techniques and power plant operational and discharge design modifications which would prevent or minimize the occurrence of gas bubble disease mortalities of menhaden at Pilgrim Nuclear Power Station. The specific alternatives considered in this report include: behavioral barriers, physical barriers, high current velocity barriers, a submerged offshore diffuser, degassing techniques, effluent dilution, plant operating restrictions, and the commercial harvest of menhaden. These alternatives were evaluated on the basis of the following criteria: system effectiveness, system cost, operating experience, design development requirements, applicability in discharge canal or thermal plume, regulatory acceptability, and potential environmental impacts (other than effects on adult menhaden). (Katz)
W77-06928

MISSISSIPPI SOUND TEMPORAL AND SPATIAL DISTRIBUTION OF NUTRIENTS,
Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss. Gulf Coast Research Lab.
For primary bibliographic entry see Field 5B.
W77-06932

ALGAL SUPPLEMENT ENHANCEMENT OF STATIC AND RECIRCULATING SYSTEM,
South Carolina Wildlife and Marine Resources Dept., Charleston. Marine Resources Research Inst.
For primary bibliographic entry see Field 5C.
W77-06933

STATE INFORMATION NEEDS RELATED TO ONSHORE AND NEARSHORE EFFECTS OF OCS PETROLEUM DEVELOPMENT,
For primary bibliographic entry see Field 6G.
W77-06934

WHO'S MINDING THE SHORE. A CITIZENS' GUIDE TO COASTAL MANAGEMENT,
Natural Resources Defense Council, Inc., Palo Alto, Calif.
Report to NOAA, Office of Coastal Zone Management, August 1976. 56 p, 4 append.

Descriptors: *Planning, *Ecosystems, *Oil pollution, *Resources development, *Baseline studies, *Environmental effects, Land use, Coasts, Shore protection, Public rights.
Identifiers: *Coastal Zone Management, Public interest.

This handbook is designed to help citizens participate in their state's planning effort. The CZMA is described and states requirements are listed. A catalog of what people can do to become actively involved in the formulation of their state's program is given. The requirements an effective program must meet are considered and the natural forces at work in the coastal ecosystems and the areas which are vital to the preservation of these ecosystems are outlined. The various recreational, commercial, and industrial activities which compete for use of the coastal zone are described and some of the considerations which should be taken into account for their proper management are given. Two of the most acute development pressures in the coastal zone--offshore oil production and residential subdivisions--are considered with their problems for the design of a management program. Finally, an analysis of the rights of public and private owners of property in the coastal zone and the extent of state authority to regulate their use of property in the management program is given. (NOAA)
W77-06935

COASTAL FACILITY GUIDELINES: A METHODOLOGY FOR DEVELOPMENT WITH ENVIRONMENTAL CASE STUDIES ON MARINAS AND POWER PLANTS,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
For primary bibliographic entry see Field 6G.
W77-06936

COASTAL ZONE MANAGEMENT, ANNOTATED BIBLIOGRAPHY,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
For primary bibliographic entry see Field 2L.
W77-06937

ENVIRONMENTAL POLLUTION: IS THERE ENOUGH PUBLIC CONCERN TO LEAD TO ACTION,
Illinois Univ. at Urbana-Champaign.
For primary bibliographic entry see Field 6G.
W77-06955

REVIEW AND ANALYSIS OF HYDROGEOLOGIC CONDITIONS NEAR THE SITE OF A POTENTIAL NUCLEAR-WASTE REPOSITORY, EDDY AND LEA COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, N Mex. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06974

CINCINNATI'S PREVENTIVE MAINTENANCE SEWER PROGRAM.
Water and Sewage Works, Vol. 124, No. 1, p 70-71, January, 1977.

Descriptors: *Sewerage, *Repairing, *Inspection, *Cleaning, *Maintenance, *Water districts, Cities, Personnel, Water quality control, Sanitary engineering, *Ohio.
Identifiers: *Cincinnati Metropolitan Sewer District(OH).

The Greater Cincinnati Sewer Maintenance Division will soon complete a 12-year program of preventive inspection and cleaning of its 4000-mile sewer system. The goal of the project is to provide repair and cleaning services before conditions warrant complaints. A complex network of crews was formed to achieve this goal. There are three cleaning and repair-section crews and an inspection section crew. Each cleaning/repair section has two major repair crews, a minor repair crew, two major cleaning crews, a power cleaning crew, and a complaint crew. The inspection and investigation section is composed of three minor investigation crews for interceptor cleaning; three regulator crews--two routine inspection crews and one maintenance crew for welding and fabrication; and four routine inspection crews. Other divisions of the Metropolitan Sewer District are Administration, Technical Services, and Operations. The entire operation is financed by a special rate charge. Daily reports are made on trouble areas, and monthly reports are given on how much sewer line was cleaned and repaired, on the number of complaints, and on recommended solutions. Equipment is serviced regularly and purchases are based on the amount of cleaning and repair work to be done. (Collins-FIRL)
W77-06989

APPARATUS FOR DISPOSAL OF EFFLUENTS.
For primary bibliographic entry see Field 5E.
W77-07002

THE OPERATIONS SECTION OF LINCOLN SEWAGE DIVISION,
For primary bibliographic entry see Field 5D.
W77-07023

MUNICIPAL WASTE WATER TREATMENT AS AN INDUSTRIAL OPERATION,
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W77-07025

FAIL-SAFE WASTE TREATMENT SYSTEM,
CH2M/Hill, Reston, Va.
For primary bibliographic entry see Field 5D.
W77-07027

SLUDGE DEWATERING ON ALASKA'S NORTH SLOPE,
For primary bibliographic entry see Field 5D.
W77-07030

NUTRIENT REMOVAL BY WATER HYACINTHS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
D. A. Cornwell, J. Zoltek, Jr., C. D. Patrinely, T. deS. Furman, and J. I. Kim.
Journal Water Pollution Control Federation, Vol 49, No 1, p 57-65, January, 1977. 5 fig, 4 tab, 15 ref.

Descriptors: *Nutrient removal, *Water hyacinth, *Waste water treatment, *Eutrophication, *Aquatic algae, *Biochemical oxygen demand, Nitrogen, Phosphorus, Water pollution effects, Water quality.

Hyacinths were studied as nutrient removal agents for use in combating eutrophication. Experiments on effluent from the University of Florida Waste Water Treatment Plant (Gainesville) were conducted in a 3-phase study to determine if there was a significant reduction of nitrogen and phosphorus in a plant scale operation during winter, to determine growth patterns and effectiveness, and to study effects of detention time and depth. Resultant data showed that water hyacinths' nutrient removal capacities were directly related to pond surface area; that depth and detention time must allow a given surface area per unit flow through the pond (80% nitrogen and 44% phosphorus removal were gained with 5.1 acres hyacinths per 1 mgd); and that nutrient uptake was good during the increase in area-growth phase and during the vertical-growth phase. The nitrogen removal factor may make the plants useful in eutrophication control. Nutrients which sloughed off during the death phase remained in ponds as a bottom sediment and reduced the need for hyacinth harvesting. The most profitable use of the dead hyacinths would be as compost. (Collins-FIRL)
W77-07036

ON THE SELF-PURIFICATION OF NATURAL WATERS, (IN GERMAN),
Limnologische Station Niederrhein in der Max-Planck-Gesellschaft z.F.d.W., Krefeld (West Germany).
K. Seidel.
Naturwissenschaften 63(6), p 286-291, 1976.

Descriptors: *Self purification, *Bacteria, Organic matter, Viruses, Water purification, Water treatment, Public health.

Whether the work of planting in natural waters is worthwhile and should be encouraged is questioned. Investigations with higher plants and emersed plants show that higher plants exert a strong influence on organic and inorganic matter, pH regulation, destruction of pathogenic bacteria, worms, eggs and viruses and also how they influence the waters and waste waters.--Copyright 1977, Biological Abstracts, Inc.
W77-07038

WHAT'S NEW IN LANDFILL LINERS.
The American City and County, Vol 92, No 2, p 54-56, February, 1977. 2 tab.

Descriptors: *Linings, *Landfills, *Water pollution control, Groundwater, Surface waters, Plastics, Asphalts, Cements, Rubber, Impervious membranes, Adhesives, Films, Polymers, Leachates, Economics, Oxidation, Temperatures, Anaerobic conditions, Environment.

Landfill linings have been used to control ground and surface water pollution resulting from landfill operations. Linings suitable for the disposal of various fluids or wastes were described. These include polyethylene (PE), plasticized polyvinyl chloride (PVC), butyl rubber sheeting, chlorosulfonated polyethylene sheeting (Hypalon), ethylene propylene rubber (EPDM), chlorinated polyethylene (CPE), admix liners, asphalt concrete, hydraulic asphalt concrete, soil asphalt, bituminous seal-catalytically blown asphalt, and bituminous seal-fabric plus asphalt emulsion. Selection often depends upon the economics of usage and the length of time the liner will be in service. Combinations of linings are sometimes preferable to single ones. Seaming is important with liners because they are usually manufactured in narrow sheets. Factory seaming usually employs electronic sealing, 'solvent welding', or heat curing adhesives. The use of adhesives is restricted by the specific polymer and specific compounding recipe for which they are designed. Environmental conditions often affect the usefulness of these liners. Anaerobic conditions, normally found at the bottom of landfills, prevent oxidation of liner materials. The liners should be placed on surfaces graded to allow drainage; objects that could cause cracking of hard liners should be removed. Polymeric materials should be protected from light which degrades the materials. Wet-humid conditions should be reduced, especially when leachate is regularly produced, to prevent leaching from a liner, and temperatures should be in the 40-70 F range. Acidic conditions and high leachate ion concentrations should also be avoided. (Collins-FIRL)
W77-07051

PHOSPHATES IN SOILS TREATED WITH SEWAGE WATER: I. GENERAL INFORMATION ON SEWAGE FARM, SOIL, AND TREATMENT RESULTS,
Agricultural Univ., Wageningen (Netherlands).
J. Beek, F. A. M. de Haan, and W. H. van Riemsdijk.
Journal of Environmental Quality, Vol 6, No 1, p 4-7, January-March, 1977. 1 fig, 3 tab, 7 ref.

Descriptors: *Phosphates, *Soils, *Sewage treatment, Sewage effluents, Sewage disposal, Organic matter, Inorganic compounds, Biochemical oxygen demand, *Waste water treatment, Waste water disposal.
Identifiers: Sewage farms.

Research conducted at a sewage farm used for 50 years was described. The 247 acre area was reclaimed from uncultivated woodland on sandy soil. A comparison of the composition of the added waste water and the drainage water can be indicative of the effectiveness of this treatment method. Water analysis results can be supported with soil analysis data. Analysis of sodium, potassium, cadmium, manganese, silica dioxide, iron, and chlorine did not reveal any significant differences, indicating a degree of soil system equilibrium relative to these compounds. Data indicated that the soil is an active filter for organic carbon compounds, as well as for organic and inorganic phosphorus compounds. These and other collected data showed land disposal of raw sewage water is still effective in reducing BOD and removing phosphates, even after 45 years of use. The use of this land as permanent pasture can be combined with waste water treatment up to a waste water level thickness of 2.5 meters on an annual basis. This treatment raises soil pH and increases organic matter content. Nitrogenous compounds are transformed into nitrate nitrogen and nitrogen removal by soil treatment is relatively low. Both adsorption and precipitation reactions play a role in phosphate bonding by soil and phosphate accumulation is mostly limited to the top 50 centimeters. (See also W77-07053 and W77-07054) (Collins-FIRL)
W77-07052

CONDITIONING AND LAND APPLICATION OF AEROBICALLY DIGESTED SLUDGE,
Montgomery County Sanitary Dept., Dayton, Ohio.
For primary bibliographic entry see Field 5D.
W77-07058

SHORT COURSE PROCEEDINGS: APPLICATIONS OF STORMWATER MANAGEMENT MODELS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-07066

INTRODUCTION TO URBAN STORM WATER RUNOFF MODELS,
Water Resources Engineers, Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-07071

THE WRE STORM MODEL,
Water Resources Engineers, Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-07073

WATER QUALITY SIMULATION OF TAHOE-TRUCKEE SYSTEM, NEVADA-CALIFORNIA-VOLUME I,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5B.
W77-07075

WATER QUALITY INVESTIGATIONS IN THE SOUTH PLATTE RIVER BASIN, COLORADO, 1971-72.
National Field Investigations Center, Denver, Colo.
For primary bibliographic entry see Field 5A.
W77-07076

DEVICE FOR SUCKING THE UPPER LAYER OF A POLLUTED WATER SURFACE,
L. Chastan-Bagnis.
United States Patent 4,008,156. Issued February 15, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 3, p 935, February, 1977. 1 fig.

Descriptors: *Patents, Equipment, *Separation techniques, *Specific gravity, Separation, Water pollution control, Surface waters, Pollutants, Water quality control, Pollution abatement.

A patent was issued for a device to collect floating pollutants from water surfaces. The mechanism has an inlet opening in the forward portion connected to a channel with extending sidewalls so that polluted water flows through the channel from the inlet opening. A collection chamber is provided with means to separate the polluting material according to their specific gravities. A negative pressure area sucks the pollutant into the collection chamber and means are provided to remove separated water and pollutants from the collection chamber. (Collins-FIRL)
W77-07089

INTEGRATED APPROACH TO URBAN WASTE WATER MANAGEMENT,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5D.
W77-07095

A NONLINEAR MULTILEVEL TRANSPORTATION MODEL FOR WATER RESOURCE-WATER QUALITY MANAGEMENT,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5B.
W77-07096

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

AN INPUT-OUTPUT ANALYSIS OF ENVIRONMENTAL PRESERVATION,
Manitoba Univ., Winnipeg. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-06706

TWO-GOAL REGIONAL ENVIRONMENTAL POLICY: THE CASE OF THE SANTA ANA RIVER BASIN,
Tel-Aviv Univ. (Israel). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-06707

MATHEMATICAL MODELS IN HYDROLOGY.
Jnited Nations Educational, Scientific and Cul-ural Organization, Paris (France).
For primary bibliographic entry see Field 2A.
W77-06708

ON THE APPLICATION OF OPTIMIZATION TECHNIQUES TO CONCEPTUAL CATCHMENT MODELS,
Technische Universitaet, Dresden (East Ger-many).
For primary bibliographic entry see Field 2A.
W77-06709

USE OF A PARAMETRIC MODEL AS A TOOL FOR HYDROMETRIC NETWORK PLANNING,
Waterloo Univ., (Ontario). Dept. of Civil En-gineering.
For primary bibliographic entry see Field 2A.
W77-06710

INDICES OF WATER RESTRICTION AND WATER DEFICIENCY TOLERANCE,
Research Inst. for Water Resources Development, Budapest (Hungary).
I. Domokos.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 865-875. 4 fig, 10 ref.

Descriptors: *Water resources development, Water demand, Planning, Management, Stochastic processes, Evaluation, Equations, Constraints, Systems analysis.
Identifiers: *Water restriction indices, *Water deficiency.

One of the groups of limiting conditions serving as a basis of planning of water development systems is that of the limit values of the indices characterizing the restriction in satisfying water demands, i.e., by the so-called water deficiency tolerance indices. A general theory of water restriction indices has been developed. First some properties of the time functions of the available water resources and of the water demands are analyzed or prescribed, respectively, as well as some properties of the periods considered, all of which can be of use for the construction of the theory. Then the concept of the water restriction index is defined as the expected value of this indicator function considered as a stochastic process. Three particular concrete water restriction indices incorporated in this theory are discussed. These are: the relative duration of water restriction surpassing a certain degree; the average relative water deficiency and the mean square relative deficiency. Simple formulae are reduced for the calculation of these indices. Their applicability in the practice of water resources management is also appraised. (See also W77-06708) (Bell-Cornell)
W77-06711

COLLECTIVE UTILITY: A SYSTEMS APPROACH TO WATER PRICING POLICY,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 6C.
W77-06712

THE CONJUNCTIVE USE OF A MULTI-RESERVOIR SYSTEM AND A DUAL-PURPOSE DESALTING PLANT,
Shahand Co., Tehran (Iran).
For primary bibliographic entry see Field 4B.
W77-06714

OPTIMAL OPERATIONS OF RESERVOIRS IN THE HARZ MOUNTAINS,
Technische Universitaet, Brunswick (West Germany). Leichtweiss Inst. for Water Research.
For primary bibliographic entry see Field 4A.
W77-06715

METHODS FOR CONTROL OF THE REGIMES FOR WATER RESOURCES SYSTEMS,
Moskovskii Energeticheskii Institut (USSR). Dept. of Hydropower.
For primary bibliographic entry see Field 4A.
W77-06717

OPTIMAL COMPLEX USE OF CONTROLLED WATER RESOURCES OF A BASIN,
Akademiya Nauk SSSR, Moscow. Central Economic Mathematical Inst.
For primary bibliographic entry see Field 4A.
W77-06718

MATHEMATICAL MODEL OF WATER RESOURCES UTILIZATION IN A RIVER BASIN,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 4A.
W77-06719

OPTIMIZATION OF A THREE-RESERVOIR SYSTEM BY DYNAMIC PROGRAMMING,
Ministerio de Obras Publicas, Madrid (Spain). Geologico Servicio.
For primary bibliographic entry see Field 4A.
W77-06720

OPTIMAL DESIGN AND OPERATION OF RESERVOIR SYSTEMS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-06721

INTEGRATION OF AQUIFERS IN FLOOD CONTROL PROJECTS,
Technion - Israel Inst. of Tech. Haifa. Dept. of Agricultural Eng.
For primary bibliographic entry see Field 4A.
W77-06723

OPTIMAL SEASONAL AND SHORT-TERM OPERATION OF A RESERVOIR USED FOR FLOOD CONTROL AND WATER SUPPLY,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 4A.
W77-06724

STREAMFLOW REGULATION BY ARTIFICIAL RECHARGE FED FROM UPSTREAM SURFACE STORAGE: DERIVATION OF CONTROL RULES,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 4A.
W77-06725

THE METHODS OF DISTRIBUTION OF WATER RESOURCES IN RIVER DEVELOPMENT SYSTEMS,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 4A.
W77-06726

MODELE MATHEMATIQUE DE SIMULATION DU SYSTEME DES RESSOURCES HYDRAULIQUES SUPERFICIELLES DU LLOBREGAT,
Ministerio de Obras Publicas, Barcelona (Spain). Study and Experimental Centre.
For primary bibliographic entry see Field 4A.
W77-06727

CONJUNCTIVE USE OF THE TAJO-SEGURA AQUEDUCT SURFACE SYSTEM AND THE AQUIFERS OF THE LA MANCHA AREA,
Ministerio de Obras Publicas, Madrid (Spain). Geologico Servicio.
For primary bibliographic entry see Field 4B.
W77-06728

OPTIMAL PLANNING OF FLOWS IN MULTI-RESERVOIR HYDRO-POWER SYSTEMS,
Boeing Computer Services Inc., Seattle, Wash. Mathematical Analysis Unit.
For primary bibliographic entry see Field 4A.
W77-06730

A SECTOR MODEL FOR REGIONAL AND NATIONAL WATER RESOURCES PLANNING,
Harvard Univ., Cambridge, Mass. Center for Population Studies.
P. Rogers.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 1040-1047. 3 fig, 1 tab, 17 ref.

Descriptors: Water resources, *Long-term planning, *Regional development, *Evaluation, *Scheduling, *Investment, *Economics, Water policy, Decision making, Agriculture, Constraints, Input-output analysis, Project planning, Methodology, Mathematical models, Systems analysis, Optimization, Linear programming.
Identifiers: *Multi-level sector model, Mixed-integer programming, Intersectoral planning, Benefit functions, Benefit maximization, Government decision model, Producer decision model, East Pakistan.

A multi-level sector model is proposed to evaluate the selection of optimal schedules from all possible investments in the water sector of an economy by regions and over time. The interregional and intertemporal nature of the model allows for the evaluation of policy decisions concerning preferred regional growth and balance. An example based on planning for the use of water for agricultural development in the Province of East Pakistan is discussed. Although the model is of only the water sector, the constraints upon it relate it to intersectoral input-output models of the regional and national economy. The crux of the intersectoral planning problem is to be able to set the size of the resource allocation to each of the sectors. The model focuses on the investment decision within the sector itself rather than between the sectors. The overall model is split into two separate but complementary models, called the Governmental Decision Model and the Producer Decision Model; the former utilizes mixed-integer programming and the latter employs continuous linear programming. A summary comparison between the two models is given; the objective of both is benefit maximization. (See also W77-06708) (Bell-Cornell)
W77-06731

HYDROLOGICAL EVALUATION OF CHANGES IN RUNOFF CHARACTERISTICS,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 4A.
W77-06732

GENERAL DESCRIPTION OF THE VISTULA RIVER PROJECT AND BASIC PLANNING DATA,
Bureau of Studies and Designs for Hydraulic Structures, Warsaw (Poland).
For primary bibliographic entry see Field 4A.
W77-06733

THE MULTI-STEP METHOD FOR SIMULATION AND OPTIMIZATION OF VISTULA RIVER PLANNING ALTERNATIVES,
Technical Univ., Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-06734

THE OUT-OF-KILTER ALGORITHM AS A SINGLE-STEP METHOD FOR SIMULATION AND OPTIMIZATION OF VISTULA RIVER PLANNING ALTERNATIVES,
Water Resources Engineers Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 4A.
W77-06735

LA SCIENCE DES SYSTEMES DANS LA PLANIFICATION DES RESSOURCES EN EAU,
Catania Univ. (Italy). Istituto di Idraulica Idrologia Gestione Acque (Italy).
E. Guggino.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 1084-1092. 7 ref.

Descriptors: *Water resources, *Management, *Planning, *Systems analysis, Methodology, Operations research, Economics, Hydrology.
Identifiers: *System science, Multiple objectives.

This paper studies the current status of water resources management through System Science. Having given some basic definitions, the necessity is shown of facing the problem of rational water resources management through active interdisciplinary research which could avoid fragmented and distorted points of view and which could state the problem within the more general framework of territorial management and economic programming. The methodology of approach through System Science is described, its different phases are analyzed, and finally some conclusions are drawn on the basis of the applications already implemented. (See also W77-06708) (Bell-Cornell)
W77-06736

A DYNAMIC MULTISECTOR PROGRAMMING APPROACH TO REGIONAL WATER RESOURCE MANAGEMENT,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
J. Bargur.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2. IAHS/Unesco, Paris, France, 1974, p 1094-1110. 3 fig, 7 tab, 16 ref, 2 append.

Descriptors: *Water resources, *Water management(Applied), Regional development, Comprehensive planning, *Optimization, Input-output analysis, Linear programming, California, Projects, Alternative planning, Economic efficiency, Constraints, Methodology, Investment, Water requirements, Equations, Mathematical models, Systems analysis.
Identifiers: *General equilibrium analysis, Western US, Benefit maximization, Activity analysis model, Basic programming model, Shadow prices, Cropping pattern.

Market forces have failed in the area of development, allocation and management of natural resources in general and of water resources in particular. The shaping of public investment programs for water resources development has long been dominated by partial equilibrium analyses such as 'benefit cost' analysis (B/C). However, this approach is rather limited for an interregional intertemporal management program of water resources. This study offers a multisector planning and management approach for water resources based on a general equilibrium analysis employing input-output models and linear programming techniques. A dynamic multisector programming model which accounts for the sectoral, spatial, and temporal aspects of regional planning is formulated and applied empirically for California and the western U.S. for a 15-year planning horizon. The objective of this basic model is to maximize the gross intertemporal interregional product up to the target year and from then on to infinity. An extension to an activity analysis model of various types of water production activities is offered to provide a choice among alternative development projects; the objective of this model is maximization of consumption. Results of the empirical application pertain to water requirements forecasts, interregional water transfer requirements, efficient production and cropping pattern, 'shadow prices' for water and labor and an optimal investment program for water resources projects. Use of this model has enabled the investigation of regional development dependent upon the interrelationships between resource availabilities and sectoral planning, illustrating complex interdependencies among economic variables. (See W77-06708) (Bell-Cornell)
W77-06737

SHORT COURSE PROCEEDINGS: APPLICATIONS OF STORMWATER MANAGEMENT MODELS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-07066

A NONLINEAR MULTILEVEL TRANSPORTATION MODEL FOR WATER RESOURCE-WATER QUALITY MANAGEMENT,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5B.
W77-07096

6B. Evaluation Process

DESIGN STUDY OF ENVIRONMENTAL AND HUMAN CULTURAL INFORMATION SYSTEM NEEDS IN URBAN WATER RESOURCE DEVELOPMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Architecture and Urban Studies.
J. E. Hackett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 957, Price codes: A08 in paper copy, A01 in microfiche. Completion Report, September 1976. 161 p., 18 fig, 47 ref. OWRT B-062-VA(2).

Descriptors: *Management, *Land use, *City planning, *Resources development, *Information exchange, Water policy, Environment, Planning, Water resources development, Data collections, *Alternative planning, Social needs, Social values, Institutions, Comprehensive planning.
Identifiers: Resource analysis, Public planning.

The scope, scale and content of comprehensive information systems for urban environmental resource management are a function of several varibles including the purpose and scope of the management study, scale and specificity of the applications level of complexity of the analysis method, and the objective of the planning program. These affect the organizational structure and content of the information system as it is designed for a particular application, whether that application is a tailored solution to a specific resource problem or whether it is a general course of action to be followed in future urban area development. In any urban application, a systematically structured information system should be developed that includes the full range of parameters associated with the urban system as well as the environmental system. A particular need exists for more thorough consideration of social factors and a descriptive framework is presented for incorporation of these factors. This research also addresses the relationship of form and content of information systems to the methods and techniques of analysis used and the influence of urban area planning approaches on the structure, content and use of information inputs. The current status of water resource planning is reviewed, indicating the need for a general process that incorporates the operational frame of resource management in the more comprehensively organized, public decision-making frame of urban land use planning. A two-stage process for management planning is developed. The process provides for the formulation, design, and implementation of an integrated management program through a series of progressively dependent activity phases. The definition stage is directed to the objective determination of problems along with a preliminary assessment of management needs to provide the basis for the specification by the public involved of the management objectives. This stage is accomplished through a three-phase program formulation, area-wide inventory and analysis, and public definition of management objectives. In the second stage, management alernatives to the stated objectives are defined and evaluated, the management program is selected and implemented, and procedures for continuing public and technical review are instituted. Technical involvement during the management stage is likely to be significantly greater than in the definition stage because extensive programs of data collection and the application of more sophisticated techniques of systems analysis and program evaluation are more likely to be required.
W77-06634

UNCERTAINTY AND THE CHOICE OF POLLUTION CONTROL INSTRUMENTS,
Tel Aviv Univ. (Israel). Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-06704

OPTIMAL INVESTMENT IN POLLUTION CONTROL CAPITAL IN A NEOCLASSICAL GROWTH CONTEXT,
Pittsburgh Univ., Pa. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-06705

A SECTOR MODEL FOR REGIONAL AND NATIONAL WATER RESOURCES PLANNING,
Harvard Univ., Cambridge, Mass. Center for Population Studies.
For primary bibliographic entry see Field 6A.
W77-06731

A DYNAMIC MULTISECTOR PROGRAMMING APPROACH TO REGIONAL WATER RESOURCE MANAGEMENT,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
For primary bibliographic entry see Field 6A.
W77-06737

ENVIRONMENTAL IMPACT STATEMENTS IN WATER RESOURCES PLANNING AND DECISION MAKING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6E.
W77-06738

IMPROVEMENT OF PLANNING FOR POST DEVELOPMENT WATER RESOURCE MANAGEMENT: A STUDY OF THE WEBER BASIN PROJECT,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Research.
G. E. Madsen, and W. H. Andrews.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 009, Price codes: A05 in paper copy, A01 in microfiche. Research Monograph No. 6, September 1976. 90 p, 1 fig, 6 tab, 53 ref. OWRT C-6092(No. 5212)(1), 14-31-0001-5212.

Descriptors: *Management, *Planning, Social impacts, Social change, *Utah, River basin development, Water resources development, Post-impoundment, Water management(Applied), Future planning(Projected), Water demand, Recreation, Urbanization, Irrigation systems, Attitudes.
Identifiers: *Weber Basin Project(Utah).

The objectives of this research were: (1) identify present management problems in the Weber Basin Project of Utah; (2) identify whether the problems are related to the planning process so that relationships between planning and management can be identified; (3) identify recommendations from present management personnel concerning changes in planning which might help alleviate management problems with future projects, as well as recommendations for present solutions to problems; (4) identify theoretical elements which can be applied to future planning. Data for the study came from three sources: indepth interviews with officials representing management agencies in the Weber Basin Project; secondary data from organizational records, previous research studies, and planning documents; and two seminars with management officials. Present management problems were being experienced primarily in two areas, urban pressurized irrigation systems (where the non-treated water is used for residential lawns, gardens and shrubs), and the recreation component of the project. Several recommendations for future water resources planning grew out of this project. Two of the most important were: (1) many of the present problems are related to changes in the project which occurred largely since the initial planning and development. Therefore, it appears that more emphasis needs to be given to a broad program of continuous planning through the lifetime of future projects; (2) it would be helpful to have periodic meetings at the early stages of the project and continue them through the operation.
W77-06739

ECONOMIC ANALYSIS OF ALTERNATIVE GROUNDWATER WITHDRAWAL RATES IN CONJUNCTION WITH SURFACE WATER IRRIGATION,
Washington State Univ., Pullman. Coll. of Agriculture.
For primary bibliographic entry see Field 4B.
W77-06740

PROGRAM DEVELOPMENT PLAN. ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 6G.
W77-06878

OPEN SPACE AND URBAN WATER MANAGEMENT - PHASE II: CASE STUDIES AND FINDINGS,
North Carolina Univ. at Chapel. Dept. of City and Regional Planning.
K. Elfers, and M. M. Hufschmidt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 087, Price codes: A07 in paper copy, A01 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No. 122, December 1976. 225 p, 5 fig, 1 tab, 153 ref. OWRT B-086-NC(1). 14-31-000-5101.

Descriptors: *Urban hydrology, *Land use, Water resources, Water management(Applied), Ecosystems, Preservation, Urban runoff, *Planning, North Carolina, Urban drainage, Small watersheds, *Management, *Watershed management, Southeast US, Water quality.
Identifiers: *Urban water management, *Open spaces preservation, Urban water resources, *Crabtree Creek watershed(NC), *Eno River watershed(NC), Raleigh area(NC), Durham area(NC), *Piedmont region(NC).

A detailed examination was made of local goals, criteria, and planning strategies for the preservation of open space and the related management of urban water resources. The key elements are two extensive case studies of small, urbanizing watersheds in the Piedmont Region of North Carolina. The two watersheds offer good examples of the diverse problems, issues, goals, and criteria that may be involved in open space preservation and related urban water management. Crabtree Creek watershed, near and including part of Raleigh, N.C., offers a case study in which (1) several City and County agencies have been involved in open space and related urban water management activities, (2) the State is expanding a major State Park, (3) the SCS is helping to implement a system of flood control impoundments, (4) the EPA is reviewing the probable impacts of a proposed major sewer interceptor, and (5) the Corps of Engineers and the Bureau of Outdoor Recreation are studying alternative flood control/recreation plans for the main stem of the Crabtree Creek within Raleigh. The Eno River watershed near Durham, N.C., offers an important contrast in that the watershed is more rural and scenic with steep valleys and narrow floodplains. Thus, interest has focused on preserving much of the river valley in its natural state and on creating a State Park. The recommendations fall into two basic categories: (1) those of a planning strategy or procedural nature which would be applicable to all areas of the country; and (2) those consisting of planning criteria and standards of a quantitative nature which, although expressed in terms of acceptable ranges of values, are directed toward the Piedmont Region of the southeastern United States. (See also W75-07596) (Kiger-North Carolina State)
W77-06917

ENVIRONMENTAL POLLUTION: IS THERE ENOUGH PUBLIC CONCERN TO LEAD TO ACTION,
Illinois Univ. at Urbana-Champaign.
For primary bibliographic entry see Field 6G.
W77-06955

A NEW RESERVOIR AND RECREATIONAL BEHAVIOR,
Oklahoma State Univ., Stillwater. Dept. of Geography.
R. D. Hecock.
Growth and Change, Vol. 5, No. 3, July 1974, p 17-20. 3 fig, 3 tab.

Descriptors: *Recreation, *Reservoirs, Behavior, *Social impact, Surveys, Water resource development, Benefits, *Oklahoma, Attitudes, Estimating, Land use.
Identifiers: *Keystone Reservoir(OK), *Recreation participation rates, Land and Water Conservation Act, Public access.

Estimating the nature and extent of a new reservoir's impact on the recreational behavior of the population surrounding the reservoir is discussed. Recreational benefits of federal reservoirs are currently calculated on predictions of gross attendance. But distortions occur because projected attendance will be greatest where there is presently a large participating population, and where there is multiple counting of active participants. It is necessary to understand how participation is developed in an area previously without any access to water resource recreation. The Keystone Reservoir, in northwest Oklahoma, completed in 1964 and containing 26,000 acres of water surface, was used as a case study. Surveys were taken between 1960 and 1970. Thirty-five percent of outdoor recreationists said Keystone stimulated a change in their recreation behavior; 25% of total respondents indicated the lake influenced their recreation behavior. In both groups about 40% reported increases in recreation participation rates, while 30% reported unchanged participation rates. The data suggest a steep distance-decay function exists, explaining a strong reverse relationship between distance from the reservoir and the proportion of respondents whose recreation behavior was influenced by Keystone. Conclusions are that different types and locations of facilities will result if emphasis on gross participation rates is reduced, and increased weight is given to rates of non-participation. Several smaller reservoirs would have a larger impact on recreation behavior than one large reservoir due to the high degree of localization of impact on recreation behavior. (Gentry-North Carolina)
W77-06956

ENERGY DEVELOPMENT: THE ENVIRONMENTAL TRADEOFFS. VOLUME 4: THE BACKGROUND PAPERS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 6G.
W77-06957

WATER QUALITY MANAGEMENT AND THE DISTRIBUTION OF EMISSION RIGHTS BY SEALED TENDER MARKETS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5E.
W77-06976

A NONLINEAR MULTILEVEL TRANSPORTATION MODEL FOR WATER RESOURCE-WATER QUALITY MANAGEMENT,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5B.
W77-07096

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COST COMPARISON BETWEEN SUBTERRENE AND CURRENT TUNNELING METHODS,
Mathews (A. A.), Inc., Rockville, Md.
For primary bibliographic entry see Field 8A.
W77-06662

COST COMPARISON BETWEEN SUBTERRENE AND CURRENT TUNNELING METHODS, APPENDIX A--BASELINE COST ANALYSES,
Mathews (A. A.), Inc., Rockville, Md.
For primary bibliographic entry see Field 8A.
W77-06663

COST COMPARISON BETWEEN SUBTERRENE AND CURRENT TUNNELING METHODS, APPENDIX B--SUBTERRENE COST ANALYSES,
Mathews (A. A.), Inc., Rockville, Md.
For primary bibliographic entry see Field 8A.
W77-06664

THE GENERATION OF RESIDUAL FLOWS IN NORWAY: AN INPUT-OUTPUT APPROACH,
Oslo Univ. (Norway). Inst. of Economics.
For primary bibliographic entry see Field 5G.
W77-06698

POLLUTERS' PROFITS AND POLITICAL RESPONSE: DIRECT CONTROL VERSUS TAXES: COMMENTS AND REPLY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for the Study of Public Choice.
For primary bibliographic entry see Field 5G.
W77-06700

COLLECTIVE UTILITY: A SYSTEMS APPROACH TO WATER PRICING POLICY,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein, and C. C. Kisiel.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 2, IAHS/Unesco, Paris, France, 1974, p 879-886. 1 tab, 11 ref. OWRT A-024-ARIZ(10).

Descriptors: *Water policy, *Pricing, Water distribution(Policy), Assessment, Water rates, Regions, Arizona, Equations, Mathematical models, Cost-benefit analysis, Conservation, Behavior, Systems analysis, Methodology.
Identifiers: *Collective utility, Tucson(Arizona), Comparison.

Collective utility of a region based on Lesourne's theory is used to compare water pricing policies in Tucson, Arizona over a single time period. The present method of marginal pricing (regressive block rate) is compared to a hypothetical conservation pricing (progressive block rate). Well-defined hypotheses are made about the behavior of consumers served by the water distribution company. The value of the change in collective utility determines which price structure should be adopted once model parameters are known and once a value has been inputed to conservation. A progressive rate structure decreases the total consumption. When peak consumption is lowered, lower capital expenditures occur. Extensions of the model to multi-period policies and uncertainty of future conditions are presented. The analysis is appropriate wherever a central water agency exists. Collective utility as an approach to analysis of water resource systems is contrasted with the techniques of cost-effectiveness and cost-benefit analyses. Although a progressive price structure goes against the established principle of 'marginal pricing' (the more water is produced, the cheaper it is sold), preliminary calculations show that a permanent change to such a structure increases the collective utility. The collective utility approach can be used for sequential decision making on price structures. (See also W77-06708) (Bell-Cornell)
W77-06712

A UNIVERSAL CALIBRATION EQUATION FOR PRICE METERS AND SIMILAR INSTRUMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 7B.
W77-06943

6D. Water Demand

THE GROWTH SHAPERS: THE LAND USE IMPACTS OF INFRASTRUCTURE INVESTMENTS.
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.30. Prepared for the Council on Environmental Quality, Washington, D.C., May 1976. 71 p, 44 fig, 37 ref, 1 append.

Descriptors: *Environmental effects, *Land use, *Capital investment, *Sewers, *Highways, *Land development, *Land management, *Land resources, Investment, Airport, Social aspects.
Identifiers: *Infrastructure, *Public investment, Economic aspects, Mass transit.

The link between infrastructure facilities such as water and wastewater systems, power supplies, highway and road networks, mass transit systems and airports, and land use is explored. Focusing on how infrastructure investments can shift existing or potential demand for land, there is, however, no agreement on the question as to whether infrastructure investment actually creates growth or merely concentrates a region's development into its own service area. Steps to estimate what development will occur for a given investment are: (1) define the impact area; (2) inventory the supply of land in an area; (3) estimate demand for land; (4) use supply and demand analysis to determine what development will occur; (5) estimate impacts of the amount, pattern, and rate of development; and (6) determine how the impacts, related to the investment, can then be controlled. Impacts of infrastructure induced development may be controlled by reduction in capacity of the infrastructure, thereby limiting demand; changing the route of the infrastructure investment; staging the investment in phases; zoning (including cluster zoning, density zoning and planned unit development); public purchase of land rights (i.e., land banking). Regulations setting performance standards for environmental management and building codes can be used to control subdivision development and construction. Detailed analysis, using the above methodology, is presented for highways, mass transit, and sewers. (Gentry-NC)
W77-06601

INDICES OF WATER RESTRICTION AND WATER DEFICIENCY TOLERANCE,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W77-06711

OPTIMIZATION OF A THREE-RESERVOIR SYSTEM BY DYNAMIC PROGRAMMING,
Ministerio de Obras Publicas, Madrid (Spain). Geologico Servicio.
For primary bibliographic entry see Field 4A.
W77-06720

IMPROVEMENT OF PLANNING FOR POST-DEVELOPMENT WATER RESOURCE MANAGEMENT: A STUDY OF THE WEBER BASIN PROJECT,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Research.
For primary bibliographic entry see Field 6B.
W77-06739

PRELIMINARY ASSESSMENT OF THE WATER RESOURCES OF THE TULALIP INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-06971

WATER IN THE PALOUSE RIVER BASIN, WASHINGTON,
Geological Survey, Madison, Wis. Water Resources Div.; and Geological Survey Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06978

6E. Water Law and Institutions

ENVIRONMENTAL IMPACT STATEMENTS IN WATER RESOURCES PLANNING AND DECISION MAKING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. D. Bradley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 023, Price codes: A08 in paper copy, A01 in microfiche. Completion Report, (1976). 161 p, 4 fig, 69 ref. OWRT C-5222(No. 4213)(2).

Descriptors: *Planning, Political aspects, Institutions, Institutional constraints, Water law, *Legislation, *Arizona, *Decision making, Environmental effects.
Identifiers: *Central Arizona Project, *Warm Springs Dam(Ariz), *National Environmental Policy Act, *Environmental impact statements.

The environmental impact statement has an information generating role. But information is not neutral; its generation changes the substance of decision-making. The Centrl Arizona Project and the Warm Springs Dam are examples of water projects requiring environmental assessment. The information generated by each EIS was controversial, and higher standards for information gathering and use are needed to assign liability and to clarify risk analysis. NEPA applies universal and objective information demands to a political and ideological policy-making process.
W77-06738

PRELIMINARY BIBLIOGRAPHY ON GROUNDWATER IN DEVELOPING COUNTRIES,
Association of Geoscientists for International Development, St. John's (Newfoundland).
For primary bibliographic entry see Field 2F.
W77-06852

POLLUTION PREVENTION, NOT CONTROL CALLED KEY TO A CLEAN ENVIRONMENT.
For primary bibliographic entry see Field 5G.
W77-06861

THE LEGAL RESPONSIBILITY OF WATER WELL DRILLERS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W77-06862

6F. Nonstructural Alternatives

FLOOD MANAGEMENT STUDY.
Northern Tier Regional Planning and Development Commission, Towanda, Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 456, Price codes: A07 in paper copy, A01 in microfiche. Prepared for the Appalachian Regional Commission and the Department of Housing and Urban Development, Washington, D.C. Final Report, October 1974. 82 p, 7 tab, 11 map, 5 append. 73-82 HUD-CPA-1047, ARC-PA-2355/.

Descriptors: *Floods, Flooding, *Flood plain insurance, *Flood plain zoning, *Flood plains, *Flood control, *Non-structural alternatives, *Land use, Flood protection, Drainage channels, Wetlands, Shores, *Pennsylvania, Dams, Reservoirs.
Identifiers: *Flood plain management, Northern Tier Regional Planning and Development Commission, *Hurricane Agnes(1972), *Intermunicipal tax sharing, Appalachian Regional Commission, National Flood Insurance Program, Flood Hazard Boundary Maps.

The Northern Tier Region of PA lies between Elmira, New York and the Scranton/Wilkes - Barre, Pennsylvania metropolitan areas. Primarily rural, it has 160,000 people within 4,000 sq mi. The flood plain management plan was the result of joint HUD and Appalachian Regional Commission funding to provide a Agnes Flood Recovery Grant to the Northern Tier Regional Planning and

Development Commission (NTRPDC) following the 1972 flood from Hurricane Agnes. The report covers hydrology, existing flood control structures, plans and programs for protective works, physical development, management techniques (land use, zoning, intermunicipal tax sharing, flood insurance), economics and natural factors. Some recommendations are: flood management should be based on non-structural alternatives: conventional zoning, the National Flood Insurance Program, and a Development District approach should be given high priority for implementation; the Comprehensive Regional Plan should incorporate preservation of undeveloped aquifer recharge areas, limit flood plain development to agriculture, recreation and other non-structural uses, restrict development according to soil suitability, and preserve vegetative cover along streams and river banks, natural drainage channels, wetlands and shoreline areas; Flood Hazard Boundary Maps developed by the Federal Insurance Administration should define locations of flood plains. Physiographic data and lot and parcel maps can be used by municipalities within the study area to develop comprehensive plans with supporting zoning ordinances. Future flood management and comprehensive plans for the area can be based on data supplied by this study. (Gentry-North Carolina)
W77-06952

DELINEATION OF FLOOD HAZARD AREAS: FLOOD HAZARD REPORT NO. 2, RARITAN RIVER.
Anderson-Nichols and Co., Inc., Boston, Mass.
For primary bibliographic entry see Field 4A.
W77-06953

FLOOD HAZARD INFORMATION: CAVE CREEK, ARIZONA CANAL TO 19TH AVENUE, PHOENIX, ARIZONA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W77-06954

6G. Ecologic Impact Of Water Development

THE GROWTH SHAPERS: THE LAND USE IMPACTS OF INFRASTRUCTURE INVESTMENTS.
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6D.
W77-06601

DESIGN STUDY OF ENVIRONMENTAL AND HUMAN CULTURAL INFORMATION SYSTEM NEEDS IN URBAN WATER RESOURCE DEVELOPMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Architecture and Urban Studies.
For primary bibliographic entry see Field 6B.
W77-06634

EVALUATION OF THE ENVIRONMENTAL IMPACT TO APPALACHIAN PENNSYLVANIA WATERS OF THE 1972 FLOOD AND SUBSEQUENT STREAM CHANNELIZATION WITH FUTURE POLICY RECOMMENDATIONS.
Baker (Michael), Jr., Inc., Beaver, Pa.
For primary bibliographic entry see Field 4A.
W77-06676

OPTIMAL OIL TANKER SIZE WITH REGARD TO ENVIRONMENTAL IMPACT OF OIL SPILLS,
California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 5G.
W77-06702

REGULATING ACTIVITIES WITH CATASTROPHIC ENVIRONMENTAL EFFECTS,
California Univ., Riverside. Dept. of Economics.
M. L. Cropper.
Journal of Environmental Economics and Management, Vol 3, No 1, p 1-15, 1976. 4 fig, 12 ref.

Descriptors: *Model studies, *Disasters, *Environmental effects, *Natural resources, *Regulation, Analytical techniques, Accidents, Exploitation, Nuclear powerplants, Water allocation(Policy), Optimization.
Identifiers: *Irreversible effects, *Pollution threshold, Utility, Disutility, Catastrophic pollution, Resource depletion, Nonrenewable resources.

Two models are developed for analyzing the natural resource impacts of two levels of disastrous activity outcomes. The first case hypothesized is that of catastrophic pollution such as might be created by accidents associated with nuclear power plants and stratospheric flight. Such a case involves a temporary reduction of utility, and the model captures the 'small probability of large loss' characteristic of pollution problems associated with these activities by assuming that the uncertain effects of pollution are potentially disastrous. The second case covers an irreversible catastrophe such as the inadvertant depletion of a nonrenewable resource for which no substitute is available. The latter might occur when the total amount of the resource extracted exceeds the uncertain resource stock. Disaster reduces the level of utility to zero, so that in utility terms, catastrophe is equal to zero consumption; the unique and stable equilibrium which characterizes many pollution control models no longer obtains and multiple-equilibria solutions are possible. In the case of resource depletion, it is shown that when reserves are uncertain the path of planned extraction is no longer necessarily monotonic and may even increase over time; future generations may be worse off under uncertainty than they would if the size of the resource stock were certain. (Harris-Wisconsin)
W77-06703

UNCERTAINTY AND THE CHOICE OF POLLUTION CONTROL INSTRUMENTS,
Tel Aviv Univ. (Israel). Dept. of Economics.
Z. Adar, and J. M. Griffin.
Journal of Environmental Economics and Management, Vol 3, No 3, p 178-188, 1976. 3 fig, 7 ref.

Descriptors: *Risks, *Pollution abatement, *Economic efficiency, *Pollution taxes(Charges), Standards, Welfare(Economics), Prices, Optimization, Mathematical studies.
Identifiers: Marginal damage function, Marginal control costs, Pollution rights, Auctions.

The relative efficiencies of pollution taxes, pollution standards, and the auctioning of pollution rights are compared, when the marginal damage function (MDF) or marginal control cost (MCC) are subject to uncertainty. uncertainty conditions are examined with respect to the three policy choices at the level of the pollution control agency, and at the firm level when combined with risk aversion. It is concluded that: (1) uncertainty in the marginal damage function has no effect on the choice between the three policy instruments, (2) uncertainty in the marginal control cost function will yield different expected welfare losses between taxes or standards or auctions depending on the variance of the stochastic error term and the slopes or elasticities of the MDF and MCC functions; and (3) this asymmetry holds even under risk aversion, with the welfare loss also dependent on the degree of risk aversion. In situations of uncertain MCC where MDF tends to be very price elastic, as with SO2 emissions, taxes seem most efficient. Where the MDF is very inelastic, quantitative restrictions of an auction or standards type seem to be desirable. in the latter case, standards introduce added informational uncertainty which seems to dominate possible welfare losses due to wide variations in auction prices. (Luedtke-Wisconsin)
W77-06704

OPTIMAL INVESTMENT IN POLLUTION CONTROL CAPITAL IN A NEOCLASSICAL GROWTH CONTEXT,
Pittsburgh Univ., Pa. Dept. of Economics.
G. W. Gruver.
Journal of Environmental Economics and Management, Vol 3, No 3, p 165-177, 1976. 6 fig, 9 ref.

Descriptors: *Pollution abatement, *Model studies, *Optimum development plans, Investment, Capital, Economic efficiency, Optimization, Mathematical models, Theoretical analysis.
Identifiers: Economic growth.

A neoclassical growth model is employed to study how the optimal division of investment between pollution control capital and directly productive capital varies over time, to determine if it would be optimal to have balanced investment or to specialize in one type of capital at a time, and if it is best to specialize, which type of capital should be accumulated first. Model assumptions treat pollution as a flow which can be measured by an appropriate index. It is considered to have a negative effect on aggregate utility, to be negatively related to the stock of pollution control capital, and to be positively related to aggregate output. The investment process is assumed to be irreversible. The model objective is to maximize the integral of discounted utility over a fixed planning period by optimal choice of the saving rate and of the relative proportion of savings to be allocated to production investment as opposed to pollution control capital. Results indicate that a balanced investment plan will not be optimal, and that the optimal approach would be to first invest in directly productive capital (even though this will cause the flow of pollution to increase) and then subsequently increase investment to control pollution. (Luedtke-Wisconsin)
W77-06705

AN INPUT-OUTPUT ANALYSIS OF ENVIRONMENTAL PRESERVATION,
Manitoba Univ., Winnipeg. Dept. of Economics.
I. F. Lipnowski.
Journal of Environmental Economics and Management, Vol 3, No 3, p 205-214, 1976. 18 ref.

Descriptors: *Input-output analysis, *Pollution abatement, Economic feasibility, Mathematical models.
Identifiers: *Environmental quality, *Economic growth, Matrix.

The implications and technical feasibility of a policy of complete environmental preservation within the context of a closed, static input-output model is examined. A well-established criterion for gauging the growth potential of an economy, the technology of which can be represented by a nonnegative indecomposable square matrix, is reviewed. The concept of growth upon which this criterion is based is shown to be ambiguous since it ignored the environmental repercussions of economic activity. Assuming that the economy possesses an antipollution technology which may be included in an enlarged technology-environment matrix which is also nonnegative and indecomposable, an alternative criterion to gauge growth potential in the presence of complete environmental preservation is proposed. Building on this new base, the magnitude of the uniform rate of profit which would have to exist in order to assure the technical feasibility of effecting a sudden transition from a situation of zero antipollution activity to one of strict environmental preservation is formulated. Various factors which would facilitate

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the implementation of an environmental preservation policy, such as technological progress, are also discussed. (Luedtke-Wisconsin)
W77-06706

TWO-GOAL REGIONAL ENVIRONMENTAL POLICY: THE CASE OF THE SANTA ANA RIVER BASIN,
Tel-Aviv Univ. (Israel). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-06707

ENVIRONMENTAL IMPACT STATEMENTS IN WATER RESOURCES PLANNING AND DECISION MAKING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6E.
W77-06738

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. PRINCIPAL INVESTIGATORS' REPORTS JULY-SEPTEMBER 1976. VOLUME 1: MARINE MAMMALS, MARINE BIRDS.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending September 1976. Vol 1. Marine Mammals, Marine Birds, November 1976, 601 p.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Mammals, Surveys, Birds, Migratory birds, Habitats, Ecology.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Gulf of Alaska, Bering Sea, Beaufort Sea, Bristol Bay, Norton Sound.

This volume contains the quarterly reports of baseline studies on the environmental effects related to petroleum development on the Alaskan Continental Shelf. The multi-year program is directed by the National Oceanic and Atmospheric Administration under the sponsorship of the Bureau of Land Management. The baseline studies in this volume encompass marine mammals and marine birds. (See also W77-06794 thru W77-06824) (Sinha-OEIS)
W77-06793

BASELINE CHARACTERIZATION OF MARINE MAMMALS IN THE BERING SEA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.
C. H. Fiscus, H. W. Braham, and R. D. Everitt.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 3-29, November 1976. 9 fig, 4 tab, 3 ref.

Descriptors: *Alaska, *Mammals, *Baseline studies, *Resources development, *Environmental effects, *Ecological distribution, Continental Shelf, Ecology, Data collections, Surveys, Seasonal, Water resources.
Identifiers: *Outer Continental Shelf, *Bering Sea, Environmental assessment, Environmental impact, Harbor seals, Sea lions, Whales, Eumetopias, Ziphius cavirostris, Cetaceans.

The number of marine mammals observed along the north coast of the Alaska Penisula and throughout the eastern Aleutian Islands is summarized. The total number of animals for all species scored is preliminary and does not necessarily reflect the actual number of animals present in each area surveyed. Additional estimates of animal numbers (i.e., relative abundance) will be provided in the annual report after a systematic analysis of the aerial photographs and other aerial survey data can be prepared. Heavy fog along the Alaska Peninsula and on the northern side of the eastern Aleutian Island not only hindered survey of pinniped rookery and hauling areas but also made observing for cetaceans difficult. Undoubtedly, the number of cetaceans seen does not reflect the total number in this area at this time of the year. (See also W77-06793) (Sinha-OEIS)
W77-06794

ABUNDANCE AND SEASONAL DISTRIBUTION OF MARINE MAMMALS IN THE GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.
C. H. Fiscus, H. W. Braham, and R. W. Mercer.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 30-32, November 1976. R71208606.

Descriptors: *Alaska, *Baseline studies, *Ecological distribution, *Resources development, *Data collections, *Environmental effects, Water resources, *Mammals, Surveys.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, Environmental assessment, Environmental impact, Eumetopius jubatus, Eschrichtius robustus.

The northern and coastal regions of the Gulf of Alaska are expected to be important areas where oil-gas research and tanker traffic will occur. These areas also represent localized habitats for breeding marine mammals (e.g. northern sea lion, Eumetopius jubatus) and for seasonal migration (e.g. California gray whale, Eschrichtius robustus). The baseline objectives of this project are to provide an understanding of the relative seasonal distribution and abundance of marine mammals. Sighting records taken aboard NOAA ships and chartered vessels working in and crossing the gulf in this quarter, data from aircraft surveys collected by supporting OCSEAP projects, and historical whaling and sealing records have been gathered and prepared for analysis. (See also W77-06793) (Sinha-OEIS)
W77-06795

DISTRIBUTION AND ABUNDANCE OF BOWHEAD AND BELUKHA WHALES IN THE BERING AND CHUKCHI SEAS,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.
C. H. Fiscus, H. W. Braham, B. D. Krogman, and R. D. Everitt.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 33-42, November 1976. 1 tab. R7120807-8.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Ecological distribution, *Data collections, *Environmental effects, Water resources, Mammals, Surveys.
Identifiers: *Outer Continental Shelf, *Environmental assessment, Environmental impact, Beaufort Sea, *Chukchi Sea, Aerial surveys, Whales, Cetaceans, Balaena mystecetus, Delphinapterus leucas, *Bering Sea.

The objectives of this project were to make estimates on the distribution and abundance of bowhead (Balaena mystecetus) and belukha (Delphinapterus leucas) whales in the Bering and Chukchi Seas. Observations on marine mammals were made throughout the daylight hours on ship cruises. Other data recorded were animal behavior, environmental parameters, exact position, etc. Computer programs were written which will allow all bowhead and belukha sightings to be plotted by time and position. The fall aerial surveys were initiated 20 September and originated from the Naval Arctic Research Laboratory. Flights were made east and west of Barrow, AK along the coast, as well as over offshore areas extending out to the edge of the pack ice approximately 15-20 miles from shore. Visual estimates were made and photographs taken to verify species identification and numbers of animals seen. (See also W77-06793) (Sinha-OEIS)
W77-06796

THE NATURAL HISTORY AND ECOLOGY OF THE BEARDED SEAL (ERIGNATHUS BARBATUS) AND THE RINGED SEAL (PHOCA (PUSA) HISPIDA),
Alaska Dept. of Fish and Game, Fairbanks.
T. J. Eley, and J. J. Burns.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 55-124, November 1976. 6 tab, 4 ref, 4 append. 02-5-022-53.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, *Distribution patterns, *Mammals, Ecology, Biology, Pathology.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, Bering Sea, *Beaufort Sea, *Chukchi Sea, Phocidae, Pinnipedia, Biological collections.

The objectives of this investigation were to provide a summarization and evaluation of existing literature and available unpublished data on reproduction, distribution, abundance, food habits and human dependence on bearded and ringed seals in the Bering, Chukchi and Beaufort Seas, and to assure the acquisition of large amounts of specimen material required for an understanding of food habits in these two species, and the acquisition of additional data of productivity and growth rates. Major efforts in this quarter were devoted to field activities. One hundred and sixty-three ringed seals and 99 bearded seals were obtained or collected. Measurements, jaws, claws, stomachs and reproductive tracts were obtained from most specimens. Analysis of reproduction and growth is critically dependent on accurate determination of the age of specimens. Although a number of measurements have been made age data is not yet available from enough individuals to allow meaningful analysis. A draft report of Marine Mammal Diseases and Parasites by Caro A. Nielson is included as Appendix 4 of this report. (See also W77-06793) (Sinha-OEIS)
W77-06799

AN AERIAL CENSUS OF SPOTTED SEALS PHOCA VITULINA LARGHA,
Alaska Dept. of Fish and Game, Fairbanks.
J. J. Burns, and S. J. Harbo, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 125-26, November 1976. 03-5-022-53.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Mammals, Sea ice.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Seals(Spotted), *Bering Sea, Seasonal distribution, Phoca vitulina largha.

Determination was made of the seasonal density and distribution of spotted seals, Phoca vitulina largha, in the ice front of eastern Bering Sea. During later winter and early spring, this seal occurs in considerable numbers, within the proposed Bristol Bay, St. George Basin and Navarin Basin lease areas. All data collected have been transcribed from field record forms to computer forms. These

forms have been keypundhed and verified. (See also W77,06793) (Sinha-OEIS)
W77-06800

IDENTIFICATION, DOCUMENTATION AND DELINEATION OF COASTAL MIGRATORY BIRD HABITAT IN ALASKA,
Alaska Dept. of Fish and Game, Fairbanks.
P. D. Arneson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 170-196, November 1976. 10 fig, 6 tab. 03-5-022-69.

Descriptors: *Alaska, *Baseline studies, *Resources development, Data collections, *Ecological distribution, *Environmental effects, Water resources, *Migratory birds, Birds, Habitats, Littoral, Estuaries.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Gulf of Alaska, *Bristol Bay, *Beaufort Sea, *Chukchi Sea.

The objectives of this investigation were to summarize and evaluate existing literature and unpublished data on the distribution, abundance, behavior, and food dependencies of birds associated with littoral and estuarine habitat in the Gulf of Alaska, Bristol Bay, Beaufort Sea and Chukchi Sea, and on barrier islands in the Beaufort Sea. Other objectives were to determine seasonal density distribution, critical habitats, migratory routes, and breeding locales for principal bird species in the study area and identify critical species particularly in regard to possible effects of oil and gas development. The technique used for shoreline bird surveys was flying in single-engine, high wing aircraft at an altitude of approximately 30-45 meters and speed of 160 kilometers per hour. Observers were used on both sides of the aircraft. All observations were recorded on cassette-type tape recorders. It was determined that southern Bristol Bay is a very important summering area for birds. The regions surveyed represent only a small portion of the southern Bering Sea area. (See also W77-06793) (Sinha-OEIS)
W77-06804

IDENTIFICATION, DOCUMENTATION, AND DELINEATION OF COASTAL MIGRATORY BIRD HABITAT IN ALASKA, AND THE DISTRIBUTION, ABUNDANCE AND FEEDING ECOLOGY OF BIRDS ASSOCIATED WITH PACK ICE,
Alaska Dept. of Fish and Game, Fairbanks.
G. J. Divoky.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 197-215, November 1976. 1 fig.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Migratory birds, Sea ice, Distribution patterns.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Bering Sea, *Pack ice.

Aerial censusing was the primary means of obtaining information on bird use of coastal waters. Transects along the coast were walked in order to determine numbers and activities of species using nshore waters, adjacent beach and tundra. Observations were also made on shipboard while underway. All birds within a 300 m wide ransect were ounted. Detaild ice observations were made during each transect and the activities of birds in relaion to ice were noted. Preliminary results for the ruises in the Bering Sea indicate that the greatest oncentrations of birds seen on the Surveyor ruise were in the leads and polynias of the ice over the continental shelf. These ice openings had densities averaging over 600 birds per square kilometer and ranged up to 8000 birds per square kilometer. Lower concentrations were found immediately south of the ice edge. Much lower densities were characteristic of Bering Sea waters with depths greater than 200 meters. (See also W77-06793) (Sinha-OEIS)
W77-06805

ECOSYSTEM DYNAMICS BIRDS AND MARINE MAMMALS. PART I: PRELIMINARY ESTIMATES OF PINNIPED - FINFISH RELATIONSHIPS IN THE BERING SEA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. B. McAlister, and M. A. Perez.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 219-248, November 1976. 4 fig, 11 tab, 26 ref.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, *Ecosystems, *Trophic levels, Mammals, Fish, Birds, Food habits.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Bering Sea, Pinnipedia.

Studies reported represent the results of research proposed to integrate and synthesize data into a conceptual submodel of the ecosystem describing tropho-dynamic relationships in the eastern Bering Sea including interactions among northern fur seals, other marine mammals, marine birds, and several species of fish. The amount of food consumed by fur seals and other pinnipeds has been estimated and compared with the amount of fish caught by commercial fisheries in the same waters. Although this report is preliminary and the first step in a detailed process of analyzing all known data on the feeding reltionships of pinnipeds, it does appear to provide a good estimate of the range of finfish consumption by fur seals and other pinnipeds. (See also W77-06793) (Sinha-OEIS)
W77-06806

ECOSYSTEM DYNAMICS BIRDS AND MARINE MAMMALS. PART II: FOOD WEB STRUCTURE AND TROPHIC RELATIONS OF BERING SEA AVIFAUNA (PRELIMINARY REPORT),
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
G. A. Sanger.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 249-263, November 1976. 2 fig, 6 tab, 11 ref.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, *Birds, *Food habits, *Food webs, Population.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Bering Sea, Trophic relationships, Feeding behavior, Uria spp., Puffinus tenuirostris, Seasonal distribution.

This report summarizes published and unpublished information on population sizes, seasonal changes in distribution and abundance, and feeding behavior and food habits of murres (Uria spp.) and short-tailed shearwaters (Puffinus tenuirostris) in the eastern Bering Sea. This report is largely a compilation of basic information in tabular form. (See also W77-06793) (Sinha-OEIS)
W77-06807

ECOSYSTEM DYNAMICS BIRDS AND MARINE MAMMALS. PART III: A DYNAMIC NUMERICAL MARINE ECOSYSTEM MODEL FOR EVALUATION OF MARINE RESOURCES IN EASTERN BERING SEA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
T. Laevastu, F. Favorite, and W. B. McAlister.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 264-377, November 1976. 24 fig, 6 tab, 12 ref, append.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Model studies, Ecosystems.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Bering Sea, Numerical models, Food availability.

The objective of this project is to design and program a complete marine ecosystem model for quantitative evaluation of: the effects of man, environmental changes (anomalies), and interspecies interactions on the dynamics of marine ecosystem, with emphasis on economically important species. The concept and design of Dynamical Numerical Marine Ecosystem Model (DYNUMES) is described and results obtained from an 8-component version of the model are presented. The use and utility of the DYNUMES model is tested and results indicated several phenomena within the ecosystem that have received little attention in the past research, but which seem to be among major determinants of the balance within the system. One of the general conclusions from the use of the model is that availability of food is a limiting factor for most ecological levels and groups. (See also W77-06793) (Sinha-OEIS)
W77-06808

REPRODUCTIVE ECOLOGY OF PRIBILOF ISLAND SEABIRDS,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
G. L. Hunt, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 378-387, November 1976. 1 fig. 03-5-022-72.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Birds, Ecology, Reproduction, Population, Phenology, Food habits.
Identifiers: *Outer Continental Shelf, *Pribilof Islands, Bering Sea, Environmental assessment, Environmental impact.

Objectives of this investigation were: to determine the phenology of seabirds nesting on St. Paul and St. George Islands; to evaluate reproductive success of seabirds nesting on St. Paul and St. George Islands; to determine food habits of Pribilof Island Seabirds; to conduct radial transects by ship in the vicinity of St. Paul and St. George Islands; and to aid in the estimation of popultion size of Pribilof Island seabirds. Results suggest that most alcids forage fairly close to the island where they nest, usually within 10 nautical miles. Tufted and Horned Puffins may travel further off shore. Cormorants forage close to their islands. Fulmars appear to move far off shore, and black-legged kittiwakes may forage in large flocks in tide-rips near the ends of their nesting islands. (See also W77-06793) (Sinha-OEIS)
W77-06809

COMMUNITY STRUCTURE, DISTRIBUTION, AND INTERRELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA,
Oregon State Univ., Corvallis. Dept. of Zoology.
J. A. Wiens.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 391-403, November 1976. 03-5-022-68.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, *Water pollution, *Water birds, Birds, Ecosystems, Populations.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Gulf of Alaska.

Patterns of seasonal abundance and distribution were studied because of their direct relevance to oil development and transport activities, and also to use in analysis of marine bird energetic impacts. The dynamics of feeding flocks of seabirds were investigated to determine the degrees and directions of dependency and/or interference between seabird species. This involves a description of the roles of different species in flock formation and development and an analysis of their contribution to the efficiency and performance of the system as a whole. Observations were made at all periods of the day but were largely dependent upon weather, visibility and ship's activity. Specimens were collected by shotgun for analysis of food habits. (See also W77-06793) (Sinha-OEIS)
W77-06810

SHOREBIRD DEPENDENCE ON ARCTIC LITTORAL HABITATS,
California Univ., Bodega Bay. Bodega Marine Lab.
R. W. Risebrough, and P. G. Connors.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 404-408, November 1976.

Descriptors: *Alaska, *Arctic, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, *Water resources, *Water birds, *Oil pollution, *Shore birds, Littoral, Habitats, Ecology.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, Seasonal variations.

The assessment of the degree and natural of dependence of each shorebird species on Arctic habitats which may be susceptible to perturbation from offshore oil development activities entails three major areas of investigation: Seasonal occurrence of shorebirds by species, in a variety of arctic littoral and near-littoral habitats; foraging habitat preferences of shorebirds within the littoral zone, by species; and diets of shorebirds in the arctic littoral zone, by species, as these change through the season. Approximately 500 transect censuses were completed during this period. In general, the timing of movements of shorebirds in littoral areas agreed with the pattern established during the 1975 season, but with several differences, especially in population magnitudes. The most striking difference discovered, however, was the change in plankton composition and density along the gravel shorelines. (See also W77-06793) (Sinha-OEIS)
W77-06811

AVIFAUNAL UTILIZATION OF THE OFFSHORE ISLAND AREA NEAR PRUDHOE BAY, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
D. Schamel.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 409-447, November 1976. 11 fig, 1 tab, 20 ref, append. 03-5-022-56.

Descriptors: *Alaska, *Migratory birds, *Baseline studies, Resources development, Data collections, *Ecological distribution, *Environmental effects, Water resources, *Oil pollution, Barrier islands, *Water pollution effects, Population, Shore birds, Seasonal, Ecology.
Identifiers: *Outer Continental Shelf, *Prudhoe Bay, Egg Island(AK), Environmental assessment, Environmental impact, Common Eiders, King Eiders, Oldsquaw, Somateria mollissima, Somateria spectabilis, Clangula hyemalis.

The objective of the study was to document changes in numbers and activity patterns of avifauna over time and space. Census work was conducted with a 1.8 km radius from an observation blind on Egg Island. Egg Island is a barrier inlet on the Beaufort Sea cost which was found to have the greatest concentration of nesting eiders during a preliminary survey of islands in this area. Mean densities of birds were greatest on 24 June and on 20 July. These figures correspond to the peaks of spring and summer migration, respectively. Spring migration is concentrated almost entirely at sea. The bay is used increasingly by birds from early July through August. The most numerous birds in the area (Common Eiders, King Eiders, and Oldsquaw) are all highly susceptible to oil spills. Since Common Eiders and, to a lesser extent, King Eiders breed on barrier islands, oil development on these islands could interfere with nesting. (See also W77-06793) (Sinha-OEIS)
W77-06812

BIRDS OF COASTAL HABITAT ON THE SOUTH SHORE OF SEWARD PENINSULA, ALASKA,
College of the Atlantic, Bar Harbor, Maine.
W. H. Drury.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 448-468, November 1976. 5 tab. 03-5-022-77.

Descriptors: *Alaska, *Shorebirds, *Water birds, *Waterfowl, *Water pollution effects, *Baseline studies, Resources development, Data collections, *Ecological distribution, *Environmental effects, Water resources, Birds, Coasts, Habitats, Population.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Seward Peninsula(Alas).

Studies of populations, community structure and ecology of marine birds at Bluff Cliffs and Sledge Island and surveys of the use of coastal habitats by waterfowl and shorebirds are the objectives of this investigation. Field activities are reported and species number and distribution are down in tables. (See also W77-06793) (Sinha-OEIS)
W77-06813

ECOLOGY AND BEHAVIOR OF SOUTHERN HEMISPHERE SHEARWATERS (GENUS PUFFINUS) AND OTHER SEABIRDS, WHEN OVER THE OUTER CONTINENTAL SHELF OF THE BERING SEA AND GULF OF ALASKA DURING THE NORTHERN SUMMER,
Calgary Univ., (Alberta).
J. Guzman.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 469-478, November 1976. 2 fig.

Descriptors: *Alaska, *Baseline studies, Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Birds, Distribution patterns, Ecology, Weather, Pollutants.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Bering Sea, *Gulf of Alaska, Shearwaters, Puffinus tenuirostris, Puffinus griseus.

The degree of overlap in the geographical distribution of the Short-tailed Shearwater (Puffinus tenuirestris) and the Sooty Shearwater (Puffinus griseus) during the northern summer in the study area, and the relationship between the distribution of these Shearwaters and particular water conditions, the distance from shore, the foods available to them, and the passage of weather systems were studied during the cruise of the DISCOVERER. (See also W77-06793) (Sinha-OEIS)
W77-06814

SEASONAL DISTRIBUTION AND ABUNDANCE OF MARINE BIRDS,
Fish and Wildlife Service, Anchorage, Alaska. Office of Biological Services and Coastal Ecosystems.
C. J. Lensink, and J. C. Bartonek.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 479-484, November 1976. 1 tab. 01-5-022-2538.

Descriptors: *Alaska, *Baseline studies, Resources development, Data collections, *Ecological distribution, *Environmental effects, Water resources, *Population, *Birds, *Surveys, *Water pollution, Seasonal, Coasts, Ecosystems, Leases.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Gulf of Alaska, *Bering Sea, Arctic Ocean.

The objective of this research unit was to describe the seasonal density distribution of marine birds in those portions of the Gulf of Alaska, the Bering Sea, and the Arctic Ocean that have been identified by the U.S. Department of the Interior for leasing and development of their oil and gas potentials. This research considered only the offshore environment and did not include species generally confined to the nearshore and littoral habitats. It did not directly consider the distribution of pelagic species when they occupy shoreline habitats such as during the breeding season. Effort continued during this quarter to bet shipboard survey data into a form useable for automatic data processing. (See also W77-06793) (Sinha-OEIS)
W77-06815

PRELIMINARY CATALOG OF SEABIRD COLONIES AND PHOTOGRAPHIC MAPPING OF SEABIRD COLONIES,
Fish and Wildlife Service, Anchorage, Alaska. Office of Biological Services and Coastal Ecosystems.
C. J. Lensink, and J. C. Bartonek.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 485-524, November 1976. 21 fig, 2 tab. 01-5-022-2538/01-06-022-11437.

Descriptors: *Alaska, *Baseline studies, *Resources development, Data collections, *Ecological distribution, *Environmental effects, Water resources, Bird, Distribution patterns, Population, Surveys.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Bristol Bay(Alas).

This report contains the preliminary catalog of seabird colonies in the Bristol Bay Basin and a summary of other activities during the quarter. The location and relative size of marine bird colonies bounding the Bristol basin are summarized and information is given about their location, composition, size, and amount of land occupied. (See also W77-06793) (Sinha-OEIS)
W77-06816

REVIEW AND ANALYSIS OF LITERATURE AND UNPUBLISHED DATA ON MARINE BIRDS,
Fish and Wildlife Service, Anchorage, Alaska. Office of Biological Services and Coastal Ecosystems.
C. J. Lensink, and J. C. Bartonek.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 525-538, November 1976. 01-6-022-11437.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Birds, Bibliographies, Leases.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Bristol Bay Basin(Alas).

A bibliography of source information on bird resources in the Bristol Bay Basin (exclusive of St. George Basin) OCS lease sale area was prepared for the Service's response to the Bureau of Land Management's request for environmental data to be used in thier deliberations on tract selection and deletion. (See also W77-06793) (Sinha-OEIS)
W77-06817

MIGRATION OF BIRDS IN ALASKA COASTAL AND MARINE HABITATS SUBJECT TO INFLUENCE BY OCS DEVELOPMENT,
Fish and Wildlife Service, Anchorage, Alaska. Office of Biological Services and Coastal Ecosystems.
C. J. Lensink, and J. C. Bartonek.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 539-541, November 1976. 01-6-022-11437.

Descriptors: *Alaska, *Baseline studies, Resources development, *Data collections, Ecological distribution, *Environmental effects, Water resources, Birds, Migratory birds, Migrations, Habitats.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact.

This report is a summary of efforts mainly during the quarter by U.S. Fish and Wildlife Service personnel, contractees, and collaborators to characterize the migration of birds inthose Alaskan waters subject to pertoleum development of the outer continental shelf. Information is presented on banding efforts, recent reports of sightings of banded birds, sea watch efforts, and a report of bird migration past Pt. Barrow during the fall of 1975. (See also W77-06793) (Sinha-OEIS)
W77-06818

FEEDING ECOLOGY AND TROPHIC RELATIONSHIPS OF ALASKAN MARINE BIRD, AND POPULATION DYNAMICS OF MARINE BIRDS,
Fish and Wildlife Service, Anchorage, Alaska. Office of Biological Services and Coastal Ecosystems.
C. J. Lensink, and J. C. Bartonek.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 542-553, November 1976. 3 tab. 01-5-022-2538.

Descriptors: *Alaska, *Baseline studies, Resources development, *Data collections, Ecological distribution, *Environmental effects, Water resources, Ecology, Birds, Food habits.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, Population dynamics, Trophic relationships, *Gulf of Alaska, *Bering Sea.

Research Units RU 341 and 342 were designed to help satisfy the objectives which are to describe the trophic relationships and the population dynamics of selected species at offshore and coastal study sites. Since personnel, coastal study sites and ships, are largely indentical the two research unites are treated together in this report. Activities under these two unites were largely restricted to the Gulf of Alaska and the southeastern Bering Sea. Most study sites were selected because of the dominant species present, their unique habitat, and the potential vulnerability of the locality to impact from OCS activities. Information on both trophic relationships and population dynamics were collected at most of these sites. Birds were collected during 4 cruises and at 14 field sites for determination of food habits. (See also W77-06793) (Sinha-OEIS)
W77-06819

AVIAN COMMUNITY ECOLOGY AT TWO SITES ON ESPENBERG PENINSULA IN KOTZEBUE SOUND, ALASKA. A COMPOSITE STUDY OF: (1) HABITAT UTILIZATION AND BREEDING ECOLOGY OF WATERBIRDS, (2) HABITAT UTILIZATION AND BREEDING ECOLOGY OF SHOREBIRDS AND NON-WATERBIRD SPECIES, AND (3) HABITAT UTILIZATION, BREEDING ECOLOGY, AND FEEDING ECOLOGY OF PREDATORS OF BIRDS,
Alaska Univ., College. Inst. of Arctic Biology.
D. Schamel, D. Tracy, and A. Ionson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 554-576, November 1976. 2 fig, 3 tab. 03-5-022-56.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, *Birds, *Waterfowl, Habitats, Breeding, Ecology, Phenology, Shore birds.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Kotzebue Sound(Alas).

As a result of field activities to evaluate avian activities in Kotzebue Sound, a list of 68 species of birds seen on Cape Espenbert in 1976 and the breeding status of each is given. Those birds listed as 'common' nesters were abundantly breeding throughout the Cape. 'Moderate' nesting species were either found in moderate breeding densities throughout the Cape or were locally abundant only. When only a few nests of a species were found, the bird was given the 'uncommon' status. 'Probable' nesters are those species that established and defended territories or acted 'broody' but for which neither nests nor broods were found. All other birds were placed in the 'not nesting' category. The complete results of the banding operation is also presented. (See also W77-06793) (Sinha-OEIS)
W77-06820

STUDIES OF POPULATIONS, COMMUNITY STRUCTURE AND COLONY OF MARINE BIRDS AT KING ISLAND, BERING STRAIT REGION, ALASKA,
College of the Atlantic, Bar Harbor, Maine.
W. H. Drury.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 577-585, November 1976. 03-6-022-35208.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Birds, Population, Ecology, Breeding, Phenology.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Bering Sea.

The objectives were to determine the number and distribution of each species relative to other species, to periods of the breeding season, and to characteristics of available habitat within the colony or study area. Other objectives were to provide estimates of nesting success of principal species, to determine the amount and kinds of foods utilized by the principal species, and to describe the chronology and phenology of events in the biology of breeding birds, including changes in population from the beginning of site occupation in the spring through departure in the fall. Seven study sites were established and three air transect routes were followed in the SE Chirikov Basin and five surface transect routes were followed. A preliminary synthesis of data and interpretation is given. (See also W77-06793) (Sinha-OEIS)
W77-06821

AVIAN COMMUNITY ECOLOGY OF THE AKULIK - INGLUTALIK RIVER DELTA, NORTON BAY, ALASKA,
Alaska Univ., College. Inst. of Arctic Biology.
G. F. Shields, and L. J. Peyton.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 586-588, November 1976. 03-5-022-56.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Ecology, Populations, Distribution patterns, Breeding.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Norton Bay(Alas).

The objectives of the investigation were to define the ecology community structure and populations of marine birds of the Akulik - Inglutalik Data area, Norton Bay, Alaska. Field data was obtained on the numbers and distribution of the birds utilizing the study area, their nesting density, their clutch sizes, and their hatching success. (See also W77-06793) (Sinha-OEIS)
W77-06822

A COMPARATIVE SEA-CLIFF BIRD INVENTORY OF THE CAPE THOMPSON VICINITY, ALASKA,
D. G. Roseneau, and A. M. Springer.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 589-593, November 1976. 1 ref. 03-6-022-35210.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, *Birds, Habitats, Breeding, Population, Ecology.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Sea-cliff birds, Murres, Kittiwakes, Puffins, Gulls, *Cape Thompson(Alas), Cape Lisburne.

This report provides information on field activities and laboratory activities on the sea cliff birds (murres, black-legged kittiwakes, horned puffins, and glaucous gulls) at Cape Thompson and comparisons with bird populations at Cape Lisburne. The murre population at Cape Lisburne was about the same as at Cape Thompson, although breeding appeared to be advanced at Cape Lisburne. Counts of the kittiwakes were not made at Cape Lisburne although reproductive success was noticeably better than at Cape Thompson. It is speculated that the late winter and spring might be one of the factors resulting in poor reproductive success of the kittiwakes at Cape Thompson this year. (See also W77-06793) (Sinha-OEIS)
W77-06823

CHARACTERIZATION OF COASTAL HABITAT FOR MIGRATORY BIRDS: NORTHERN BERING SEA,
Fish and Wildlife Service, Anchorage, Alaska. Office of Biological Services and Coastal Ecosystems.
C. J. Lensink, and R. D. Jones, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 594-596, November 1976. 01-6-022-15670.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, *Habitats, *Migratory birds, Intertidal areas, Land use, Ecology, Coasts.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Bering Sea.

The area covered by this study extends from Cape Newenham to the Bering Straits and relates most directly to the proposed developments in Norton Sound. The objectives of the study were to to characterize coastal habitat utilized by marine birds by: describing extent and characteristics of unvegetated intertidal beaches; describing extent and characteristic of intertidal plant communities; identifying the maximum limit of tidal influence of terrestrial habitat by mapping the occurrence of drift lines; identify ownership status (private or public) and responsible land management agency; and identify and quantify existing land uses; and to characterize use of habitat by birds including identification of principal species, identification of habitat use and identifying relative or approximate numbers of birds utilizing habitats seasonally. Primary effort during the quarter was devoted to field studies on the Yukon Delta north and west of Kotlik. (See also W77-06793) (Sinha-OEIS)
W77-06824

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. PRINCIPAL INVESTIGATORS' REPORTS JULY-SEPTEMBER 1976. VOLUME 2: FISH, PLANKTON, BENTHOS, LITTORAL.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending September 1976. Vol 2. Fish, Plankton, Benthos, Littoral, November 1976, 535 p.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Environmental effects, Water resources, *Data collections, Aquatic life, Marine fish, Plankton, Aquatic algae, Benthos.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Gulf of Alaska, Bering Sea, Beaufort Sea, Cook Inlet, Kodiak Island.

This volume contains the quarterly reports of baseline studies on the environmental effects related to petroleum development on the Alaskan Continental Shelf. The multi-year program is directed by the National Oceanic and Atmospheric Administration under the sponsorship of the Bureau of Land Management. The baseline studies in this volume encompass fish, plankton, benthos and littoral biota. (See W77-06826 thru W77-06849) (Sinha-OEIS)
W77-06825

THE DISTRIBUTION, ABUNDANCE, DIVERSITY AND PRODUCTIVITY OF BENTHIC ORGANISMS IN THE BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
H. M. Feder.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 1-5, November 1976. 03-5-022-56.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Environmental effects, Water resources, *Benthos, *Aquatic populations, *Ecosystems, *Ecology, Data collections, Leases, Oil industry.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Bering Sea, Resource availability, Oil lease sites.

Objectives of the study were to make qualitative and quantitative census of dominant species within oil lease sites and to provide descriptions of seasonal and spatial distribution patterns, with emphasis on assessing patchiness and correlation with microhabitat. Comparisons of species distribution with physical, chemical and geological factors were to be made and observations of biological interrelationships in benthic biota of the study area were to be documented. A selected set of stations from the cruise of the R/V DISCOVERER in 1975 have been processed by the Marine Sorting Center. This data has been keypunched, and analysis, inclusive of cluster analysis, will take place when 60 selected stations on the MB grid have been completely processed. (See also W77-06825) (Sinha-OEIS)
W77-06826

SPAWNING HERRING SURVEYS IN THE BERING SEA AND FINFISH RESOURCE SURVEYS IN NORTON SOUND AND KOTZEBUE SOUND,
Alaska Dept. of Fish and Game, Anchorage. Div. of Commercial Fisheries.
L. H. Barton.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Report for the Quarter Ending September 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 41-102, November 1976. 3 fig, 3 tab, append.

Descriptors: Water resources, *Fish populations, *Alaska, *Spawning, *Data collections, *Fish migration, *Baseline studies, *Resources development, *Water pollution effects, *Environmental effects, Distribution patterns, Herrings, Salmon.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Bering Sea, Norton Sound, Kotzebue Sound, Finfishes, Geographic distribution, Capelin, Fishery resources, Resources availability.

The progress of activities extending through September 30, 1976 for two OCS Research Units are reported. The objectives of these research units were to: determine the spatial and temporal distribution, species composition and relative abundance of finfishes in the coastal waters of Norton Sound and Kotzebue Sound east of 166 W longitude; determine the timing and routes of juvenile salmon migrations as well as examine age and growth, relative maturity and food habits of important species in Norton Sound and Kotzebue Sound east of 166 W longitude; determine the spatial and temporal distribution and relative abundance of spawning populations of herring and capelin from Unimak Pass to Point Hope; monitor egg density, distribution and development and document types of spawning substrates of herring and capelin; and monitor the subsistence utilization of fishery resources by local residents. An appendix written by Irving M. Warner and Pamela M. Shafford reports on the field activities and laboratory activities for the forage fish spawning surveys from Unimak Pass to Ugashik River. (See also W77-06825) (Sinha-OEIS)
W77-06828

PELAGIC AND DEMERSAL FISH ASSESSMENT IN THE LOWER COOK INLET ESTUARY SYSTEM,
Alaska Dept. of Fish and Game, Kodiak.
J. E. Blackburn.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 103-113, November 1976. 2 fig, 3 tab.

Descriptors: Water resources, *Alaska, *Data collections, *Baseline studies, *Meteorological data, *Fish populations, *Resource development, *Environmental effects, *Distribution patterns, Migrations, Spawning, Estuaries.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Pelagic fish, Demersal fish, Cook Inlet, Fish assessment.

Activities, progress and some preliminary results on Cook Inlet Pelagic and Demersal Fish Studies from July through September 1976 are reported. The study area for this project includes lower Cook Inlet from the Forelands to 59 N latitude and west of 152 W longitude, south of Pt. Bede on the Kenai Peninsula. Some objectives of this project were to: determine the spatial and temporal (May-September) distribution, relative abundance and inter-relationships of the various pelagic and demersal finfish and shellfish species in the study area; determine when, where, at what rate and in what relative abundance pelagic fish species (primarily salmonids) migrate into and through the study area; and determine the growth rate and food habits of selected pelagic and demersal fish species. (See also W77-06825) (Sinha-OEIS)
W77-06829

RAZOR CLAM (SILIQUA PATULA, DIXON) DISTRIBUTION AND POPULATION ASSESSMENT STUDY,
Alaska Dept. of Fish and Game, Kodiak. Div. of Commercial Fisheries.
R. J. Kaiser, and D. Konigsberg.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 115-162, November 1976. 15 fig, 8 tab. 03-5-022-69.

Descriptors: Water resources, *Alaska, *Clams, *Distribution patterns, *Baseline studies, *Resource development, *Environmental effects, Data collections, Beaches, Sediment, Ecology, Intertidal areas.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Population assessment, Substrates, Pacific razor clam, Siliqua patula.

Specific objectives of this study were to gather information of bivalve density, distribution, age and growth (razor clams only), and habitat on beaches from Yakutat Bay at 139 degrees west longitude to Unimak Bight on the Alaska Peninsula. Nine sandy beach areas were investigated and each organism's location was identified with regard to the extent of the specie's existance, density, and habitat. Bivalves were collected and identified at each location and density, length, and age composition was assessed. Core samples were collected at each base site to investigate substrate composition and grain size. Severe weather conditions proved to be the limiting factor in terms of the amount of work accomplished. (See also W77-06825) (Sinha-OEIS)
W77-06830

RESOURCES OF NON-SALMONID PELAGIC FISH OF THE EASTERN BERING SEA AND THE GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. T. Pereyra, and M. O. Nelson.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 173-251, November 1976. 2 fig, 1 tab. R7120811 and R7120812.

Descriptors: Fishes, *Alaska, *Bibliographies, *Baseline studies, Water resources, *Resources development, *Environmental effects, Distribution patterns, Abundance, Populations.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Pelagic fish, *Bering Sea, *Gulf of Alaska, Fishery resources, Life histories, Resource availability.

In spite of difficulties encountered during the quarter, a nine track magnetic computer tape containing all non-proprietary data pertaining to sampling and catches of nonsalmonids under study was provided. A report describing the data record, methods of data acquisition, reliability and accuracy estimates, and evaluation of individual records was given. This report consists chiefly of an annotated bibliography of 208 references and abstracts containing information on pelagic fish within the target areas. The abstracts are arranged alphabetically by author and data and are cross indexed according to subject matter and general geographic area. Individual species were selected for inclusion in the bibliography on the basis of their prominence in the catches of both United States and foreign commercial fishing fleets, their relative abundance in research vessel catches indicating potentially latent resources, and/or their prominence in the provision and maintenance of ecological balance as major predators, competitors, or forage fish. The final list of species includes 15 families and more than 22 individual species. (See also W77-06825) (Sinha-OEIS)
W77-06832

BASELINE/RECONNAISSANCE CHARACTERIZATION, LITTORAL BIOTA, GULF OF ALASKA AND BERING SEA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Fisheries Lab; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
S. T. Zimmerman, and T. R. Merrell, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 252-267, November 1976. 1 tab.

Descriptors: *Alaska, Water resources, *Baseline studies, *Resources development, *Habitats, *Data collections, *Environmental effects, Coasts, Biota, Oil industry, Exploration, *Distribution patterns, Populations.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Gulf of Alaska, *Bering Sea.

There were two objectives in this study: to determine the distribution of the major habitat types (sandy, muddy, rocky, etc.) along the coastline; and to determine the densities and distribution of biotic populations within these habitat types. The distribution of habitat was determined by visual reconnaissance methods from fixed wing aircraft. Additional information utilizing aerial photography and multispectral scanning methods was produced in cooperation with NASA and the Environmental Research Institute of Michigan. The distribution of organisms within habitat types was determined by field parties from the Auke Bay Fisheries Laboratory (ABFL), with logistical assistance from the Pacific Marine Center. Additional projects included a study of the accumulation of biotic debris in the 'drife zone,' the estimation of variability between sampling areas, and more intensive studies at a few sites which may receive major impact from oil exploration in the eastern Gulf of Alaska. (See also W77-06825) (Sinha-OEIS)
W77-06833

PLANKTON OF THE GULF OF ALASKA - ICHTHYOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
T. S. English.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 269-303, November 1976. 2 fig, 13 tab. 03-5-022-67-TA No. 4.

Descriptors: *Alaska, Water resources, *Data collections, *Resources development, *Environmental effects, *Distribution patterns, *Baseline studies, Ecosystems, Shrimp, Crabs, Plankton.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Gulf of Alaska, Cook Inlet, Ichthyoplankton, Biological collections, Seasonal distribution, Eggs, Larvae.

The main objecti ve was to conduct a quantitative survey to determine the seasonal distribution of commercially or ecosystem important species of ichthyoplankton and shrimp and crab larvae in Lower Cook Inlet, Alaska. Two cruises were undertaken during the summer of 1976. The first was aboard the University of Alaska research vessel ACOMA, from 8-15 July 1976 while the second was aboard the NOAA ship SURVEYOR, from 24-31 August 1976. Zooplankton and ichthyoplankton were sampled with a bongo net in a double oblique tow. Continuous acoustic surveys were conducted. A summary of taxonomic categories of fish eggs, larvae, young and adults found in Bongo nets samples collected on Lower Cook Inlet on a previous cruise in May 1976 is given. (See also W77-06825) (Sinha-OEIS)
W77-06834

INITIAL ZOOPLANKTON INVESTIGATIONS IN LOWER COOK INLET,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
D. M. Damkaer.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 304-314, November 1976. 3 fig, 2 tab.

Descriptors: *Alaska, *Zooplankton, Water resources, *Distribution patterns, *Baseline studies, *Resources development, *Environmental effects, *Data collections, Population, Copepods, Amphipoda, Monitoring, Ecosystems, Seasonal Ecology.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Cook Inlet, Abundance, Euphausids, Chaetognaths.

The seasonal distribution and abundance of zooplankton in selected areas of the Gulf of Alaska, especially Lower Cook Inlet were determined. Particular attention is given to the distributions of copepods (the most abundant net-plankton and the key grazers), amphipods and euphausids (important food for fishes), chaetognaths (key carnivores), larval decapods, and some other groups. All major taxa are enumerated as such whether or not the individual species can be identified. This work should lead to development of a monitoring strategy. Also, it will ultimately contribute to an ecosystem model by defining pathways and amounts of energy or material flow and indicating the relative importance of the several populations. (See also W77-06825) (Sinha-OEIS)
W77-06835

PHYTOPLANKTON AND PRIMARY PRODUCTIVITY IN THE NORTHEAST GULF OF ALASKA,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
J. D. Larrance, and D. A. Tennant.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 315-344, November 1976. 7 fig, 4 tab, 3 ref.

Descriptors: *Alaska, Water resources, *Baseline studies, *Resources development, *Phytoplankton, *Primary productivity, *Environmental effects, *Data collections, Chlorophyll, Nitrates, Distribution patterns.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Gulf of Alaska, Prince William Sound, Cook Inlet, Standing stock.

The time succession of primary production, phytoplankton standing stocks and species during the spring in lower Cook Inlet and Prince William Sound were determined. Much of the data has been reduced and listed in tables. Primary productivity and plant pigments are integrated over depth in the upper layers and daily totals of incident radiation are listed. Nitrate concentrations were selected for discussion because they are most often the critical of the plant nutrients when nutrient limitation of primary production occurs. At most stations, chlorophyll a concentrations and primary production increased between early April and late May, maintained a high level through early July, then decreased to near the early April level by late August. (See also W77-06825) (Sinha-OEIS)
W77-06836

THE MAMMALIAN AND FISH FAUNA OF THE NATURE PRESERVE OF MARTELY, (IN HUNGARIAN),
I. Sterbetz.
Allattani Kozl 62(1-4), p 107-114, 1975.

Descriptors: *Wildlife, *Flood protection, *Environmental effects, *Ecosystems, *Preservation, Mammal groupings, Fish, Dams, Ecotypes, Rivers, Ecology, Forests, Grasslands, Inlets.
Identifiers: *Hungary(Martely), Nature preserve.

Modern flood protection techniques are slowly modifying the botanically and zoologically significant biotope created by the flood dams built on both banks of the Tiza river near Hodmezovasarhely (Hungary) in the late 19th century which contains willow, poplar and oak forests, meadows, inlets and deep depressions. This is why the 2565 ha, 10 km long region was placed under protection in 1952. Notes based on observations of 27 families of mammals and fish between 1947 and 1974 are presented.--Copyright 1976, Biological Abstracts, Inc.
W77-06838

BASELINE STUDIES OF FISH AND SHELLFISH RESOURCES OF NORTON SOUND AND THE SOUTHEASTERN CHUKCHI SEA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. J. Wolotira, Jr.,, and W. T. Pereyra.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 355-359, November 1976. R7120802.

Descriptors: *Alaska, *Baseline studies, Water resources, *Resources development, *Data collections, *Environmental effects, Fish, Shellfish, Population, Distribution patterns.

Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Norton Sound, *Chukchi Sea, Fishery resources, Demersal fish, Cottidae, Cyclopteridae.

The objectives of this study were to determine the distribution and abundance of fish and shellfish resources in the southern Chukchi Sea and Norton Sound, estimate the productivity, length, weight and age distribution of selected demersal fish and shellfish to develop growth models and to provide a data base against which later changes in these parameters may be compared. Considerable information on demersal and near-surface fish stocks was obtained during Leg I of the FRS MILLER FREEMAN Cruise 76B in Norton Sound and the Chukchi Sea. One hundred seventy-four of the entire survey's 240 demersal trawling sites were examined with bottom trawls during September 1976, completing all scheduled sampling in Kitzebue Sound and the Chukchi Sea as well as most of Norton Sound. In addition to completing the trawl stations, 22 gillnet sets were performed. Nearly 50 tentatively identified fish species were encountered during Leg I. Of the 162 preserved amples over half contained members of the family Cottidae. Most of the remaining samples included specimens of the families Cyclopteridae (snailfishes) and Zoarcidae (eelpouts). (See also W77-06825) (Sihna-OEIS)
W77-06839

BEAUFORT SEA ESTUARINE FISHERY STUDY,
Alaska Dept. of Fish and Game, Fairbanks. Div. of Sport Fish.
T. M. Bendock.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 360-362, November 1976. 03-5-022-69.

Descriptors: *Alaska, *Estuaries, Water resources, *Baseline studies, *Resources development, *Environmental effects, *Data collections, Fisheries, Ecology, Distribution patterns.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Beaufort Sea, Anadromous fishes.

Field activities during the summer of 1976 were directed towards identifying the migration patterns, timing of movements and seasonal abundances of Beaufort Sea fish in the vicinity of Prudhoe Bay and along the Beaufort Sea coast and barrier islands westward to the Colville River. Thirty sampling and recapture stations were monitored along the westward coastal area and barrier islands and two stations were monitored in the lower Sagavanirktok River. Other tasks include identifying critical habitats including spawning, overwintering, feeding, rearing and migration areas; determining the interrelationship of Arctic fishes to lower food-web organisms; and determining the present rate of exploitation of the anadromous fishes of the area and monitoring changes in this usage as development of the area's petroleum resource progresses. (See also W77-06825) (Sinha-OEIS)
W77-06840

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF BENTHIC ORGANISMS IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
H. M. Feder.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 363-415, November 1976. 13 fig, 4 tab, 28 ref, append. 03-5-022-56.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Benthos, *Environmental effects, *Distribution patterns, *Productivity, Data collections, Ecosystems, Biota.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Gulf of Alaska, Epibenthic biota.

A preliminary, but detailed, examination of the trawl data collection in the north Pacific on the M/V NORTH PACIFIC in the summer of 1975 was made. This assessment of data was included in a paper presented at the Alaska Science Conference in August 1976; the manuscript is attached as an appendix. A qualitative and quantitative inventory census of dominant epibenthic invertebrates was examined from the northeast Gulf of Alaska. Subsequent taxonomic analysis delineated 168 species with the molluscs, crustaceans and echinoderms dominating in species representation with 47, 42, and 36 species taken respectively in each group. Mulluscs were represented by 28 families. A description of the spatial patterns of selected species is presented with emphasis on assessing patchiness and correlation with habitat. (See also W77-06825) (Sinha-OEIS)
W77-06841

FOOD AND FEEDING RELATIONSHIPS IN THE BENTHIC AND DEMERSAL FISHES OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
R. L. Smith.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 418-425, November 1976. 03-5-022-56.

Descriptors: *Alaska, *Benthos, *Baseline studies, *Resources development, Water resources, *Environmental effects, Data collections, Food, Feeding habits, Ecology, Computer programs.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Bering Sea, *Gulf of Alaska, Demersal fish.

Tasks for this quarter included a continuation of very limited archival procedures on recently acquired Bering Sea samples, completion of preliminary sorts on five target species and devising a computer program for analysis of data. Laboratory activities were centered around completing gut analyses for the three Gulf of Alaska species and two Bering Sea species. (See also W77-06825) (Sinha-OEIS)
W77-06842

RECONNAISSANCE CHARACTERIZATION OF LITTORAL BIOTA, BEAUFORT AND CHUKCHI SEAS,
Western Washington State Coll., Bellingham.
A. C. Broad.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 437-455, November 1976. 1 tab. 03-5-022-81.

Descriptors: *Alaska, *Baseline studies, *Aquatic life, *Resources development, *Environmental effects. Water resource, Data collections, Surveys, Littoral, Biota, Coasts.
Identifiers: *Outer Continental, *Environmental assessment, *Environmental impact, *Beaufort Sea, *Chukchi Sea, Biological collections, Arctic, Environmental survey.

The shoreline of the Beaufort Sea is unconsolidated and is comprised largely of pebble or sand and pebble beaches. There is virtually no shoal water or intertidal attached macrobenthos, but there sometimes are large numbers of smaller, invertebrates (mainly annelid worms) in the bottom sediments, and there are nearly always very large numbers of amphipods present everywhere. At depths in excess of 2 m in the lagoons as well as in the sea bivalve molluscs are common and polychaete worms are virtually ubiquitous. The Arctic littoral ecosystem receives significant contributions from the essentially terrestrial vegetation of beaches and tundra banks and is inseparable from it. Periodic wind-induced fluctuations in local sea level result in innundation of much of the low-lying land. The plant communities in these marshy areas are affected by the sea and are also important in the feeding of geese. The degree to which the Arctic littoral is a detritus-based ecosystem bears further study. (See also W77-06825) (Sinha-OEIS)
W77-06843

ICHTHYOPLANKTON OF THE EASTERN BERING SEA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
F. Favorite, and K. D. Waldron.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 483-486, November 1976. 1 fig.

Descriptors: *Plankton, *Baseline studies, *Alaska, *Resources development, *Environmental effects, *Larvae, Water resources, Data collections, Surveys.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Ichthyoplankton, Biological collections, *Bering Sea, Theragra chalcogramma, Teinhardtius hippoglossoides, Atheresthes stomias, Hippoglossus stenolepis.

Ichthyoplankton samples from a portion of the eastern Bering Sea were collected and analyzed. Ichthyoplankton from the 505 bongo and the neuston samples were received at the Northwest Fisheries Center during the first week of September and identification was begun. The samples were from the continental slope west of the Pribiliof Islands and from one station near Unimak Pass. The predominant species from these stations was walleye pollock. Larvae of other fish of commercial importance includes those of Greenland turbot, arrowtooth flounder, and Pacific halibut. Capture of halibut larvae is of interest because they have been reported infrequently from the eastern Bering Sea. (See also W77-06825) (Sinha-OEIS)
W77-06845

ASSESSMENT OF PELAGIC AND NEARSHORE FISH IN THREE BAYS ON SOUTHEAST KODIAK ISLAND,
Washington Univ., Seattle. Fisheries Research Inst.
C. K. Harris, and A. C. Hartt.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 487-510, November 1976. 3 fig, 5 tab.

Descriptors: *Alaska, *Fishes, *Baseline studies, Water resources, *Resources development, *Data collections, *Environmental development, Ecology, Distribution patterns, Migrations, Surveys, Bays.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Kodiak Island(Alas), Stock assessment.

This quarterly progress report covers the last two sampling sessions of the pelagic and nearshore fish survey of Ugak, Kaiugnak, and Alitak bays on southeast Kodiak Island, Alaska. One of the findings of the study is that while all three bays have numerous species in the pelagic zone, only a few are regularly abundant. Capelin, sandfish, and to a lesser extent sandlace and pink salmon comprise a major fraction of the pelagic fish community. Almost all species in the pelagic zone were

overwhelmingly represented by larval or juvenile stages which suggests that the pelagic areas of the bays are nursery areas for fish which reside as adults in benthic, littoral, or oceanic habitats. There are indications of patchy or localized distributions within the study area. The pink salmon especially, deserves special mention in this regard because of their immense economic importance to the Kodiak region. (See also W77-06825) (Sinha-OEIS)
W77-06846

DEMERSAL FISH AND SHELLFISH ASSESSMENT IN SELECTED ESTUARY SYSTEMS OF KODIAK ISLAND,
Alaska Dept. of Fish and Game, Kodiak.
J. E. Blackburn.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 511-520, November 1976. 5 fig, 1 tab.

Descriptors: *Alaska, *Fishes, *Shellfish, *Distribution patterns, *Baseline studies, *Resources development, *Environmental effects, Water resources, Data collections, Surveys, Ecology.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Kodiak Island(Alas), Stock assessment, Demersal fish.

This report presents the activities and a preliminary statement of results obtained on demersal fish and shellfish assessment from July 1 through September 30, 1976. Catches in both Ugak and Alitak Bays consisted almost entirely of crustaceans, flounders, sculpins and cod. There were considerable differences in the catch between the bays. In Ugak Bay the mean total catch was greater in each month. The catch of fish within both Ugak and Alitak Bays tended to be greatest near the mouth and decrease further within the bay. The catch of crustaceans within each bay did not show a trend of abundance along the length of the bay. King crab were virtually never captured in Deadman Bay while they were taken at nearly every other station in Alitak Bay each month. (See also W77-06825) (Sinha-OEIS)
W77-06847

TECHNICAL TRAWL SURVEY OF THE BENTHIC EPIFAUNA OF THE CHUKCHI SEA AND NORTON SOUND.
Alaska Univ., College. O.C.S. Coordination Office.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 521-526, November 1976. 03-5-022-56.

Descriptors: *Alaska, *Baseline studies, Invertebrates, *Resources development, Environmental effects, Water resources, Data collections, Surveys, Distribution patterns, Benthos, Biota.
Identifiers: *Outer Continental Shelf, Environmental assessment, *Environmental impact, *Chukchi Sea, *Norton Sound(Alas), Epibenthic invertebrates, Biological collections, Cruise reports.

Enumeration and gravimetric determination of the epibenthic invertebrates of Chukchi Sea and segments of Norton Sound was made on Leg I of MILLER FREEMAN cruise 76-B. Invertebrate data was obtained from 136 stations. Although large concentrations of invertebrates were encountered, no economically important species were found in commercial quantities. The asteroids (sea stars) were the most conspicuous members of the invertebrate biomass with nine species encountered and four species dominating. In addition to the qualitative and quantitative inventory census of benthis invertebrate ipifaunal species, preliminary observations of biological interrelationships between selected segments of the benthic biota was made. (See also W77-06825) (Sinha-OEIS)
W77-06848

THE DISTRIBUTION, ABUNDANCE AND DIVERSITY OF THE EPIFAUNAL BENTHIC ORGANISMS IN TWO (ALITAK AND UGAK) BAYS OF KODIAK ISLAND, ALASKA,
Alaska Univ., College Inst. of Marine Science.
H. M. Feder.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 527-530, November 1976. 03-5-022-56.

Descriptors: *Alaska, *Benthos, *Distribution patterns, *Ecology, *Surveys, *Invertebrates, Water resources, *Baseline studies, *Resources development, *Environmental effects, Data collections, Biomass, Coasts, Pollutant identification, Bays.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Kodiak Island(Alas).

Invertebrates were identified to the lowest taxon with numbers and weights normally assigned to each taxon. Approximately 95% of the invertebrate biomass and species consisted of Chionecetes bairdi, Paralithodes camtschatica, Pandalus borealis and Pandalus hypsinotus. Unidentified organisms were preserved for later identification. Some observations of biological interrelationships between segments of the benthic biota were made, i.e., feeding observations on commercial crab and demersal fishes. Also, reproductive conditions of selected crabs and shrimps were noted. Pollutants were recorded in four stations. (See also W77-06825) (Sinha-OEIS)
W77-06849

A PILOT STUDY ON THE DESIGN OF A PETROLEUM HYDROCARBON BASELINE INVESTIGATION FOR NORTHERN PUGET SOUND AND STRAIT OF JUAN DE FUCA,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5C.
W77-06875

THE NEW YORK BIGHT PROJECT - 1975; STONY BROOK, LONG ISLAND, NEW YORK.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5G.
W77-06876

IMPACT OF OIL SPILLAGE FROM WORLD WAR II TANKER SINKINGS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5C.
W77-06877

PROGRAM DEVELOPMENT PLAN. ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Washington, D.C.
December 1976. 263 p, 15 fig, 4 tab, 2 append. NOAA-BLM Basic Interagency Agreement No. AA550-BA7-4.

Descriptors: *Alaska, Baseline studies, *Continental Shelf, Legislation, Leases, Resources development, Oil industry, Environmental effects.
Identifiers: *Outer Continental Shelf, *Environmental assessment, Research programs.

This document is the Program Development Plan for the Alaskan Outer Continental Shelf environmental studies being managed by the National Oceanic and Atmospheric Administration (NOAA) for the Bureau of Land Management. Part III describes the goals and objectives for the OCSEA program. Part IV is organized in a logical engineering program sequence including general approach, user needs, sites of work, related work past and present, the types of studies included in the program, considerations in setting priorities, definition of specific tasks, methods for handling, intergrating, and synthesizing the data, and finally definitions of the end products or 'deliverables'. Parts V and VI detail the study schedules tied to user needs, and the management structure, established to provide the study products in a usable and timely manner. Appendixes provide essential background material on each geographic lease area, and interagency agreements. (NOAA)
W77-06878

GUIDELINES FOR THE PREPARATION OF ENVIRONMENTAL REPORTS FOR FOSSIL-FUELED STEAM ELECTRIC GENERATING STATIONS,
United Engineers and Constructors, Inc., Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 071, Price codes: A08 in paper copy, A01 in microfiche. Compleion Report, November 1976. 166 p, 54 ref. OWRT C-6531(No. 5238)(1).

Descriptors: *Environmental effects, *Thermal power plants, Electric power plants, *Steam, *Fossil fuels, Electric power demand, Electric power production, Waste treatment, Thermal pollution, Air pollution, Operations, Performance, Standards.
Identifiers: *Environmental impact statements.

Described are the many types of information which should be assembled into an Environmental Report (ER) by an Applicant who proposes to construct a fossil-fueled electrical generating unit and who requires a grant, license, permit or approval from a Federal Agency. The resulting ER would serve as the Applicant's input from which the Federal Lead Agency would prepare an Environmental Impact Statement (EIS). The EIS is required by the National Environmental Policy Act of 1969 (NEPA) when a Federal Agency proposes taking a major federal action significantly affecting the quality of the human environment. The report contains the following chapter headings: Introduction to the Project; Need for the Proposed Facility; Major Alternatives Considered for the Project; Project Description; Alternate Design of Plant Facilities; Mitigation Measures of the Project; Project Evaluation Summary; Applicable Licenses, Permits and Approvals; Environmental Impact and Effects of the Project; Adverse Environmental Effects which Cannot Be Avoided; Relationship of Short Term Use of the Environment and Long-Term Productivity; Resources Committed During Plant Construction and Operation; Environmental Effects and Impacts of Alternatives; Consultations, Conferences and Meetings; Appendices; and References.
W77-06918

STATE INFORMATION NEEDS RELATED TO ONSHORE AND NEARSHORE EFFECTS OF OCS PETROLEUM DEVELOPMENT,
D. C. Williams.
NOAA, Office of Coastal Zone Management and Bureau of Land Management Joint Report on State Information Needs Related to Onshore and Nearshore Effects of OCS Petroleum Development, January 1977. 193 p, 5 maps, 3 append.

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Descriptors: *Resources development, *Baseline studies, *Environmental effects, Water resources, Coasts, Oil industry, State governments, Local governments, Information exchange, Oil pollution.
Identifiers: *Outer Continental Shelf, *Coastal zone management.

The study conducted in cooperation with coastal States in the summer of 1976, by the Bureau of Land Management, and the Office of Coastal Zone Management, NOAA provides useful information for local, State and Federal officials, the petroleum and offshore development industries, and other groups. There are three sections: The National Analysis, derived from the responses of 22 States, was designed to array nationally significant OSC related State information needs within the context of the States' OCS policies and concerns, current information and State-local relationships in OCS impact planning; The Regional Analysis section identified the findings on specific information needs and variations of the five OCS leasing regions covered by the study; and the Conclusions were drawn from the study findings. Recommendations were made for responsive actions by Federal and State agencies, industry and other interested groups. Appendices include the summaries of the individual State responses, the framework documents of the study and a list of the attendees of the meetings with the States. (NOAA)
W77-06934

WHO'S MINDING THE SHORE. A CITIZENS' GUIDE TO COASTAL MANAGEMENT,
Natural Resources Defense Council, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W77-06935

COASTAL FACILITY GUIDELINES: A METHODOLOGY FOR DEVELOPMENT WITH ENVIRONMENTAL CASE STUDIES ON MARINAS AND POWER PLANTS,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
Working Paper, August 1976. 161 p, 4 append.

Descriptors: Coasts, *Florida, Maryland, Marinas, Powerplants, Resources development, Facilities, *Environmental effects, Water pollution effects, Ecosystems.
Identifiers: Coastal zone management, Guidelines, Environmental impact.

This report provides state coastal zone management (CZM) agencies with information and recommendations for developing guidelines for facility development in the coastal zone. Section A of the report presents a methodology for identifying and initiating implementation procedures for management recommendations for specific facility types. Section B and C apply the methodology to marinas and power plants in the states of Florida and Maryland, respectively. The two case studies from Florida and Maryland serve the dual purpose of (1) providing a useful CZM refernce source on enviromental mitigation techniques and relevant Federal authorities for the two facility types and (2) further clarifying the format, intended information content, and applications envisioned in the methodology. (NOAA)
W77-06936

COASTAL ZONE MANAGEMENT, ANNOTATED BIBLIOGRAPHY,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
For primary bibliographic entry see Field 2L.
W77-06937

ENVIRONMENTAL POLLUTION: IS THERE ENOUGH PUBLIC CONCERN TO LEAD TO ACTION,
Illinois Univ. at Urbana-Champaign.
N. C. Sharma, J. E. Kivlin, and F. C. Fliegel.
Environment and Behavior, Vol. 7, No. 4, December 1975, p 455-471. 1 fig, 1 tab, 21 ref.

Descriptors: *Water quality, *Attitudes, *Social aspects, *Decision-making, *Information exchange, *Political aspects, *Environmental quality, *Illinois, *Social participation, Pollution, Employment.
Identifiers: *Public participation, *Communication channels, Socio-economic status.

A town of 3,000 inhabitants, located in northern Illinois, was studied to discover the extent to which the public was informed, what the public thought of alternative solutions, and generally, the problem solving process in the community when faced with a severe pollution problem. A large meat packing plant was polluting the river which ran through the town. Employing 400 people, it was the most important employer in the town. Pollution attitudes of the residents were analyzed to determine which groups were willing to accept the pollution or were willing to accept the economic consequences of closing the plant. Forty-two percent of the survey respondents favored closing the industry, 58% chose to accept the current pollution level. A 4 stage causal model is presented relating attitudes toward pollution with a number of variables, among which were socioeconomic status, age, length of residence in the community, communication channel usage, and personal interaction in the community. The first stage found significant positive correlations between the willingness to close the plant and discussion with family and friends (rather than drawing from media information or voting activity), negative attitudes toward pollution, and the higher occupational prestige of the respondent. Older people and young people who have not long resided in the community were more tolerant of pollution than young long-time residents. The results show that the political process and involvement in it are not effective in generating anti-pollution sentiment. Reliance on discussion with family and friends to generate anti-pollution sentiment suggests that a grass-roots movement may eventually emerge to combat pollution. (Gentry-North Carolina)
W77-06955

ENERGY DEVELOPMENT: THE ENVIRONMENTAL TRADEOFFS. VOLUME 4: THE BACKGROUND PAPERS,
Stanford Research Inst., Menlo Park, Calif.
M. D. Levine, R. V. Steele, and I. W. Yabroff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 003, Price codes: A07 in paper copy, A01 in microfiche. Prepared for the U.S. Environmental Protection Agency, Washington, D.C., Office of Planning and Evaluation, October 1975. 122 p, 12 fig, 28 tab. 68-01-2469.

Descriptors: *Colorado River Basin, *Missouri River Basin, *Energy, Technology, *Air pollution, *Water pollution, *Social aspects, *Oil shale, Environmental effects, Recycling, Watersheds(Basins).
Identifiers: *Energy development, *Coal liquefication, *Coal conversion, *Lurgi process, Synthane process.

Background information is presented to provide detailed assessment of selected social and environmental impacts associated with general energy development as well as impacts resulting from specific technology used. A state-of-the-art view of energy conversion technologies is given; e.g., two techniques for increasing production of electricity from western coal are direct burning of coal to produce steam, and low Btu gasification of coal; technologies for increasing liquid fuel supplies are recovery of oil from shale, coal liquefication, oil and gas recovery from the outer continental shelf, and gas produced through use of assisted recovery; technologies for producing pipeline gas from coal now involve the Lurgi process; synthane process is promising. The social impacts of energy development in rural areas arise principally due to population increases and urbanization, with subsequent demands for housing, health services and education. Barriers to solving social problems in boom towns are absence of city planners and lack of planning expertise in city councils or other governmental agencies. Effects of energy development on non-energy uses and instream flow levels in the upper Colorado and Missouri River basins appear to be major. Conclusions concerning water quality impacts of oil shale and coal conversion processes are: direct discharge of contaminated water into streams and reservoirs can be minimized by using evaporation ponds, treating and recycling waste water, underground injection of excess water and providing catchment dams. Air pollution varies among conversion technologies and final use of the energy resource. (See also W76-13039) (Gentry-North Carolina)
W77-06957

7. RESOURCES DATA

7A. Network Design

COASTAL METEOROLOGICAL NETWORKS TO DETERMINE EFFECTS OF NUCLEAR PLANT COOLING SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
For primary bibliographic entry see Field 2B.
W77-06643

USE OF A PARAMETRIC MODEL AS A TOOL FOR HYDROMETRIC NETWORK PLANNING,
Waterloo Univ., (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-06710

SURFACE WATER NETWORK DESIGN BY REGRESSION ANALYSIS SIMULATION,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-06963

7B. Data Acquisition

ROTARY-FLOW TECHNIQUE FOR TESTING FITNESS OF FISH,
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
For primary bibliographic entry see Field 5C.
W77-06608

AN APPROXIMATING POLYNOMIAL FOR THE COMPUTATION OF SATURATION VAPOR PRESSURE,
Naval Environmental Prediction Research Facility, Monterey, Calif.
For primary bibliographic entry see Field 2B.
W77-06652

A NOTE ON TEMPERATURE AND HUMIDITY PROFILE MEASUREMENT OVER FORESTS USING DIODES,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
J. H. McCaughey, and J. I. Walker.
Journal of Applied Meteorology, Vol. 16, No. 1, p 106-109, January 1977. 3 fig, 6 ref.

Descriptors: *Forests, *Vapor pressure, *Temperature, *Humidity, *Canada, Winds

Agricultural watersheds, Evapotranspiration, Sampling, Instrumentation.
Identifiers: *Germanium diodes, *Vapor pressure gradients, *Quebec, Humidity profile, Temperature sensors, Sampling array, Temperature profile, Diodes, Dry-bulb temperature, Wet-bulb temperature.

The measurement of accurate air temperature and humidity profiles is fairly routine over agricultural surfaces where the roughness seldom exceeded 2 m in height. In most cases, the sensors are easily accessible, and routine maintenance is simple. Over forests, however, where the roughness elements are several tens of meters in height, accessibility is a major problem, and routine maintenance of the sensors is difficult. A sampling array was described for the measurement of temperature and humidity profiles, using diodes as temperature sensors, above a 15 m balsam fir canopy at Montmorency, Quebec. There were six levels of measurement of dry-bulb and wet-bulb temperature (14.4, 15.15, 16.15, 17.4, 18.4, and 19.8 m). The array was mounted on a 21.3 m television tower. The system was thoroughly tested in the summer of 1974 as part of an energy balance study. The system proved to be very satisfactory. The very small temperature and vapor pressure gradients characteristically found over forests were successfully resolved. (Roberts-ISWS)
W77-06653

LABORATORY STUDY OF THE FLEXURAL STRENGTH AND ELASTIC MODULUS OF FRESHWATER AND SALINE ICE,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2C.
W77-06661

COMPUTER MAPPING OF LANDSAT DATA FOR ENVIRONMENTAL APPLICATIONS,
Bendix Aerospace Systems Div. Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W77-06666

A STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN,
Purdue Univ., Lafayette, Ind. Lab for Applications of Remote Sensing.
L. F. Silva.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-19508, Price codes: A08 in paper copy, A01 in microfiche. Final Report, Project SR397, 1976. 143 p, 48 fig, 53 tab, 28 ref, 1 append. NASA NAS9-13301, NASA NGL15-005-112.

Descriptors: *Remote sensing, *Satellites(Artificial), *Instrumentation, *Indiana, Vegetation, Crops, Forests, *Land use, Water resources, Cities, Urbanization, Atmosphere, Classification, Soil classification, Analytical techniques, Radiation, Photography.
Identifiers: *Skylab, *LANDSAT, *Wabash River Basin(Ind).

Data from the Earth Resource Experiment Package (EREP) on Skylab were used to study the utilization of these data in the Wabash River Basin. The study of the spacecraft multispectral data sets indicated that better land use delineation using machine processing techniques can be obtained with data from multispectral scanners than digitized S190A photographic sensor data. Better results were obtained for both a late spring scene and, to a much more significant degree, a winter scene. Comparable results were obtained from the LANDSAT 1 and Skylab S192 scanners for the late spring scene even though the S192 scanner contained channels with a broader spectral range and smaller spectral resolutions. The results of the multi-emulsion photographic data set were a little better than the multiband photographic data set. The results of the comparison of the interim and filtered S192 data indicated that the data were improved some for machine processing techniques. It is questionable, however, whether the improvement obtained was worth the time and resources spent in the filtering effort. The results of the S192 X-5 detector array studies over a wintertime scene indicated that a good quality far infrared channel can be very useful. The results of the S191 spectroradiometer study indicated that the data from the S191 was usable, and it was possible to estimate the path radiance. The results of the channel significance study indicated that channel 11, a middle infrared band, was very useful in all three data sets. Based on these studies, it was recommended that future space earth resource systems include multispectral scanners which contain channels in the middle infrared and the far infrared in addition to channels in the visible and near infrared. (Sims-ISWS)
W77-06670

ELECTRICALLY POWERED SAMPLER FOR BENTHIC MACROINVERTEBRATES,
Stephen F. Austin State Univ., Nacogdoches, Tex. Dept. of Biology.
J. D. McCullough, and S. Williams.
The Progressive Fish-Culturist, Vol 38, No 4, p 186-187, 1976. 2 fig.

Descriptors: *Equipment, *Sampling, *Bottom sampling, Bottom sediments, Electric motor, Research equipment, On-site tests, *Benthos, Methodology, On-site-investigations, Invertebrates.
Identifiers: Grab samplers.

A 6.8 kg benthic sampler has been developed which uses an electric motor to close the jaws with enough force (408.2 kg) to break small branches and roots and to penetrate even hard clay to a depth of 8 cm. (Katz)
W77-06757

INVESTIGATION OF PRECIPITATION WITHIN FOREST ECOSYSTEMS, (IN HUNGARIAN),
Lajos Kossuth Univ., Debrecen (Hungary). Dept. of Botany.
For primary bibliographic entry see Field 2B.
W77-06797

A SINGLE FIELD OF VIEW METHOD FOR RETRIEVING TROPOSPHERIC TEMPERATURE PROFILES FROM CLOUD-CONTAMINATED RADIANCE DATA,
Texas A and M Univ., College Station. Center for Applied Geosciences.
For primary bibliographic entry see Field 2B.
W77-06887

USE OF REMOTE SENSING TO QUANTIFY CONSTRUCTION MATERIAL AND TO DEFINE GEOLOGIC LINEATIONS; DICKEY-LINCOLN SCHOOL LAKES PROJECT, MAINE,
Cold Regions Research and Engineering Lab. Hanover, N.H. Research Div.
For primary bibliographic entry see Field 8D.
W77-06888

A DEVICE FOR MEASURING SEEPAGE FLUX IN LAKES AND ESTUARIES,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
D. R. Lee.
Limnology and Oceanography, Vol 22, No 1, p 140-147, January 1977. 8 fig, 2 tab, 14 ref.

Descriptors: *Seepage, *Estuaries, *Instrumentation, *Wisconsin, *Minnesota, *North Carolina, Lakes, Laboratory tests, Groundwater, Permeability, Water, Wells, Observation wells, Benthic fauna, Plastics.
Identifiers: *Seepage flux, *Hydraulic head, *Nova Scotia, Seepage inflow, Seepage velocity, Seepage cylinder.

Seepage flux can be measured and samples of groundwater flowing into lakes and estuaries can be collected by enclosing an area of bottom with a cylinder vented to a plastic bag. The method has the advantage of not requiring measurements of permeability of bottom sediments. Seepage velocities from -0.1-2.58 micrometer/s were measured in Minnesota and Wisconsin lakes and in Nova Scotia and North Carolina estuaries. Where seepage inflow was rapid (0.4-0.8 micrometer/s), water collected with the seepage meter was chemically similar to water from wells on the same flow path, and the distribution and chemistry of the seepage concurred with the theoretical flow net. The rate and direction of seepage flux were correlated with water surface elevation during a tidal cycle. (Roberts-ISWS)
W77-06903

NASA DEVELOPS WATER MONITORING SYSTEM,
Boeing Aerospace Co., Seattle, Wash.
For primary bibliographic entry see Field 5A.
W77-06912

RIVER BASIN SNOW MAPPING AT THE NATIONAL ENVIRONMENTAL SATELLITE SERVICE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-06915

OPTIC DEVICE FOR OBSERVATIONS OF SMALL ORGANISMS UNDER WATER, (IN RUSSIAN),
Ukrainskii Nauchno-Issledovatelskii Institut Eksperimentalnoi Veterinarii, Kharkov (USSR). Veterinary Research Station.
L. K. Likhovoz.
Parazitologiya (Leningr) 9(5), p 461-462, 1975.

Descriptors: *Instrumentation, *On-site investigations, *Aquatic animals, Bodies of water, Hatching, Aquatic insects, Underwater.
Identifiers: *Optic device, Observations.

Dismountable magnifying optic device was designed and tested in order to raise the labor productivity, safety and quality of investigations in water bodies, hatching sites of black fly larvae, mosquitoes and other small hydrobionts.--Copyright 1976, Biological Abstracts, Inc.
W77-06926

A UNIVERSAL CALIBRATION EQUATION FOR PRICE METERS AND SIMILAR INSTRUMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
P. Engel.
Scientific Series No. 65, 1976, 12 p., 12 fig., 2 tab, 7 ref.

Descriptors: *Measurement, *Instrumentation, *Equations, Costs, Velocity, Fluid properties, Saline water, Freshwater, Streamflow, *Calibration.
Identifiers: *Price current meters, Fluid density, Calibration accuracy.

A universal calibration curve has been developed using theoretical and empirical methods. The analysis shows that for a meter of given rotor diameter and fixed frictional resistance, the rate of rotation of the meter rotor is dependent only on the speed of the fluid and the fluid density. Changes in temperature and small changes in density as experienced when changing from fresh water to salt water do not have a significant effect on measure-

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ment accuracy. A practical form of the calibration equation is given. Suggestions are made for applying the universal calibration equation to calibrations of current meters in wind tunnels. The principles developed can be applied to other current meters used in oceanographic and lake surveys as well as anemometers used to measure wind velocities. (WATDOC)
W77-06943

MEASUREMENT IN A MARINE ENVIRONMENT USING LOW COST SENSORS OF TEMPERATURE AND DISSOLVED OXYGEN,
National Oceanic and Atmospheric Administration, Washington, D.C. Environmental Data Service; and Geological Survey, Edgewater, Md. Water Resources Div.
F. A. Godshall, R. L. Cory, and D. E. Phinney.
Chesapeake Science, Vol 15, No 3, p 178-181, September 1974. 5 fig, 5 ref.

Descriptors: *Dissolved oxygen, *Water temperature, *Chesapeake Bay, *Estuaries, *Analytical techniques, Sampling, On-site data collections, Costs, Research equipment, Evaluation, *Maryland, *Measurement, Instrumentation.
Identifiers: *Chemical thermometers, Rhode River(Md).

Continuous records of physical parameters of the marine environment are difficult as well as expensive to obtain. This paper describes preliminary results of an investigative program with the purpose of developing low cost time integrating measurement and averaging devices for water temperature and dissolved oxygen. Measurements were made in an estuarine area of the Chesapeake Bay over two week periods. With chemical thermometers average water temperature for the two week period was found to be equal to average water temperature measured with thermocouples plus or minus 1.0 C. The slow diffusion of oxygen through the semipermiable sides of plastic bottles permitted the use of water filled bottles to obtain averaged oxygen measurements. Oxygen measurements for two week averaging times using 500 ml polyethylne bottles were found to vary from conventionally measured and averaged dissolved oxygen by about 1.8 mg/liter. (Woodard-USGS)
W77-06960

HYDROLOGIC INTERPRETATION OF GEOPHYSICAL DATA FROM THE SOUTHEASTERN HUECO BOLSON, EL PASO AND HUDSPETH COUNTIES, TEXAS,
Geological Survey, El Paso, Tex. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06970

IMPROVING ESTIMATES OF STREAMFLOW CHARACTERISTICS USING LANDSAT-1 (ERTS-1) IMAGERY,
Geological Survey, Nashville, Tenn. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-06972

7C. Evaluation, Processing and Publication

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, UMATILLA DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06602

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREA, GRANDE RONDE DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06603

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, POWDER DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06604

OREGON'S LONG RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, MALHEUR RIVER DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06605

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, OWYHEE DRAINAGE BASIN,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-06606

SIMPLE FORMULAE FOR THE ESTIMATION OF WET BULB TEMPERATURE AND PRECIPITABLE WATER,
Meteorological Office, Poona (India).
For primary bibliographic entry see Field 2B.
W77-06646

AREA-DEPTH RELATIONS FOR FREQUENCY VALUES OF RAINFALL,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2B.
W77-06647

EXCHANGE THROUGH A BARRIER ISLAND INLET: ADDITIONAL EVIDENCE OF UPWELLING OFF THE NORTHEAST COAST OF NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Geosciences; and North Carolina State Univ., Raleigh. Center for Marine and Coastal Studies.
For primary bibliographic entry see Field 2L.
W77-06654

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF EUTROPHICATION IN SAGINAW BAY,
Bendix Aerospace Systems Div. Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W77-06665

COMPUTER MAPPING OF LANDSAT DATA FOR ENVIRONMENTAL APPLICATIONS,
Bendix Aerospace Systems Div. Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W77-06666

COMPUTING EOLIAN SAND TRANSPORT FROM ROUTINE WEATHER DATA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.; and Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
For primary bibliographic entry see Field 2L.
W77-06669

A STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN,
Purdue Univ., Lafayette, Ind. Lab for Applications of Remote Sensing.
For primary bibliographic entry see Field 7B.
W77-06670

CONSTRUCTION AND ADJUSTMENT OF A TWO-LAYER MATHEMATICAL MODEL OF THE LLOBREGAT DELTA,
Ministerio de Obras Publicas, Barcelona (Spain). Computer Centre.
For primary bibliographic entry see Field 4A.
W77-06722

HYBRID COMPUTER ANALYSIS OF A COMBINED SURFACE WATER--GROUNDWATER SYSTEM,
City Univ., London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-06729

FURTHER DEVELOPMENT AND TESTING OF A STREAM-AQUIFER SYSTEM MODEL,
Kansas Water Resources Research Inst., Lawrence.
For primary bibliographic entry see Field 2F.
W77-06762

AN AERIAL CENSUS OF SPOTTED SEALS PHOCA VITULINA LARGHA,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-06800

SMOOTHING DATA WITH CUBIC SPLINES,
Agricultural Research Service, Phoenix, Ari. Water Conservation Lab.
B. A. Kimball.
Agron J, (68) p 126-129. 1976.

Descriptors: *Statistical methods, *Statistic *Soil moisture, *Mathematical studies, Samplin Equations, Moisture content, Data collection Agronomy, *Data processing.
Identifiers: *Cubic splines, *Mathematic smoothing.

Agronomic data frequently requires smoothing order to obtain a reliable functional relationsh for interpolating, predicting or determining t rate of change of one variable with respect another. To test whether cubic spline functio could provide satisfactory smoothing, the necess ry equations were derived, computer progra written, and several sets of soil temperature a water content data were smoothed. Cubic spli smoothing displayed the following advantage Because spline functions are defined piecewis they can represent any variable arbitrarily w over wide ranges of the other. The data can be o tained at unequal intervals, so high sampling ra can be used where changes are rapid and low ra where they are slow. Additionally, the gradie derived from cubic spline functions are smoot joined parabolas, not the abruptly join straightline segments characteristic of parabo spline smoothing.--Copyright 1976, Biological A stracts, Inc.
W77-06831

A COMPREHENSIVE PLAN FOR THE GLOB INVESTIGATION OF POLLUTION IN T MARINE ENVIRONMENT AND BASELI STUDY GUIDELINES.
United Nations Educational Scientific and C tural Organization, Paris (France).
For primary bibliographic entry see Field 5A.
W77-06850

LAKE ONTARIO ATLAS: SURFACE WAVES,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 2H.
W77-06884

RIVER BASIN SNOW MAPPING AT THE NATIONAL ENVIRONMENTAL SATELLITE SERVICE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-06915

DISSOLVED NITROGEN, DISSOLVED OXYGEN AND RELATED WATER TEMPERATURES IN THE COLUMBIA AND LOWER SNAKE RIVERS, 1965-1969,
National Marine Fisheries Service, Seattle, Wash.
For primary bibliographic entry see Field 5C.
W77-06925

TABLES AND TYPE CURVES FOR ANALYSIS OF PUMP TESTS IN LEAKY PARALLEL-CHANNEL AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 4B.
W77-06941

FLOOD HAZARD INFORMATION: CAVE CREEK, ARIZONA CANAL TO 19TH AVENUE, PHOENIX, ARIZONA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W77-06954

NUMERICAL MODELS OF WIND-DRIVEN CIRCULATION IN LAKES,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2H.
W77-06958

RECONNAISSANCE OF THE WATER RESOURCES OF THE CLINTON QUADRANGLE, WEST-CENTRAL OKLAHOMA,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
J. E. Carr, and D. L. Bergman.
Oklahoma Geological Survey, Norman, Hydrologic Atlas 5, 1976. 4 sheets, 14 fig, 3 tab, 11 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Water quality, *Oklahoma, Available water, Streams, Maps, Water utilization, Irrigation, Industries, Domestic water, Hydrogeology, Aquifer characteristics, Withdrawal, Groundwater recharge, Chemical analysis, Water supply.
Identifiers: *Clinton quadrangle(Okla).

This 4-sheet atlas describes surface and groundwater conditions in the Clinton quadrangle which encompasses the red-bed plains of west-central Oklahoma. The mean annual precipitation ranges from about 22 inches in the west to about 30 inches in the east. High mineralization makes water from most streams in the quadrangle unsuitable for municipal use during low-flow periods. Gypsum and halite from natural sources are the principal causes of mineralization. The amount of water used during 1971 for municipal, industrial, rural-domestic, and irrigation purposes is estimated at 36 billion gallons. Irrigation accounted for 33.2 billion gallons; municipal and industrial demand accounted for 1.8 billion gallons; and rural-domestic use accounted for about 1.0 billion gallons. Ground water is the major source of water used in the quadrangle. Ground-water withdrawal for irrigation amounted to 28.9 billion gallons, or 87 percent of the total irrigation water used. More than 75 percent, 1.4 billion gallons, of the water used for municipal and industrial purposes was taken from ground-water sources. Rural-domestic use accounted for withdrawal of an additional 1.0 billion gallons of ground water. (Woodard-USGS)
W77-06959

URBANIZATION AND FLOODING IN SHADES CREEK BASIN, JEFFERSON COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-06977

FLOODS IN LOUISIANA, MAGNITUDE AND FREQUENCY, THIRD EDITION,
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-06979

ON-LINE ADAPTIVE CONTROL FOR COMBINED SEWER SYSTEMS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5D.
W77-07100

8. ENGINEERING WORKS

8A. Structures

COST COMPARISON BETWEEN SUBTERRENE AND CURRENT TUNNELING METHODS,
Mathews (A. A.), Inc., Rockville, Md.
J. D. Bledsoe, J. E. Hill, and R. F. Coon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 481, Price codes: A05 in paper copy, A01 in microfiche. Report NSF-RA-T-75-001, May 1975. 96 p, 6 fig, 21 tab, 23 ref. NSF-C840.

Descriptors: *Tunneling, *Tunneling machines, *Cost analysis, *California, *Cost comparisons, Tunnel construction, Drilling, Tunnel linings, Underground structures, Excavation, Rock excavation, Costs, Construction, Construction costs, Construction equipment, Civil engineering.
Identifiers: *Thermal tunneling, Subterrene.

A study was made to compare tunnel construction costs between the Subterrene tunneling system and methods currently in use. Three completed tunnels were selected for study cases to represent finished diameters ranging from 3.05 m (10 ft) to 6.25 m (20.5 ft). The study cases were normalized by deleting extraneous work and assigning labor, equipment, and materials costs for the Southern California area in 1974. Detailed cost estimates (shown in Appendix A) were then made for the three tunnels for baselines. A conceptual nuclear powered Subterrene tunneling machine (NSTM) was designed. It was assumed that NSTM's were available for each of the three baseline tunnels. Costs were estimated (shown in Appendix B) for the baseline tunnels driven by NSTM. Savings of 12% for the 4.73 m (15.5 ft) tunnel and 6% for the 6.25 m (20.5 ft) tunnel were found to be possible using the NSTM as compared to current methods. A penalty of 30% was found for the 3.05 m (10 ft) tunnel using the NSTM. The cost advantage for the NSTM results from the combination of (1) a capital rather than labor intensive system, and (2) formation of both initial support and final lining in conjunction with the excavation process. (See W77-06663 and W77-06664) (Sims-ISWS)
W77-06662

COST COMPARISON BETWEEN SUBTERRENE AND CURRENT TUNNELING METHODS, APPENDIX A--BASELINE COST ANALYSES,
Mathews (A. A.), Inc., Rockville, Md.
J. D. Bledsoe, J. E. Hill, and R. F. Coon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 482, Price codes: A15 in paper copy, A01 in microfiche. Report NSF-RA-T-75-001A, May 1975. 327 p. NSF-C840.

Descriptors: *Tunneling, *Tunneling machines, *Cost analysis, *California, *Cost comparisons, Tunnel construction, Drilling, Tunnel linings, Underground structures, Excavation, Rock excavation, Costs, Construction, Construction costs, Construction equipment, Civil engineering.
Identifiers: *Thermal tunneling, Subterrene.

A study was made to compare tunnel construction costs between the Subterrene tunneling system and methods currently in use. Three completed tunnels were selected for study cases to represent finished diameters ranging from 3.05 m (10 ft) to 6.25 m (20.5 ft). The study cases were normalized by deleting extraneous work and assigning labor, equipment, and materials costs for the Southern California area in 1974. Detailed cost estimates (shown in Appendix A) were then made for the three tunnels for baselines. A conceptual nuclear powered Subterrene tunneling machine (NSTM) was designed. It was assumed that NSTM's were available for each of the three baseline tunnels. Costs were estimated (shown in Appendix B) for the baseline tunnels driven by NSTM. Savings of 12% for the 4.73 m (15.5 ft) tunnel and 6% for the 6.25 m (20.5 ft) tunnel were found to be possible using the NSTM as compared to current methods. A penalty of 30% was found for the 3.05 m (10 ft) tunnel using the NSTM. The cost advantage for the NSTM results from the combination of (1) a capital rather than labor intensive system, and (2) formation of both initial support and final lining in conjunction with the excavation process. (See also W77-06662) (Sims-ISWS)
W77-06663

COST COMPARISON BETWEEN SUBTERRENE AND CURRENT TUNNELING METHODS, APPENDIX B--SUBTERRENE COST ANALYSES,
Mathews (A. A.), Inc., Rockville, Md.
J. D. Bledsoe, J. E. Hill, and R. F. Coon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 483, Price codes: A11 in paper copy, A01 in microfiche. Report NSF-RA-T-75-001B, May 1975. 233 p. NSF-C840.

Descriptors: *Tunneling, *Tunneling machines, *Cost analysis, *California, *Cost comparisons, Tunnel construction, Drilling, Tunnel linings, Underground structures, Excavation, Rock excavation, Costs, Construction, Construction costs, Construction equipment, Civil engineering.
Identifiers: *Thermal tunneling, Subterrene.

A study was made to compare tunnel construction costs between the Subterrene tunneling system and methods currently in use. Three completed tunnels were selected for study cases to represent finished diameters ranging from 3.05 m (10 ft) to 6.25 m (20.5 ft). The study cases were normalized by deleting extraneous work and assigning labor, equipment, and materials costs for the Southern California area in 1974. Detailed cost estimates (shown in Appendix A) were then made for the three tunnels for baselines. A conceptual nuclear powered Subterrene tunneling machine (NSTM) was designed. It was assumed that NSTM's were available for each of the three baseline tunnels. Costs were estimated (shown in Appendix B) for the baseline tunnels driven by NSTM. Savings of 12% for the 4.73 m (15.5 ft) tunnel and 6% for the 6.25 m (20.5 ft) tunnel were found to be possible using the NSTM as compared to current methods. A penalty of 30% was found for the 3.05 m (10 ft) tunnel using the NSTM. The cost advantage for

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the NSTM results from the combination of (1) a capital rather than labor intensive system, and (2) formation of both initial support and final lining in conjunction with the excavation process. (See also W77-06662) (Sims-ISWS)
W77-06664

NEW DESIGN GIVES DENVER DISTRICT IRON-FREE WELL,
Wright Water Engineers, Inc., Denver, Colo.
T. L. Decker, and R. E. Darr.
The Johnson Drillers Journal, Vol 49, No 1, p 5-8, January-February, 1977. 5 fig.

Descriptors: *Water wells, *Corrosion, *Iron bacteria, Construction materials, Stainless steel, Well casings, Logging(Recording), Well screens, Drilling, Aquifers, *Colorado.
Identifiers: *Fiberglass well casing, Non-corrosive materials, Denver Basin, Gravel packs, Shaw Heights Water District, *Denver(Colorado).

The Shaw Heights Water District in Colorado recently constructed a replacement well with both casing and well screen made entirely of corrosion-resistant materials. Out of eight deep wells purchased by the district in 1968 only one remained operational by 1975. The other seven wells were dropped out of service from time to time as yields of water quality deteriorated. The primary problem was the increasing iron content of the water. Although iron bacteria had not been specifically identified, their presence was suspected. Evidence pointed to a pickup of iron from the steel casing and slotted pipe as the cause of the increased iron content. Increased corrosion rates appeared to result from bacterial activity and alternating reducing-oxidizing conditions caused by pumping schedules. Iron bacteria probably were inadvertently introduced into the wells when installing test pumps or changing pumping equipment that was contaminated at another location. The replacement well was a gravel pack design utilizing 150 feet of 8 inch stainless steel screen. The well was completed to a depth of 664 feet. Seven inch fiberglass casing in 30 foot joints, with 0.5 inch thickness were installed. Rates as high as 80 gpm were used to develop the well during 5 1/2 days of pumping over 250,000 gallons of water. Just prior to termination of the pumping test a water sample contained total dissolved solids of 445 ppm. The iron contest was 0.05 ppm, well below that of other local wells in the same aquifer. (Heiss-NWWA)
W77-06868

CONFERENCE ON RESEARCH IN TUNNELING AND EXCAVATION TECHNOLOGY,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 8E.
W77-06885

8B. Hydraulics

A STUDY TO FORECAST THE WAVES AT DIGHA,
River Research Inst., Calcutta (India).
For primary bibliographic entry see Field 2L.
W77-06648

OPTIMIZATION MODEL OF A SYSTEM OF TWO OPEN-CHANNEL HYDROPLANTS,
Gdansk Technical Univ. (Poland). Inst. of Hydraulic Engineering.
For primary bibliographic entry see Field 4A.
W77-06716

PUMPING SYSTEMS: THE SIMPLER, THE BETTER,
Plummer and McDannald Drilling Co. Galena, Ohio.
For primary bibliographic entry see Field 8C.
W77-06856

THE LEGAL RESPONSIBILITY OF WATER WELL DRILLERS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W77-06862

HYDRAULICS AND ECONOMICS OF WELL FIELD LAYOUT.
Universal Oil Products, St. Paul, Minn. Johnson Div.
Public Works, Vol 108, No 1, p 40-41, January, 1977, 3 fig, 3 ref.

Descriptors: *Pumping, *Drawdown, Hydraulics, Aquifers, *Economic efficiency, Water wells, Economics, Costs.
Identifiers: *Water well field, *Multiple wells, Well yield, Well diameter, Well interference.

Although decisions based on economics alone will frequently favor the drilling of a single well of large yield as opposed to multiple wells of limited yield, the principl of hydraulics often suggest the opposite conclusion. In an extensive aquifer, a ring of wells equidistantly spaced has nearly the same performance effects as one very large well at the center of the ring. For example, one analysis of a ring of eight 12-inch wells on a circle of 1,000 feet diameter showed the theoretical performance of a single well 550 feet in diameter discharging at a rate equal to the composite yield of the smaller wells. In general, a multiple well system is more favorable in thin aquifers and in finer sand formations, or situations where transmissivity varies with both thickness and permeability of the sand formation. In water-bearing formations of considerable thickness (50 feet or more) a single high capacity well may be preferred. (Eberle-NWWA)
W77-06863

BITS AND PIECES,
Plummer and McDannald Co., Galena, Ohio.
For primary bibliographic entry see Field 8G.
W77-06866

SUBMERSIBLE PUMP DESIGN: DEPENDENT ON WELL DIAMETER AND DEPTH.
For primary bibliographic entry see Field 8C.
W77-06867

A LABORATORY STUDY OF FLUID AND SOIL MECHANICS PROCESSES DURING HYDRAULIC DREDGING (HYDRAULISCHE UND BODENTECHNISCHE VORGANGE BEIM GRUNDSAUGEN),
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-06883

HYDRAULICS OF SHEET FLOW IN WETLANDS,
Florida Univ., Gainesville. Dept. of Civil Engineering.
B. A. Christensen.
Reprinted from: Proceedings of ASCE Symposium on Inland Waters for Navigation, Flood Control and Water Diversions held at Colorado State University, Aug 10-12, 1976. p 746-759, 4 fig, 10 ref.

Descriptors: Hydraulics, *Wetlands, *Sheet flow, *Forecasting, *Flood plains, Mannings equation, Vegetation, Equations, Overland flow.
Identifiers: Hydrodynamic drag.

The numerical prediction of sheet flow behavior in wetlands and flood plains is usually handled by use of the Manning equation. However, a successful use of that formula requires a reasonably accurate estimate of Manning's n for such usually heavily vegetated areas. This is, in most cases, an impossible, or nearly impossible task which adds a substantial amount of uncertainties to this approach. Observations also tend to indicate that Manning's n should be a function not only of the type and degree of vegetation but also of the flow depth indicating that another power formula or a modified form of the Manning formula might be better than the classic Manning formula for describing this type of flow. Such an expression is developed in the present paper by considering the velocity distribution in overland flow in the turbulent rough flow range, i.e., for wall Reynolds' numbers in excess of seventy, and considering the equilibrium of forces in the direction of the flow taking the hydrodynamic drag on the vegetation into consideration. (NOAA)
W77-06929

8C. Hydraulic Machinery

IT'S ALL ON THE NAMEPLATE: EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT JET PUMPS,
Smith (A. O.), Tipp City, Ohio. Electric Motor Div.
M. F. Wendein.
Water Well Journal, Vol. 31, No. 3, p 56-58, March, 1977. 1 fig, 3 tab.

Descriptors: *Pumps, *Electric motors, *Water wells.
Identifiers: *Jet pumps, Motor nameplates.

Pump nameplates furnish the dealer or installer with vital information concerning the operation of the unit. Usually included are data such as diagrams for hook-up to proper voltage, whether or not there is a thermal cutoff device, Canadian Standards Association insignia if unit is approved for installation in Canada, model and serial numbers, nominal HP of motor, amps, single or three-phase designation, RPMs, motor frame size, service factor (indicates permissible horsepower loading), class of insulation and maximum ambient temperature, electrical type (relative to starting), locked rotor KVA per horsepower rating, and UL approval. (Eberle-NWWA)
W77-06854

PUMPING SYSTEMS: THE SIMPLER, THE BETTER,
Plummer and McDannald Drilling Co. Galena, Ohio.
R. B. McDannald.
Water Well Journal, Vol. 31, No. 3, p 30-31, March, 1977.

Descriptors: *Pumps, *Hydraulic systems, *Corrosion, *Electrical equipment, Performance, Capacitors, Electrical motors, Electric wires, Electrolysis, Water wells, Plastic pipes.
Identifiers: *Submersible pumps, Electrical connections, Pumping system design.

Simple water pumping systems are superior in maintenance, frequency and life of system. The basic components of pumping systems are: the pump motor, the motor electrical system, the pump components housings, impellers, shafts, bearings and pump casing. Applications usually dictate the type of pump used. Motor differences such as capacitor start-capacitor run of capacitor start-winding run types dictate the application. The materials used in the construction of pump components are critical due to the corrosive environmental in which the pump may operate. Stainless steel, brass or plastic seem to resist corrosion better than other materials. The connection between the pump and the drop pipe is vulnerable to corrosion if two different types of metal are used together, for example galvanized steel connected to brass. PVC nipple spacers should be

used as connections to preclude connection corrosion. All PVC drop pipe may be used in these cases also. Wiring connections should be made with properly applied electrical tape. Wiring should be of sufficient length to accommodate 'growth' or stretch of the drop pipe after installation.
W77-06856

ONE GOOD IDEA SPURS ANOTHER.
Ground Water Age, Vol 11, No 5, p 21-22, January, 1977. 1 fig.

Descriptors: *Drilling equipment, Well drilling, *Rotary drilling, Water wells.
Identifiers: *Drilling pipe clamps, Time saving innovations, Equipment installation tools.

Two innovative rotary drilling devices designed specifically to speed up well drilling operations were invented and introduced by the Eastwood Drilling company. The pipe holder, mounted on the drilling rig, consists of four 'Slips' of case hardened, high tensile steel, with multiple sharpened horizontal grooves. The holder locks a length of pipe in place with a handle. The pipe lifter operates on the same principle except in an 'internal way'. Swung from the boom, the lifter inserts into a length of pipe and locks with a thumb catch. From the rack of casings, the boom operator can swing a length over the one held by the holder, enabling the two sections to be welded together. The Eastwoods' devices are able to handle all sizes of pipe from six to twelve inch diameters. (Heiss-NWWA)
W77-06860

SUBMERSIBLE PUMP DESIGN: DEPENDENT ON WELL DIAMETER AND DEPTH.
Water Well Journal, Vol 31, No 3, p 51-54, March, 1977. 1 tab.

Descriptors: *Pumps, *Deep wells, Water levels, Impellers, Water wells.
Identifiers: *Submersible pumps, *Well design, Well diameter, Vertical turbine pumps, Net required inlet head, Total available inlet head.

Recent improvements in submersible electric motors, watertight seals, and power cables have resulted in the submersible pump, which eliminates the long drive shafts and bearing assemblies necessary for the surface-driven vertical turbine pumps originally developed for deep wells. Proper well design, however, is essential for obtaining good performances and long life of the submersible pump. Well diameter is directly related to the size of the pump; a good rule is to select a well casing two sizes larger than the nominal pump diameter. Submersible pumps lift water by developing a negative pressure head, allowing atmospheric pressure to raise water to the surface. A certain amount of hydraulic head at the pump inlet is necessary to prevent pump damage to cavitation (net required inlet head' or NRIH). For proper pump operation, the 'total available inlet head' must exceed the sum of the NRIH plus water vapor pressure plus entrance and friction losses. Total available inlet head can be increased by placing the pump inlet at a lower level of the well or by lowering pumping rate to decrease drawdown. (Eberle-NWWA)
W77-06867

HOW TO DEAL WITH PITTING AND CORROSION.
For primary bibliographic entry see Field 8G.
W77-06869

GUIDELINES FOR THE PREPARATION OF ENVIRONMENTAL REPORTS FOR FOSSIL-FUELED STEAM ELECTRIC GENERATING STATIONS,
United Engineers and Constructors, Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 6G.

W77-06918

8D. Soil Mechanics

A LABORATORY STUDY OF FLUID AND SOIL MECHANICS PROCESSES DURING HYDRAULIC DREDGING (HYDRAULISCHE UND BODENTECHNISCHE VORGANGE BEIM GRUNDSAUGEN),
Texas A and M Univ., College Station. Dept. of Civil Engineering.
H. Salzmann.
Sea Grant Report No. TAMU-SG-77-204, February 1977. Translation from German by Gertrud M. Adams. Edited by David R. Basco. 178 p, 93 fig, 4 tab, 35 ref.

Descriptors: *Soil mechanics, *Soil types, Hydraulic equipment, Hydraulics, Resources development, Dredging.
Identifiers: Hydraulic dredging.

The objectives of this paper are: (1) to describe the processes between water (suction flow) and soil during hydraulic dredging; (2) to determine the influence of soil type; (3) to determine the influence of the shape of the suction head; and (4) to determine the influence of supplementary pressured water jets upon the output of solid material output into which all soil-mechanical, hydraulic, geometric and pumping conditions of hydraulic dredging are incorporated. (NOAA)
W77-06883

USE OF REMOTE SENSING TO QUANTIFY CONSTRUCTION MATERIAL AND TO DEFINE GEOLOGIC LINEATIONS; DICKEY-LINCOLN SCHOOL LAKES PROJECT, MAINE,
Cold Regions Research and Engineering Lab. Hanover, N.H. Research Div.
H. L. McKim, and C. J. Merry.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-023 276, Price Codes: A03 in paper copy, A01 in microfiche. Special Report 242, Part I, December 1975. 26 p, 19 fig, 5 tab, 11 ref.

Descriptors: *Remote sensing, *Construction materials, *Dam construction, *Maine, Damsites, Earth dams, Dikes, Aerial photography, Satellites(Artificial), Aircraft, Geology, Earthquakes, Geological surveys, Geologic units, Geologic mapping, Geologic formations, Fractures(Geologic), Faults(Geologic), Projects, Reservoirs.
Identifiers: *Geologic lineations, *Dickey-Lincoln School Lake Project(ME).

A potential site for construction of a series of earth dams and dikes with a maximum height of 335 ft, the Dickey-Lincoln School Lakes Project, is being evaluated. The site is located on the St. John River in Aroostook County, Maine, approximately 30 mi west of the town of Ft. Kent. The project is primarily designed to generate hydroelectric power, but it is also intended to provide flood control. During November 1974, a study was initiated to apply state-of-the-art remote sensing techniques to the delineation and quantification of surficial geology units to locate construction material within the headwaters of the St. John River Basin. A photomosaic was prepared from 1966 black and white photography (scale 1:33,600). Fourteen surficial geology units were delineated in an 1100-sq mi area. The areal extent of each surficial geology unit within a 4-mi radius of the 3 dike sites and within a 6-mi radius of the main dam site was quantified using a planimetric color densitometer. The volume of construction material was computed based upon these areal determinations and estimated depths. Considerable time was saved using remote sensing techniques compared with conventional ground surveys. The volume estimates obtained from this investigation were compared with the estimates of required construction material computed during the 1967 initial design phase. The comparison showed that the required construction material could be found within the prescribed area around the dam and dike sites. Because transportation of materials is a major cost in dam construction, the reduction in transportation distances determined from this study could result in considerable savings. (Sims-ISWS)
W77-06888

8E. Rock Mechanics and Geology

CONFERENCE ON RESEARCH IN TUNNELING AND EXCAVATION TECHNOLOGY,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 680, Price codes: A05 in paper copy, A01 in microfiche. Report NSF-RA-T-73-097, Proceedings of a Conference held September 14-15, 1973, Spring Hill Conference Center, Wayzata, Minnesota, September 1973. 87 p. S.L. Crouch, Conference Chairman. NSF GI-40254.

Descriptors: *Rock mechanics, *Tunneling, *Conferences, *Excavation, Tunnel construction, Rock properties, Earth handling equipment, Tunneling machines, Drilling, Rock excavation, Rocks, Underground structures, Civil engineering.
Identifiers: *Tunnel boring.

The purposes of the conference were (1) to discuss the aims and progress of the NSF/RANN Excavation Technology Program, and (2) to give researchers an opportunity to present their recent findings and discuss them with others working in the field. Twenty different NSF/RANN-supported research projects were described during 7 conference sessions. Slightly more than half of the projects involved new or improved methods of excavating rock, while the rest were concerned with such aspects of excavation as: rock properties and their effects on tunnel boring, machine feasibility and advance rates, and structural and systems analysis of the excavations and the excavation process. (Sims-ISWS).
W77-06885

CHICAGO DRIVES LARGE BORES TO CONTROL COMBINED SEWAGE FLOW.
Engineering News-Record, Vol. 198, No. 5, p 20, February, 1977. 1 fig.

Descriptors: *Combined sewers, *Runoff, *Overflow, *Water pollution sources, *Pollution abatement, Construction, Reservoirs, Waste treatment, Waste water treatment, Engineering structures, Underground storage, Rock excavation, Tunnel excavation, Costs, Illinois, New York.
Identifiers: *Chicago(Ill), Rochester(NY).

Chicago has begun work on a program to control storm and sanitary sewage runoff by utilizing underground storage caverns. With pilot bores for testing tunneling and sealing completed, work on the remaining hardrock tunnels has proceeded. The two systems will contain 125 miles when completed in 10 years. Combined sewer overflow has been an irritant, creating problems of waterway pollution and disease. Sewer overflow has accounted for nearly 45% of the metropolitan area water pollution. The tunnel and reservoir plan provides for three reservoirs (118,000 acre/foot of combined sewage) which will pump stored water to surface plants for off-peak treatment. Rochester, New York, and other cities are considering similar plans. Also included in the system are a $365 million mainstream system under downtown Chicago, $114 million pumping station and associated structures, and tunnels, shafts, and pumping works estimated at $183 million. Machine mining without blasting is to be used for hardrock

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tunneling to avoid surface disturbances. Shale portions of rock must be concrete-lined, and more competent rock must be 100% grouted to prevent infiltration. Surface disturbance must be minimized when drop shafts are excavated. (Collins-FIRL)
W77-06988

8F. Concrete

METHANE-DERIVED CARBONATE CEMENTS IN BARRIER AND BEACH SANDS OF A SUBTROPICAL DELTA COMPLEX,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W77-06677

SLIPFORM PAVER, STEEL FORMS SPEED LINING OF 25,000-FOOT SEWER TUNNEL,
N. Hancock.
Engineering and Contract Record, Vol. 90, No. 1, p 64-65, January, 1977. 1 fig.

Descriptors: *Tunnel linings, *Tunnel construction, Sewers, Engineering structures, Construction, Concrete construction, Concrete placing, Equipment, Underground structures, Construction equipment, Canada.
Identifiers: Montreal(Canada).

A slipform paver was used to pour a 12-inch concrete lining for a 25,000-foot sewer tunnel in Montreal, Canada. Special steel forms were used for the 16-foot horseshoe-shaped arch and wall. The Miller M9000 paver can slipform up to 16 feet wide and 2 feet deep and was used to form curbs and an invert. After a very successful experience with tunnels for the Montreal subway system, modifications were instituted to make the apparatus applicable to sewer tunnel construction. Telescoping steel forms with hinged upper quarters were used on the horseshoe portion of the tunnel. When the first form is anchored and the concrete is poured, the second 40-foot form is moved ahead, anchored, and more concrete is poured. This operation is repeated until the first form is ready to be moved on the 20-foot traveler to a new position. This process completes about 1,000 feet of wall and arch per week. (Collins-FIRL)
W77-06992

WASTE WATER TREATMENT PLANT BUILT IN WET HOLE,
For primary bibliographic entry see Field 5D.
W77-07021

8G. Materials

IT'S ALL ON THE NAMEPLATE: EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT JET PUMPS,
Smith (A. O.), Tipp City, Ohio. Electric Motor Div.
For primary bibliographic entry see Field 8C.
W77-06854

MAKE WIRE ROPE LAST-TREAT IT LIKE A MACHINE,
The Drilling Contractor, Vol. 33, No. 1, p 55, January-February, 1977. 2 fig.

Descriptors: *Drilling equipment, Mechanical properties, Flexibility, Stress analysis, Strain measurement.
Identifiers: *Wire rope, Rope cores, Strand construction.

Wire rope is a piece of flexible, multi-wired stranded machinery made up of many precision parts. The usual type of wire rope consists of a core member around which any number of multi-wired strands are 'laid' or helically wrapped. Wire ropes are specifically tailored for special uses. These specific designs are accomplished by combinations of wire size, number and arrangements, and by length and direction of lay. Wire rope should be selected with the specific use in mind. Proper selection includes such factors as: the lay of the rope (right, left, regular or lang), type of strand construction, the proper combination of wire diameters, the proper combination of physical properties of the wires, i.e., tensile strength, elongation, resistance to torsion, hardness and fatigue resistance, the relative length of rope lay and of strand lay, and the specific size, type, grade and construction of the core. A great number of combinations are available in the fabrication of a wire rope. For best service from a wire rope it should be designed to meet the specific applications it will be used in. (Heiss-NWWA)
W77-06857

ONE GOOD IDEA SPURS ANOTHER.
For primary bibliographic entry see Field 8C.
W77-06860

ELECTRIC LOGGING,
National Water Well Association, Worthington, Ohio.
T. E. Gass.
Water Well Journal, Vol 31, No 3, p 34-35, March, 1977. 2 fig.

Descriptors: *Electrical well logging, Resistivity, Logging(Recording), Boreholes, Water wells.

Electric log interpretation is best left to experienced trained hydrologists, however, well drillers can make some basic readings if they know what to look for. E-log interpretation involves simultaneous reading of the spontaneous potential (SP) and resistivity curves, which relate to the fluids in the formation, and comparison with the drillers log, which indicates lithologic change. SP variations in unconsolidated material are read relative to a fairly uniform baseline obtained in clays. Shifts to the right generally indicate fresh water in permeable material. Shifts to the left show a higher concentration of dissolved solids, large shifts indicating saline water. For the resistivity curve, shifts to the right indicate fresh water or dense rock, movement to the left indicates clay or saline water. (Eberle-NWWA)
W77-06865

BITS AND PIECES,
Plummer and McDannald Co., Galena, Ohio.
R. B. McDannald.
Water Well Journal, Vol 31, No 2, p 21, February, 1977.

Descriptors: *Well casings, *Electronic equipment, Water wells.
Identifiers: *Pitless adapters, *Capped wells, Magnetic locators, Well depth measurement.

The problem of locating wells that have been cut off and capped below ground may diminish as legislation and modern well drilling and compltion methods promote increased use of pitless adapters. For those cases in which a driller must locate a lost well, the Schonstedt Model GA-32 Magnetic Locator is recommended. This portable and easy-to-use tool enables one to detect cut-off casing at depths up to 5 1/2 feet, and is useful for finding curb boxes, valves, and septic tank lids. Also recommended is a measuring tool available from Velsen Pump and Supply (Norton, Ohio) used for measuring deep holes being drilled by cable-tool methods. (Eberle-NWWA)
W77-06866

NEW DESIGN GIVES DENVER DISTRICT IRON-FREE WELL,
Wright Water Engineers, Inc., Denver, Colo.
For primary bibliographic entry see Field 8A.
W77-06868

HOW TO DEAL WITH PITTING AND CORROSION.
Water Well Journal, Vol 31, No 3, p 48, March, 1977.

Descriptors: *Corrosion control, *Pitting(Corrosion), *Pumps, Jets, Bacteria algae, *Chlorination, Acidity, Neutralization, Water wells, Water quality control.
Identifiers: Soda ash solution.

Pitting due to organic growth and corrosion due to acid well water frequently shorten the life of pumps, drop pipes, jets, bowl assemblies, and cylinders. Pitting results when bacteria and algae attach themselves to metal surfaces, forming minute electrolytic cells and drawing metallic ions from the equipment surfaces into surrounding water. Inexpensive automatic chlorinators help control these organisms and thus prolong pump life. Acid ground waters which can cause rapid corrosion and deterioration of entire water systems can easily be detected with a simple pH tester. These acid waters may be neutralized by combining soda ash solution with chlorine solution and feeding the mixture into the well via automatic chlorination equipment. (Eberle-NWWA)
W77-06869

USE OF REMOTE SENSING TO QUANTIFY CONSTRUCTION MATERIAL AND TO DEFINE GEOLOGIC LINEATIONS: DICKEY-LINCOLN SCHOOL LAKES PROJECT, MAINE,
Cold Regions Research and Engineering Lab Hanover, N.H. Research Div.
For primary bibliographic entry see Field 8D.
W77-06888

SAND STABILIZATION ON THE DUNES BEACH AND SHOREFACE OF A HISTORICALLY ERODING BARRIER ISLAND. WASSAW ISLAND EROSION STUDY, PART III,
Georgia Marine Science Center, Savannah.
George F. Oertel, and James L. Harding.
Georgia Marine Science Center Sea Grant Technical Report Series No 77-3, (1977). 47 p, 4 fig, 7 ref, 3 append. TRS-77-3. SG-04-5-158-4.

Descriptors: *Georgia, *Barrier islands, *Erosion control, *Sedimentation, *Stabilization, *Shore protection, Dunes, Beaches, Shores.
Identifiers: Snow fences, Artificial seaweed, Durabags, Sea Grant Program.

Two earlier reports on the sedimentary framework and water-flow characteristics adjacent to the north end of Wassaw Island, Georgia supplement this report. The effects of synthetic devices on the sediment budget of a historically eroding area of shore is described. Three devices were used to modify the sediment transport patterns in order to control erosion. The marginal tidal channel at the north end of Wassaw Island appears to be a critical feature controlling the development of the shore. Submarine pervious dikes such as those constructed with Durabags are useful structures for keeping the marginal channels open. When these channels are open, sediment is transported to and deposited at the north end of Wassaw Island. Snow fences appeared to be an effective means of trapping and storing large quantities of sand on the upper beach. However, fences were only effective where rapid beach growth produced broad areas of loose sand available for eolian transport. Snow fences were not an effective means of building the beach in areas where the beach is eroding and the shoreline is retreating. Small plots of artificial seagrass had no obvious contributing effect for producing a source of sediment for the beach. (Sinha-OEIS)

W77-06940

ANNOTATED BIBLIOGRAPHY ON NORTHERN ENVIRONMENTAL ENGINEERING 1974-75,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5D.
W77-06948

TESTING AND GROUTING LEAKING JOINTS,
Halliburton Services, Duncan, Okla. Environmental Control Dept.
J. Herndon.
Water and Sewage Works, Vol. 124, No. 1, p 76, January, 1977. 1 fig.

Descriptors: *Grouting, *Chemical grouting, *Leakage, *Equipment, Sealants, Seepage, Sewerage, Infiltration, Testing, Repairing.

A three-element packer was designed to alleviate the problem of sewer infiltration through faulty joints. This instrument tests, grouts and retests joints. The packer contains a liquid-filled center portion connected to a direct reading, Bourbon tube pressure gauge which is viewed by television during air testing or grouting. The packer is usually pulled through the sewer line from the downstream manhole. The air test is performed by applying air to the center void until test pressure is attained; the pressure is released from the line and stays trapped in the void around the joint. Void pressure decrease indicates a leak. PWG chemical grout is mixed and pumped in two streams to the packer and, as the grout is injected, the two streams mix to begin a reaction which forms a high-strength gelled material that squeezes around the center element and fills the void between the flows into the leaking joint. This prevents further leakage. If necessary, retesting of the joint can be performed by deinflating and reinflating the end elements of the packer. The system is efficient and can be controlled by one operator. It is also economical since a minimum amount of grout is wasted and no excess is used. (Collins-FIRL)
W77-06986

CINCINNATI'S PREVENTIVE MAINTENANCE SEWER PROGRAM.
For primary bibliographic entry see Field 5G.
W77-06989

PREVENTIVE SEWER MAINTENANCE HELPS PRESERVE HISTORIC ANNAPOLIS.
Public Works, Vol. 108, No. 2, p 58-59, February, 1977.

Descriptors: *Sewerage, *Inspection, *Cleaning, *Equipment, *Maintenance, Water districts, Machinery, Repairing, Sanitary engineering, Water quality control, *Maryland.
Identifiers: *Annapolis(Md).

The role of sewer maintenance in preserving Annapolis, Maryland, as a clean city and tourist attraction was reviewed. The program was designed to prevent blockages which could cause backups and flooding. An evaluation of equipment was conducted in 1972 and a Myers-Sherman Vactor 'Jet-Rodder' was selected to bring the city's equipment level to a state of adequacy. First used full time on emergency work, the apparatus now cleans the entire system on a regular basis. Trouble spots are serviced every six months and the rest of the system is inspected annually and cleaned every two years. The former average of 370 emergency calls per year has been cut by more than 60%. Since the new machinery has been in use, there has been no severe basement flooding problem or back-up problem. Claims for blocked line damage were reduced by 50%. Economic savings have been made in maintenance and labor costs, as well as costs associated with treatment and removal of the sludge previously accumulated in the system. Lift station wet wells are now cleaned every four months and the machinery has been used to remove sand and gravel from filters. Valve boxes can now be cleared of clogging debris and other adapted uses include the removal of dead fish accumulations from the harbor. (Collins-FIRL)
W77-06990

COPPER SULFATE FIGHTS ROOT GROWTH IN SEWER SYSTEMS,
S. B. Tuwiner.
Water and Sewage Works, Vol. 124, No. 1, p 40-41, January, 1977. 1 fig.

Descriptors: *Root distribution, *Root systems, *Copper sulfate, *Sewerage, *Cleaning, Drainage, Storm drains, Combined sewers, Municipal wastes, Domestic wastes, Hydrogen ion concentration, Flow.

Copper sulfate has become an effective cure for the problem of sewer and storm drain blockage by root and fungus growth. Root growth in pipes produces a mechanical obstruction causing unsanitary conditions, and an odor problem from the decomposition of detained organic matter. This obstruction deteriorates mortar pipe, joints, manholes, pipes and substructures, treatment plant units and mechanisms; it reduces the capacity of pumps, force mains and gravity lines, and it can lead to stream pollution. Copper sulfate treatment produces an immediate abatement of these conditions, but an exact usage formula has not been deduced. The only guideline is that the amount of needed copper sulfate is in ration to the total mass of roots present. The pH-alkalinity test can be used to determine the existence of a problem as well as the results of treatment. Sewer and lateral application is by sprinkling copper sulfate along the invert of the pipe. In homes and buildings, flushing the chemical through the toilet is the prescribed procedure. About two pounds is used for home treatment. It is safe to use around trees because it results in only local killing action on the root system. It is a stable, crystalline, easily handled, mildly acidic material. Use should be planned only at low flow periods to avoid excess dilution. (Collins-FIRL)
W77-06991

SLIPFORM PAVER, STEEL FORMS SPEED LINING OF 25,000-FOOT SEWER TUNNEL,
For primary bibliographic entry see Field 8F.
W77-06992

CONTROL SEWER CORROSION WITH H2O2,
Corpus Christi Public Utilities, Tex.
D. G. Matthews.
The American City and County, Vol. 92, No. 2, p 65, February, 1977.

Descriptors: *Sewers, *Corrosion, *Corrosion control, *Odor, *Hydrogen sulfide, Waste treatment, Waste water treatment, Liners, Chemical reactions, Economics, *Texas.
Identifiers: *Hydrogen peroxide, *Corpus Christi(TX).

In Corpus Christi, Texas, hydrogen peroxide was used to control odor and hydrogen sulfide-induced corrosion. The city tried, unsuccessfully, to eliminate the problem with the use of liners for its concrete sewers. No liner material proved satisfactory. Peroxide completely oxidizes hydrogen sulfide. Water and sulfur are formed in acid or neutral sewage; water and sulfates are formed in alkaline sewage. Although available in various concentrations, a 50% solution of hydrogen peroxide is the maximum concentration that can be used safely and housed easily in residential areas, although the 70% solution is the more economical. Other alternatives were suggested, but the peroxide proved efficient and more effective. (Collins-FIRL)
W77-06993

CONTRACT SERVICES STRETCH SEWER MAINTENANCE BUDGET,
Gladstone Public Utilities, Mo.
D. C. Anderson.
The American City and County, Vol. 92, No. 2, p 53, February, 1977.

Descriptors: *Sewerage, *Maintenance, *Cleaning, Costs, Cities, Equipment, Personnel, Flood protection, Leakage, Odor, Root systems, Water pollution sources, Pollution abatement, Missouri.
Identifiers: *Gladstone(MO), Contracted maintenance.

The city of Gladstone, Missouri, has contracted its sewer maintenance work. The annual fee of $9,000 enables the city to avoid the purchase and maintenance of $100,000 worth of equipment. Personnel costs are also eliminated, as are insurance, unemployment compensation, hiring or overhead charges, and salaries. Round-the-clock service is guaranteed and the service keeps lines free of roots, leaks, and other obstructions. Flooding, odor, and pollution have all been abated as a result of this contracted service. (Collins-FIRL)
W77-06994

NEW PROGRAMS IMPROVE SENSITIVE AREAS OF WATER AND SEWER SYSTEMS,
Waltham Public Works, Mass.
E. F. Delaney.

Descriptors: *Sewage, *Instrumentation, Measurement, Equipment, Cities, Water use, Storage, Pumping plants, Design criteria, Interceptor sewers, *Massachusetts.
Identifiers: *Waltham(MA).

Waltham, Massachusetts, has embarked on a program of water and sewer improvements. The oil and inaccurate metering system was first to be renovated to improve efficiency in accounting for water use. Nine thousand self-generating remote readout meters have already been installed, producing a $33,000 savings in one year, and accounting for 138 million 'lost' gallons of water. These meters, which will eventually total 12,000, eliminate the need for access to homes. The specifications required a self-generating remote meter with a simplified two-wire system; a bronze maincase; noncorrosive gears and measuring chamber; a rost bottom plate for severe winters; and a hermetically sealed, easily removable register. The water program also included new municipal storage and pumping facilities, new pumping station and interceptors, and a preventive maintenance program. (Collins-FIRL)
W77-06995

WASTE WATER TREATMENT PLANT BUILT IN WET HOLE,
For primary bibliographic entry see Field 5D.
W77-07021

THE FABRIC-LINED PURIFICATION BASIN.
For primary bibliographic entry see Field 5D.
W77-07035

WHAT'S NEW IN LANDFILL LINERS.
For primary bibliographic entry see Field 5G.
W77-07051

8H. Rapid Excavation

COST COMPARISON BETWEEN SUBTERRENE AND CURRENT TUNNELING METHODS,
Mathews (A. A.), Inc., Rockville, Md.
For primary bibliographic entry see Field 8A.

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W77-06662

COST COMPARISON BETWEEN SUBTERRENE AND CURRENT TUNNELING METHODS, APPENDIX A--BASELINE COST ANALYSES,
Mathews (A. A.), Inc., Rockville, Md.
For primary bibliographic entry see Field 8A.
W77-06663

COST COMPARISON BETWEEN SUBTERRENE AND CURRENT TUNNELING METHODS, APPENDIX B--SUBTERRENE COST ANALYSES,
Mathews (A. A.), Inc., Rockville, Md.
For primary bibliographic entry see Field 8A.
W77-06664

8I. Fisheries Engineering

EGG INCUBATION AND LARVAL REARING OF NAVAGA (ELEGINUS NAVAGA PALL.), POLAR COD (BOREOGADUS SAIDA LEPECHIN) AND ARCTIC FLOUNDER (LIOPSETTA GLACIALIS PALL.) IN THE LABORATORY,
All Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
T. M. Aronovich, S. I. Doroshev, L. V. Spectorova, and V. M. Makhotin.
Aquaculture, Vol 6, 1975, p 233-242, 3 tab, 7 fig, 8 ref.

Descriptors: *Laboratory tests, *Incubation, *Larval growth stage, Eggs, Hatching, Larvae, Feeding rates, Fish.
Identifiers: Navaga, Arctic flounder, Polar cod, First feeding.

The incubation period for polar cod eggs was 35 days, for arctic flounder 41-42 days, and for navaga 48 days. Emergent larvae averaged 5.54 mm (polar cod), 6.0 mm (Navaga and 5.56 mm (arctic flounder). The rate of yolk sac absorption was higher in starving larvae than in feeding ones. In polar cod and arctic flounder the yolk sac was fully utilized by 18-20 days after hatching and 22-24 days after hatching for navaga. Starvation beyond 8-10 days after hatching was critical for navaga, and 20 days for polar cod. Artemia nauplii of about 600 microm in length and natural plankton consisting of Paracalanus and Pseudocalanus nauplii are suggested as an initial food for navaga and polar cod at a density of one organism/ml. Feeding efficiency of larvae at the time when they first established feeding was low. Food digestion in older larvae proceeded faster than in the early stages of development. Chilton-ORNL)
W77-06792

EXPERIMENT WITH A MULTIPOINT SYSTEM FOR JUDGING CARP FATTENING PONDS, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
For primary bibliographic entry see Field 02H.
W77-06798

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

PRELIMINARY BIBLIOGRAPHY ON GROUNDWATER IN DEVELOPING COUNTRIES,
Association of Geoscientists for International Development, St. John's (Newfoundland).
For primary bibliographic entry see Field 02F.
W77-06852

COASTAL ZONE MANAGEMENT, ANNOTATED BIBLIOGRAPHY,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
For primary bibliographic entry see Field 02L.
W77-06937

ANNOTATED BIBLIOGRAPHY ON NORTHERN ENVIRONMENTAL ENGINEERING 1974-75,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 05D.
W77-06948

SUBJECT INDEX

Loss of 2,4-D in Runoff from Plots Receiving Simulated Rainfall and from a Small Agricultural Watershed,
W77-06908 5B

ABALONE
Long-Term Lead Accumulation in Abalone (Haliotis Spp.) Fed on Lead-Treated Brown Algae (Egregia Laevigata),
W77-06776 5C

ABSORPTION
The Accumulation of Organic Mercury from Sea Water by the Plaice, Pleuronectes platessa L.,
W77-06607 5C

LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

Toxicity of Fluoride to Brown Trout Fry (Salmo trutta),
W77-06628 5C

The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

Effects of Various Ecological Factors on Radiostrontium Uptake in Two Euryhaline Teleosts: Mugil Auratus Risso and Pleuronectes Platessal, (Influence de Divers Facteurs Ecologiques Sur L'Accumulation du Radiostrontium Chez Deux Teleosteens Euryhalins: Mugil Auratus Risso et Pleuronectes Platessa L.),
W77-06777 5C

Dependence of Water Absorption by the Cell Walls of Plant Leaves on the Volume of the Free Space, (In Russian),
W77-06827 2I

CETIC ACID
Determination of Free Formic and Acetic Acids by Gas Chromatography Using the Flame Ionization Detector,
W77-06961 5A

CID SOLUBILIZATION
Acid Solubilization of Sewage Sludge and Ash Constituents for Possible Recovery,
W77-07017 5E

CIDS
Determination of Free Formic and Acetic Acids by Gas Chromatography Using the Flame Ionization Detector,
W77-06961 5A

Acid Solubilization of Sewage Sludge and Ash Constituents for Possible Recovery,
W77-07017 5E

CROLEIN
The Influence of Acrolein and Hydrocryle on the Development Dynamics of Aquatic Bacteria,
W77-06690 5C

ACTIVATED CARBON
Process for the Purification of Waste Waters with Activated Carbon,
W77-07093 5D

ACTIVATED SLUDGE
Activated Sludge Treatment of High Strength NSSC Mill Effluent,
W77-06945 5D

Expansion Comes Quickly to AWT Plant,
W77-07009 5D

Acid Solubilization of Sewage Sludge and Ash Constituents for Possible Recovery,
W77-07017 5E

Influence of Phosphorus Removal on Solids Budget,
W77-07032 5D

Some Factors Affecting Floc Formation by Zoogloea Ramigera, Strain I-16-M,
W77-07042 5D

The Effect of High Purity Oxygen on the Activated Sludge Process,
W77-07043 5D

Plant Data Analysis of Temperature Significance in the Activated Sludge Process,
W77-07046 5D

Fuel Gas and Electricity from Municipal Sewage,
W77-07065 5D

Renovated Water from Municipal Sewage Treatment Plants,
W77-07086 5D

Method of Treating Waste Water with Jet Nozzles,
W77-07090 5D

ADAPTATION
Some Significant Regularities in Plant Hydroadaptation, (In Russian),
W77-06774 3B

ADENOSINE TRIPHOSPHATE
Adenosine Triphosphate (ATP) Levels in Microbial Cultures and a Review of the ATP Biomass Estimation Technique,
W77-06942 5A

ADJUSTED COSTS
Adjustment Costs and Optimal Waste Treatment,
W77-06699 5D

ADJUSTMENT COSTS
Adjustment Costs and Optimal Waste Treatment,
W77-06699 5D

ADSORPTION
Adsorption of Polychlorinated Biphenyl (Aroclor 1254) on Shrimp,
W77-06758 5C

Phosphates in Soils Treated with Sewage Water: III. Kinetic Studies on the Reaction of Phosphates with Aluminum Compounds,
W77-07054 5B

Solubility and Plant Uptake of Cadmium in Soils Amended with Cadmium and Sewage Sludge,
W77-07055 5B

Quantitative Analysis of Enteroviruses in Water with Various Degrees of Pollution, (In Russian),
W77-07070 5A

Adsorption, Coagulation and Filtration Make a Useful Treatment Combination-Part 2,
W77-07077 5D

ADVECTION
Evaporation and Advection II: Evaporation Downwind of a Boundary Separating Regions Having Different Surface Resistances and Available Energies,
W77-06897 2D

AEOLIAN SOILS
Computing Eolian Sand Transport from Routine Weather Data,
W77-06669 2L

AERATED LAGOONS
Stabilisation Lagoons Including Experience in Brazil. Part 1,
W77-07063 5D

AERATION
Mixing and Circulation of Lakes and Reservoirs with Air Plumes,
W77-06633 5G

Sewage Aeration Impeller-With Automatic De-Icing and Anti-Clogging System,
W77-07001 5D

Design Criteria for Waste Water Aerator Drives,
W77-07060 5D

Method of Treating Waste Water with Jet Nozzles,
W77-07090 5D

AERATOR DRIVES
Design Criteria for Waste Water Aerator Drives,
W77-07060 5D

AERIAL PHOTOGRAPHY
Improving Estimates of Streamflow Characteristics Using LANDSAT-1 (ERTS-1) Imagery,
W77-06972 4A

AEROBIC BACTERIA
Stabilisation Lagoons Including Experience in Brazil. Part 1,
W77-07063 5D

AEROBIC DIGESTION
Influence of Phosphorus Removal on Solids Budget,
W77-07032 5D

AEROBIC TREATMENT
Method of Waste Treatment and Algae Recovery,
W77-07003 5D

Conditioning and Land Application of Aerobically Digested Sludge,
W77-07058 5D

Design Criteria for Waste Water Aerator Drives,
W77-07060 5D

AFRICA
Circulation and Hydrographic Structure Over the Ghana Continental Shelf During the 1974 Upwelling,
W77-06893 2L

LIBRARY U. OF I. URBANA-CHAMPAIGN

AFRICA

Hydrochemistry of the Lake Magadi Basin, Kenya,
W77-06967 2K

AGE

Effects of Various Ecological Factors on Radiostrontium Uptake in Two Euryhaline Teleosts: Mugil Auratus Risso and Pleuronectes Platessal, (Influence de Divers Facteurs Ecologiques Sur L'Accumulation du Radiostrontium Chez Deux Teleosteens Euryhalins: Mugil Auratus Risso et Pleuronectes Platessa L.),
W77-06777 5C

AGE CLASSES

Occurrence and Growth of Dreissena Polymorpha Pall. in Lakes Included in a Cooling System, (In Polish),
W77-06754 5C

AGRICULTURAL CHEMICALS

Loss of 2,4-D in Runoff from Plots Receiving Simulated Rainfall and from a Small Agricultural Watershed,
W77-06908 5B

The Impact of Fertilizer Use and Crop Management on Nitrogen Content of Subsurface Water Draining from Upland Agricultural Watersheds,
W77-06909 5B

AGRICULTURAL WATERSHEDS

The Impact of Fertilizer Use and Crop Management on Nitrogen Content of Subsurface Water Draining from Upland Agricultural Watersheds,
W77-06909 5B

AIR PLUMES

Mixing and Circulation of Lakes and Reservoirs with Air Plumes,
W77-06633 5G

AIR POLLUTION

Pollution Prevention, Not Control Called Key to a Clean Environment.
W77-06861 5G

Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
W77-06957 6G

AIR POLLUTION EFFECTS

Coastal Meteorological Networks to Determine Effects of Nuclear Plant Cooling Systems,
W77-06643 2B

AIR TEMPERATURE

A Single Field of View Method for Retrieving Tropospheric Temperature Profiles from Cloud-Contaminated Radiance Data,
W77-06887 2B

AIRPORTS

Compressed Air for Supercooled Fog Dispersal,
W77-06674 3B

ALABAMA

Urbanization and Flooding in Shades Creek Basin, Jefferson County, Alabama,
W77-06977 4C

ALASKA

Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 1: Marine Mammals, Marine Birds.
W77-06793 6G

Baseline Characterization of Marine Mammals in the Bering Sea,
W77-06794 6G

Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska,
W77-06795 6G

Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
W77-06796 6G

The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
W77-06799 6G

An Aerial Census of Spotted Seals, Phoca Vitulina Largha,
W77-06800 6G

Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska,
W77-06804 6G

Identification, Documentation, and Delineation of Coastal Migratory Bird Habitat in Alaska, and the Distribution, Abundance and Feeding Ecology of Birds Associated with Pack Ice,
W77-06805 6G

Ecosystem Dynamics Birds and Marine Mammals. Part I: Preliminary Estimates of Pinniped - Finfish Relationships in the Bering Sea,
W77-06806 6G

Ecosystem Dynamics Birds and Marine Mammals. Part II: Food Web Structure and Trophic Relations of Bering Sea Avifauna (Preliminary Report),
W77-06807 6G

Ecosystem Dynamics Birds and Marine Mammals. Part III: A Dynamic Numerical Marine Ecosystem Model for Evaluation of Marine Resources in Eastern Bering Sea,
W77-06808 6G

Reproductive Ecology of Pribilof Island Seabirds,
W77-06809 6G

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W77-06810 6G

Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

Avifaunal Utilization of the Offshore Island Area Near Prudhoe Bay, Alaska,
W77-06812 6G

Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, When Over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska During the Northern Summer,
W77-06814 6G

Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

Preliminary Catalog of Seabird Colonies and Photographic Mapping of Seabird Colonies,
W77-06816 6G

Review and Analysis of Literature and Unpublished Data on Marine Birds,
W77-06817 6G

Migration of Birds in Alaska Coastal and Marine Habitats Subject to Influence by OCS Development,
W77-06818 6G

Feeding Ecology and Trophic Relationships of Alaskan Marine Bird, and Population Dynamics of Marine Birds,
W77-06819 6G

Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

Studies of Populations, Community Structure and Colony of Marine Birds at King Island, Bering Strait Region, Alaska,
W77-06821 6G

Avian Community Ecology of the Akulik - Inglutalik River Delta, Norton Bay, Alaska,
W77-06822 6G

A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
W77-06824 6G

Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 2: Fish, Plankton, Benthos, Littoral.
W77-06825 6G

The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
W77-06826 6G

Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
W77-06828 6G

Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
W77-06829 6G

Razor Clam (Siliqua Patula, Dixon) Distribution and Population Assessment Study,
W77-06830 6G

Resources of Non-Salmonid Pelagic Fish of the Eastern Bering Sea and the Gulf of Alaska,
W77-06832 6G

Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

Plankton of the Gulf of Alaska - Ichthyoplankton,
W77-06834 6G

Initial Zooplankton Investigations in Lower Cook Inlet,
W77-06835 6G

Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chukchi Sea,
W77-06839 6G

Beaufort Sea Estuarine Fishery Study,
W77-06840 6G

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W77-06842 6G

Reconnaissance Characterization of Littoral Biota, Beaufort and Chukchi Seas,
W77-06843 6G

Ichthyoplankton of the Eastern Bering Sea,
W77-06845 6G

Assessment of Pelagic and Nearshore Fish in Three Bays on Southeast Kodiak Island,
W77-06846 6G

Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
W77-06847 6G

Technical Trawl Survey of the Benthic Epifauna of the Chukchi Sea and Norton Sound.
W77-06848 6G

The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

Program Development Plan. Environmental Assessment of the Alaskan Continental Shelf,
W77-06878 6G

Sludge Dewatering on Alaska's North Slope,
W77-07030 5D

LBERNI INLET (BRITISH COLUMBIA)

The Influence of Wind on the Surface Layer of a Stratified Inlet: Part I. Observations,
W77-06894 2L

The Influence of Wind on the Surface Layer of a Stratified Inlet: Part II. Analysis,
W77-06895 2L

LGAE

The Algal Flora in the Thermal Baths of Montegrotto Terme (Padua). Its Distribution Over One-Year Period,
W77-06770 5C

Correlation Coefficients and Concentration Factors of Copper and Lead in Seawater and Benthic Algae,
W77-06783 5C

Algal Supplement Enhancement of Static and Recirculating System,
W77-06933 5C

Method of Waste Treatment and Algae Recovery,
W77-07003 5D

LGAE RECOVERY

Method of Waste Treatment and Algae Recovery,
W77-07003 5D

ALGORITHMS

Mathematical Model of Water Resources Utilization in a River Basin,
W77-06719 4A

ALLUVIAL AQUIFERS

Chemical Quality of Effluents and Their Influence on Water Quality in a Shallow Aquifer,
W77-06658 5B

Further Development and Testing of a Stream-Aquifer System Model,
W77-06762 2F

ALTERNATIVE PLANNING

Design Study of Environmental and Human Cultural Information System Needs in Urban Water Resource Development,
W77-06634 6B

The Multi-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06734 4A

The Out-of-Kilter Algorithm as a Single-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06735 4A

ALUMINUM RECYCLING

Recycling of Aluminum Used for Phosphate Removal in Domestic Waste Water Treatment,
W77-07099 5D

AMMONIA

Ammonia Concentration in Relation to Ammonia Toxicity During a Rainbow Trout Rearing Experiment in a Closed Freshwater-Seawater System,
W77-06743 5C

UNOX System for Waste Water Treatment,
W77-07014 5D

AMMONIA COMPOUNDS

Apparatus and Process for Removing Ammonia Nitrogen from Waste Water,
W77-07008 5D

AMMONIA TOXICITY

Ammonia Concentration in Relation to Ammonia Toxicity During a Rainbow Trout Rearing Experiment in a Closed Freshwater-Seawater System,
W77-06743 5C

ANADROMOUS FISH

Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
W77-06924 5C

Identity, Origin and Development of Off-Flavors in Great Lakes Anadromous Fish,
W77-06931 5A

ANAEROBIC BACTERIA

The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

ANAEROBIC CONDITIONS

The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

Anaerobic Filter Treats Waste Activated Sludge,
W77-07078 5D

ANAEROBIC DIGESTERS

Anaerobic Digestion and Membrane Separation for the Treatment of Domestic Sewage,
W77-06631 5D

ANAEROBIC DIGESTION

Anaerobic Digestion and Membrane Separation for the Treatment of Domestic Sewage,
W77-06631 5D

Elimination of Anaerobic Digester Supernatant,
W77-07059 5D

ANAEROBIC TREATMENT

Stabilisation Lagoons Including Experience in Brazil. Part 1,
W77-07063 5D

ANALOG MODELS

Analog-Model Simulations for Secondary Canal Controls and Forward Pumping Water-Management Schemes in Southeast Florida,
W77-06968 4B

ANALYTICAL TECHNIQUES

LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

Computing Eolian Sand Transport from Routine Weather Data,
W77-06669 2L

Measurement in a Marine Environment Using Low Cost Sensors of Temperature and Dissolved Oxygen,
W77-06960 7B

Determination of Free Formic and Acetic Acids by Gas Chromatography Using the Flame Ionization Detector,
W77-06961 5A

Drugs and Drug Metabolites as Environmental Contaminants: Chlorophenoxyisobutyrate and Salicylic Acid in Sewage Water Effluent,
W77-07045 5A

Simplified Methods of Computing the Quantity of Urban Runoff,
W77-07072 5B

Concentration and Determination of Trace Organic Pollutants in Water,
W77-07098 5A

ANCESTRAL CHANNELS

Delaware River: Evidence for Its Former Extension to Wilmington Submarine Canyon,
W77-06966 2E

ANEMONEFISH

Notes on the Nesting Success and Fecundity of the Anemonefish Amphiprion Clarkii at Miyake-Jima, Japan,
W77-06763 5C

ANGLIAN WATER AUTHORITY (ENGLAND)

The Operations Section of Lincoln Sewage Division,
W77-07023 5D

ANIMAL GROWTH

Environmental Factors Affecting Survival and Growth of Vibrio Parahaemolyticus. A Review,
W77-06765 5C

ANIMAL PATHOLOGY

Gas Bubble Disease of Salmonids: A Critical Review,
W77-06920 5

LIBRARY U. OF I. URBANA-CHAMPAIGN

ANIMAL PATHOLOGY

Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
W77-06924 5C

ANIMAL PHYSIOLOGY

The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

ANION EXCHANGE

The Removal of Organic Matter from Water Supplies by Ion Exchange,
W77-06760 5F

ANNAPOLIS (MD)

Preventive Sewer Maintenance Helps Preserve Historic Annapolis.
W77-06990 8G

AQUACULTURE

Algal Supplement Enhancement of Static and Recirculating System,
W77-06933 5C

AQUATIC ALGAE

Nutrient Removal by Water Hyacinths,
W77-07036 5G

AQUATIC ANIMALS

Optic Device for Observations of Small Organisms Under Water, (In Russian),
W77-06926 7B

AQUATIC BACTERIA

The Influence of Acrolein and Hydrocryle on the Development Dynamics of Aquatic Bacteria,
W77-06690 5C

AQUATIC ENVIRONMENT

Ecological Data on Continental Aquatic Vegetation, (In Spanish),
W77-06784 2I

AQUATIC FUNGI

Foam and Film of Fresh Waters as an Ecological Niche of Aquatic Hyphomycetes, (In Russian),
W77-06787 2I

AQUATIC HABITATS

Ecological Data on Continental Aquatic Vegetation, (In Spanish),
W77-06784 2I

AQUATIC LIFE

Reconnaissance Characterization of Littoral Biota, Beaufort and Chukchi Seas,
W77-06843 6G

AQUATIC PLANTS

The Mining Fauna in Four Macrophyte Species in Mikolajskie Lake,
W77-06688 5C

Ecological Data on Continental Aquatic Vegetation, (In Spanish),
W77-06784 2I

AQUATIC POPULATIONS

The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
W77-06826 6G

AQUATIC PRODUCTIVITY

Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

AQUEDUCT

Comprehensive Monitoring of Meteorology, Hydraulics, and Thermal Regime of the San Diego Aqueduct, California,
W77-06973 2D

AQUEDUCTS

Conjunctive Use of the Tajo-Segura Aqueduct Surface System and the Aquifers of the La Mancha Area,
W77-06728 4B

AQUEOUS SOLUTIONS

Determination of Free Formic and Acetic Acids by Gas Chromatography Using the Flame Ionization Detector,
W77-06961 5A

AQUICULTURE

Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

AQUIFER CHARACTERISTICS

Review and Analysis of Hydrogeologic Conditions Near the Site of a Potential Nuclear-Waste Repository, Eddy and Lea Counties, New Mexico,
W77-06974 5B

AQUIFER TESTING

Further Development and Testing of a Stream-Aquifer System Model,
W77-06762 2F

AQUIFERS

On Large-Scale Simulation of Groundwater Flow Systems,
W77-06713 4B

Construction and Adjustment of a Two-Layer Mathematical Model of the Llobregat Delta,
W77-06722 4A

Integration of Aquifers in Flood Control Projects,
W77-06723 4A

Conjunctive Use of the Tajo-Segura Aqueduct Surface System and the Aquifers of the La Mancha Area,
W77-06728 4B

Tables and Type Curves for Analysis of Pump Tests in Leaky Parallel-Channel Aquifers,
W77-06941 4B

ARCTIC

Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

ARGON

The Solubility of Nitrogen, Oxygen and Argon in Water and Seawater,
W77-06923 5C

ARGON SOLUBILITIES

The Solubility of Nitrogen, Oxygen and Argon in Water and Seawater,
W77-06923 5C

ARIZONA

Monitoring Groundwater Quality: Illustrative Examples.
W77-06673 5A

Environmental Impact Statements in Water Resources Planning and Decision Making,
W77-06738 6E

Flood Hazard Information: Cave Creek, Arizona Canal to 19th Avenue, Phoenix, Arizona.
W77-06954 4A

ARKANSAS

Monitoring Groundwater Quality: Illustrative Examples.
W77-06673 5A

AROCLOR

Adsorption of Polychlorinated Biphenyl (Aroclor 1254) on Shrimp,
W77-06758 5C

Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

AROMATIC HYDROCARBONS

Identity, Origin and Development of Off-Flavors in Great Lakes Anadromous Fish,
W77-06931 5A

ARTIFICIAL RECHARGE

Streamflow Regulation by Artificial Recharge Fed from Upstream Surface Storage: Derivation of Control Rules,
W77-06725 4A

ASWAN DAM

Nile Cone: Late Quaternary Stratigraphy and Sediment Dispersal,
W77-06650 2L

ASWAN HIGH DAM

Effect of the Nile Flood on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-06907 2L

ATLANTIC OCEAN

Circulation and Hydrographic Structure Over the Ghana Continental Shelf During the 1974 Upwelling,
W77-06893 2L

High Seas Oil Pollution: Particulate Petroleum Residues in the North Atlantic,
W77-06911 5B

ATLANTIC SALMON

Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

ATMOSPHERE

An Estimate of the Input of Atmospheric Trace Elements into the North Sea and the Clyde Sea (1972-3),
W77-06668 5B

Investigation of the Effects of Nonhomogeneous (or Nonstationary) Behavior on the Spectra of Atmospheric Turbulence,
W77-06678 2B

ATMOSPHERIC TURBULENCE

Investigation of the Effects of Nonhomogeneous (or Nonstationary) Behavior on the Spectra of Atmospheric Turbulence,
W77-06678 2B

ATTITUDES

Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

AUSTRALIA
Purifying Water,
W77-07061 5D

AUTOMATION
NASA Develops Water Monitoring System,
W77-06912 5A

Automated Method for the Determination of the Phosphorus Content of Detergents,
W77-06944 5A

AVAILABLE WATER
Preliminary Assessment of the Water Resources of the Tulalip Indian Reservation, Washington,
W77-06971 4A

AVAILABLE WATER-HOLDING CAPACITY (AWHC)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

BACKWASH TECHNIQUES
Backwashing of Granular Filters,
W77-07037 5D

BACTERIA
Microbial Methane Consumption Reactions and Their Effect on Methane Distributions in Freshwater and Marine Environments,
W77-06899 5C

Adenosine Triphosphate (ATP) Levels in Microbial Cultures and a Review of the ATP Biomass Estimation Technique,
W77-06942 5A

UNOX System for Waste Water Treatment,
W77-07014 5D

On the Self-Purification of Natural Waters, (In German),
W77-07038 5G

Some Factors Affecting Floc Formation by Zoogloea Ramigera, Strain I-16-M,
W77-07042 5D

Ozone Oxidation of Waste Water,
W77-07094 5D

BARCELONA (SPAIN)
Construction and Adjustment of a Two-Layer Mathematical Model of the Llobregat Delta,
W77-06722 4A

BARGES
Dispersion of Liquid Waste from a Moving Barge,
W77-06913 5B

BARRIER ISLANDS
Exchange Through a Barrier Island Inlet: Additional Evidence of Upwelling Off the Northeast Coast of North Carolina,
W77-06654 2L

Sand Stabilization on the Dunes, Beach and Shoreface of a Historically Eroding Barrier Island. Wassaw Island Erosion Study, Part III,
W77-06940 8G

BASELINE STUDIES
Limnological and Planktonic Studies in the Waterton Lakes, Alberta,
W77-06680 5C

Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 1: Marine Mammals, Marine Birds.
W77-06793 6G

Baseline Characterization of Marine Mammals in the Bering Sea,
W77-06794 6G

Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska,
W77-06795 6G

Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
W77-06796 6G

The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
W77-06799 6G

An Aerial Census of Spotted Seals, Phoca Vitulina Largha,
W77-06800 6G

Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska,
W77-06804 6G

Identification, Documentation, and Delineation of Coastal Migratory Bird Habitat in Alaska, and the Distribution, Abundance and Feeding Ecology of Birds Associated with Pack Ice,
W77-06805 6G

Ecosystem Dynamics Birds and Marine Mammals. Part I: Preliminary Estimates of Pinniped - Finfish Relationships in the Bering Sea,
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Ecosystem Dynamics Birds and Marine Mammals. Part II: Food Web Structure and Trophic Relations of Bering Sea Avifauna (Preliminary Report),
W77-06807 6G

Ecosystem Dynamics Birds and Marine Mammals. Part III: A Dynamic Numerical Marine Ecosystem Model for Evaluation of Marine Resources in Eastern Bering Sea,
W77-06808 6G

Reproductive Ecology of Pribilof Island Seabirds,
W77-06809 6G

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W77-06810 6G

Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

Avifaunal Utilization of the Offshore Island Area Near Prudhoe Bay, Alaska,
W77-06812 6G

Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, When Over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska During the Northern Summer,
W77-06814 6G

Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

Preliminary Catalog of Seabird Colonies and Photographic Mapping of Seabird Colonies,
W77-06816 6G

Review and Analysis of Literature and Unpublished Data on Marine Birds,
W77-06817 6G

Migration of Birds in Alaska Coastal and Marine Habitats Subject to Influence by OCS Development,
W77-06818 6G

Feeding Ecology and Trophic Relationships of Alaskan Marine Bird, and Population Dynamics of Marine Birds,
W77-06819 6G

Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

Studies of Populations, Community Structure and Colony of Marine Birds at King Island, Bering Strait Region, Alaska,
W77-06821 6G

Avian Community Ecology of the Akulik - Inglutalik River Delta, Norton Bay, Alaska,
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A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
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Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 2: Fish, Plankton, Benthos, Littoral.
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The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
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Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
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BASELINE STUDIES

Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
W77-06829 6G

Razor Clam (Siliqua Patula, Dixon) Distribution and Population Assessment Study,
W77-06830 6G

Resources of Non-Salmonid Pelagic Fish of the Eastern Bering Sea and the Gulf of Alaska,
W77-06832 6G

Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

Plankton of the Gulf of Alaska - Ichthyoplankton,
W77-06834 6G

Initial Zooplankton Investigations in Lower Cook Inlet,
W77-06835 6G

Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chukchi Sea,
W77-06839 6G

Beaufort Sea Estuarine Fishery Study,
W77-06840 6G

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W77-06842 6G

Reconnaissance Characterization of Littoral Biota, Beaufort and Chukchi Seas,
W77-06843 6G

Ichthyoplankton of the Eastern Bering Sea,
W77-06845 6G

Assessment of Pelagic and Nearshore Fish in Three Bays on Southeast Kodiak Island,
W77-06846 6G

Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
W77-06847 6G

Technical Trawl Survey of the Benthic Epifauna of the Chukchi Sea and Norton Sound.
W77-06848 6G

The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

A Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment and Baseline Study Guidelines.
W77-06850 5A

A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

The New York Bight Project - 1975; Stony Brook, Long Island, New York.
W77-06876 5G

A Test Particle Dispersion Study in Massachusetts Bay.
W77-06880 2L

Mississippi Sound Temporal and Spatial Distribution of Nutrients,
W77-06932 5B

State Information Needs Related to Onshore and Nearshore Effects of OCS Petroleum Development,
W77-06934 6G

Who's Minding the Shore. A Citizens' Guide to Coastal Management,
W77-06935 5G

BASS

Effect of Malachite Green and Formalin on the Survival of Largemouth Bass Eggs and Fry,
W77-06612 5C

Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

BEACHES

Effects of Engineering Activities on the Ecology of Pismo Clams,
W77-06886 5C

BEANS

Dependence of Water Absorption by the Cell Walls of Plant Leaves on the Volume of the Free Space, (In Russian),
W77-06827 2I

BEAUFORT SEA

The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
W77-06799 6G

Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska,
W77-06804 6G

Beaufort Sea Estuarine Fishery Study,
W77-06840 6G

Reconnaissance Characterization of Littoral Biota, Beaufort and Chukchi Seas,
W77-06843 6G

BEHAVIOR

On the Application of Optimization Techniques to Conceptual Catchment Models,
W77-06709 2A

BELGIUM (CITY OF GHENT)

Depth and Seasonal Fluctuations in the Condition of the Groundwater of the Area Around the City of Ghent (Belgium), (In Dutch),
W77-06681 2G

BENDING STRENGTH

Laboratory Study of the Flexural Strength and Elastic Modulus of Freshwater and Saline Ice,
W77-06661 2C

BENTHIC FAUNA

A Pneumatic Grab for Obtaining Large, Undisturbed Mud Samples: Its Construction and Some Applications for Measuring the Growth of Larvae and Emergence of Adult Chironomidae,
W77-06613 5A

The Effects of Methoxychlor on Riffle Invertebrate Populations and Communities,
W77-06614 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin I. Quantitative Relations and Qualitative Composition of the Bottom Fauna of the Konin Lakes Complex, (In Polish),
W77-06749 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin II. Changes in Time of Bottom Fauna, (In Polish),
W77-06750 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin III. An Effort to Explain the Causes and Results of Changes in the Bottom Fauna of Lakes as Influenced by the Inflow of Heated Waters, (In Polish),
W77-06751 5C

BENTHOS

Electrically Powered Sampler for Benthic Macroinvertebrates,
W77-06757 7B

The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
W77-06826 6G

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W77-06842 6G

The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

BERING SEA

Baseline Characterization of Marine Mammals in the Bering Sea,
W77-06794 6G

Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
W77-06796 6G

An Aerial Census of Spotted Seals, Phoca Vitulina Largha,
W77-06800 6G

Identification, Documentation, and Delineation of Coastal Migratory Bird Habitat in Alaska, and the Distribution, Abundance and Feeding Ecology of Birds Associated with Pack Ice,
W77-06805 6G

Ecosystem Dynamics Birds and Marine Mammals. Part I: Preliminary Estimates of Pinniped - Finfish Relationships in the Bering Sea,
W77-06806 6G

Ecosystem Dynamics Birds and Marine Mammals. Part II: Food Web Structure and Trophic Relations of Bering Sea Avifauna (Preliminary Report),
W77-06807 6G

Ecosystem Dynamics Birds and Marine Mammals. Part III: A Dynamic Numerical Marine Ecosystem Model for Evaluation of Marine Resources in Eastern Bering Sea,
W77-06808 6G

Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, When Over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska During the Northern Summer,
W77-06814 6G

Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

Feeding Ecology and Trophic Relationships of Alaskan Marine Bird, and Population Dynamics of Marine Birds,
W77-06819 6G

Studies of Populations, Community Structure and Colony of Marine Birds at King Island, Bering Strait Region, Alaska,
W77-06821 6G

Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
W77-06824 6G

Resources of Non-Salmonid Pelagic Fish of the Eastern Bering Sea and the Gulf of Alaska,
W77-06832 6G

Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W77-06842 6G

Ichthyoplankton of the Eastern Bering Sea,
W77-06845 6G

BIBLIOGRAPHIES

Resources of Non-Salmonid Pelagic Fish of the Eastern Bering Sea and the Gulf of Alaska,
W77-06832 6G

Preliminary Bibliography on Groundwater in Developing Countries,
W77-06852 2F

Coastal Zone Management, Annotated Bibliography.
W77-06937 2L

Annotated Bibliography on Northern Environmental Engineering 1974-75,
W77-06948 5D

Literature Review of Wastewater Characteristics and Abatement Technology in the Wood and Timber Processing Industry.
W77-06951 5D

BIOASSAY

LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

Toxicity of Fluoride to Brown Trout Fry (Salmo trutta),
W77-06628 5C

Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
W77-06639 5C

Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

The Measurement of Temperature Tolerance: Verification of an Index,
W77-06764 5C

BIOCHEMICAL OXYGEN DEMAND

Waste Treatment Apparatus,
W77-07005 5D

Nutrient Removal by Water Hyacinths,
W77-07036 5G

The Electrolytic Respirometer-II. Use in Water Pollution Control Plant Laboratories,
W77-07081 5D

Waste Treatment Process,
W77-07091 5D

BIOCHEMISTRY

Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
W77-06639 5C

BIODEGRADATION

Biogenic Elements and Sulfate Reduction in Water Oil Carbonate Layer, (In Russian),
W77-07040 5B

BIOGENIC ELEMENTS

Biogenic Elements and Sulfate Reduction in Water Oil Carbonate Layer, (In Russian),
W77-07040 5B

BIOINDICATORS

Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

An Offshore Biomonitoring System for Chlorinated Hydrocarbons,
W77-06641 5A

The Measurement of Temperature Tolerance: Verification of an Index,
W77-06764 5C

Indicator Values of Vascular Plants in Central Europe, (In German),
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A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

Escherichia Coli as a Sanitary-Indicator Microorganism, (In Russian),
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BIOLOGICAL COMMUNITIES

The Effects of Methoxychlor on Riffle Invertebrate Populations and Communities,
W77-06614 5C

Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

Limnological and Planktonic Studies in the Waterton Lakes, Alberta,
W77-06680 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin I. Quantitative Relations and Qualitative Composition of the Bottom Fauna of the Konin Lakes Complex, (In Polish),
W77-06749 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin II. Changes in Time of Bottom Fauna, (In Polish),
W77-06750 5C

BIOLOGICAL TREATMENT

Waste Treatment Apparatus,
W77-07005 5D

Plug-In Concept for Pilot Sewage Treatment Plant,
W77-07026 5D

Upgrading Biological Sewage Treatment Plants Today,
W77-07062 5D

Fuel Gas and Electricity from Municipal Sewage,
W77-07065 5D

BIOMASS

Effects of Copper on the Dominance and the Diversity of Algae: Controlled Ecosystem Pollution Experiment,
W77-06625 5A

Measurements of Planktonic Biomass in a Reservoir,
W77-06679 5A

Dynamics of Phytoplankton Biomass in Two Lakes of Different Limnological Character,
W77-06685 5C

The Share of Algae with Different Dimensions in the Plankton of Two Lakes of Different Trophic Character in the Annual Cycle,
W77-06692 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin I. Quantitative Relations and Qualitative Composition of the Bottom Fauna of the Konin Lakes Complex, (In Polish),
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Adenosine Triphosphate (ATP) Levels in Microbial Cultures and a Review of the ATP Biomass Estimation Technique,
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BIRDS

Ecosystem Dynamics Birds and Marine Mammals. Part II: Food Web Structure and Trophic Relations of Bering Sea Avifauna (Preliminary Report),
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Seasonal Distribution and Abundance of Marine Birds,
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A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

BISCAYNE AQUIFER (FLA)
Analog-Model Simulations for Secondary Canal Controls and Forward Pumping Water-Management Schemes in Southeast Florida,
W77-06968 4B

BONDING
Bonding of Calcium and Potassium by Vermiculite and Kaolinite Clays as Affected by H-Clay Addition,
W77-06872 2G

BORER FAUNA
The Mining Fauna in Four Macrophyte Species in Mikolajskie Lake,
W77-06688 5C

BOTTOM SAMPLING
A Pneumatic Grab for Obtaining Large, Undisturbed Mud Samples: Its Construction and Some Applications for Measuring the Growth of Larvae and Emergence of Adult Chironomidae,
W77-06613 5A

The Effects of Methoxychlor on Riffle Invertebrate Populations and Communities,
W77-06614 5C

Electrically Powered Sampler for Benthic Macroinvertebrates,
W77-06757 7B

BOTTOM SEDIMENTS
Interstitial Water Chemistry of Anoxic Long Island Sound Sediments. 1. Dissolved Gases,
W77-06900 5B

BRINE DISPOSAL
Monitoring Groundwater Quality: Illustrative Examples.
W77-06673 5A

BRINES
Hydrochemistry of the Lake Magadi Basin, Kenya,
W77-06967 2K

BRISTOL BAY
Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska,
W77-06804 6G

BRISTOL BAY (ALAS)
Preliminary Catalog of Seabird Colonies and Photographic Mapping of Seabird Colonies,
W77-06816 6G

BRISTOL BAY BASIN (ALAS)
Review and Analysis of Literature and Unpublished Data on Marine Birds,
W77-06817 6G

BRITISH COLUMBIA
The Influence of Wind on the Surface Layer of a Stratified Inlet: Part II. Analysis,
W77-06895 2L

BROWN TROUT
Toxicity of Fluoride to Brown Trout Fry (Salmo trutta),
W77-06628 5C

BUBBLES
In Situ Acoustic Measurements of Microbubbles at Sea,
W77-06916 2L

BUDGETING
The Operations Section of Lincoln Sewage Division,
W77-07023 5D

BYPRODUCTS
State-of-the-Art Review of Processes for Treatment and Reuse of Potato Wastes,
W77-06949 5D

CADMIUM
The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

Solubility and Plant Uptake of Cadmium in Soils Amended with Cadmium and Sewage Sludge,
W77-07055 5B

CALANOID COPEPOD
Effects of Pressure, Temperature and Oxygen on the Oxygen-Consumption Rate of the Midwater Copepod Gaussia Princeps,
W77-06642 5C

CALCIUM
Distribution and Indicatory Value of the Submerged Macrophytes in the Flowing Waters of the Friedberger Au, (In German),
W77-06802 5C

Bonding of Calcium and Potassium by Vermiculite and Kaolinite Clays as Affected by H-Clay Addition,
W77-06872 2G

CALIBRATION
A Universal Calibration Equation for Price Meters and Similar Instruments,
W77-06943 7B

CALIFORNIA
Monitoring the Marine Environment Through Sedimentation,
W77-06651 2L

Cost Comparison Between Subterrene and Current Tunneling Methods,
W77-06662 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix A--Baseline Cost Analyses,
W77-06663 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix B--Subterrene Cost Analyses,
W77-06664 8A

Monitoring Groundwater Quality: Illustrative Examples.
W77-06673 5A

USGS Scientists Bring California Water Supply into Compliance with Federal Regulations,
W77-06853 5G

Effects of Engineering Activities on the Ecology of Pismo Clams,
W77-06886 5C

In Situ Acoustic Measurements of Microbubbles at Sea,
W77-06916 2L

Comprehensive Monitoring of Meteorology, Hydraulics, and Thermal Regime of the San Diego Aqueduct, California,
W77-06973 2D

CALLITRICHE-OBTUSANGULA
Distribution and Indicatory Value of the Submerged Macrophytes in the Flowing Waters of the Friedberger Au, (In German),
W77-06802 5C

CANADA
A Note on Temperature and Humidity Profile Measurement Over Forests Using Diodes,
W77-06653 7B

Presenting Trends in Lake Eutrophication,
W77-06693 5C

Devon Island Ice Cap: Core Stratigraphy and Paleoclimate,
W77-06890 2C

The Influence of Wind on the Surface Layer of a Stratified Inlet: Part I. Observations,
W77-06894 2L

The Influence of Wind on the Surface Layer of a Stratified Inlet: Part II. Analysis,
W77-06895 2L

Tables and Type Curves for Analysis of Pump Tests in Leaky Parallel-Channel Aquifers,
W77-06941 4B

Automated Method for the Determination of the Phosphorus Content of Detergents,
W77-06944 5A

Annotated Bibliography on Northern Environmental Engineering 1974-75,
W77-06948 5D

Proceedings Technology Transfer Seminar on Waste Handling, Disposal and Recovery in the Metal Finishing Industry, November 12-13, 1975, Toronto, Ontario.
W77-06950 5D

Literature Review of Wastewater Characteristics and Abatement Technology in the Wood and Timber Processing Industry.
W77-06951 5D

Canwel Can Do,
W77-06985 5D

The Chemical Characteristics of the City of Winnipeg Waste Water,
W77-07047 5A

CANADA WATER ACT REGULATIONS
Automated Method for the Determination of the Phosphorus Content of Detergents,
W77-06944 5A

CANALS
Analog-Model Simulations for Secondary Canal Controls and Forward Pumping Water-Management Schemes in Southeast Florida,
W77-06968 4B

CAPE THOMPSON (ALAS)
A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

CAPITAL INVESTMENT
The Growth Shapers: The Land Use Impacts of Infrastructure Investments.
W77-06601 6D

CAPPED WELLS
Bits and Pieces,
W77-06866 8G

CARASSIUS AURATUS
Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

CARP
A Biological Monitoring System Employing Rheotaxis of Fish,
W77-06609 5C

Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

Effect of Two Rearing Conditions on Growth and Body Composition in Carp (Cyprinus Carpio L), (Influence de Deux Modes d'Elevage sur la Croissance et la Composition Corporelle de la Carpe Commune),
W77-06769 5C

Median Tolerance Limits of Some Chemicals to the Fresh Water Fish Cyprinus-Carpio,
W77-06780 5C

Experiment with a Multipoint System for Judging Carp Fattening Ponds, (In Russian),
W77-06798 2H

CATFISH
Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

CAVE CREEK (AZ)
Flood Hazard Information: Cave Creek, Arizona Canal to 19th Avenue, Phoenix, Arizona.
W77-06954 4A

CAVITATION
Method of Applying Ozone and Sonic Energy to Sterilize and Oxidize Waste Water,
W77-07007 5D

CEMENTS
Methane-Derived Carbonate Cements in Barrier and Beach Sands of a Subtropical Delta Complex,
W77-06677 2L

CENTRAL ARIZONA PROJECT
Environmental Impact Statements in Water Resources Planning and Decision Making,
W77-06738 6E

CENTRIFUGATION
Sludge Dewatering on Alaska's North Slope,
W77-07030 5D

CESSPOOLS
The Plight and Promise of On-Site Waste Water Treatment,
W77-07010 5D

CHANDELEUR ISLANDS (LA)
Methane-Derived Carbonate Cements in Barrier and Beach Sands of a Subtropical Delta Complex,
W77-06677 2L

CHANNEL CATFISH
Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

CHANNEL IMPROVEMENT
Evaluation of the Environmental Impact to Appalachian Pennsylvania Waters of the 1972 Flood and Subsequent Stream Channelization with Future Policy Recommendations.
W77-06676 4A

CHANNEL ROUTING
Further Development and Testing of a Stream-Aquifer System Model,
W77-06762 2F

CHANNELS
On the Application of Optimization Techniques to Conceptual Catchment Models,
W77-06709 2A

CHEMICAL ANALYSIS
Determination of Free Formic and Acetic Acids by Gas Chromatography Using the Flame Ionization Detector,
W77-06961 5A

Drugs and Drug Metabolites as Environmental Contaminants: Chlorophenoxyisobutyrate and Salicylic Acid in Sewage Water Effluent,
W77-07045 5A

CHEMICAL GROUTING
Testing and Grouting Leaking Joints,
W77-06986 8G

CHEMICAL PROPERTIES
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

The Chemical Characteristics of the City of Winnipeg Waste Water,
W77-07047 5A

CHEMICAL THERMOMETERS
Measurement in a Marine Environment Using Low Cost Sensors of Temperature and Dissolved Oxygen,
W77-06960 7B

CHEMICAL TREATMENT
Plug-In Concept for Pilot Sewage Treatment Plant,
W77-07026 5D

Purifying Water,
W77-07061 5D

Upgrading Biological Sewage Treatment Plants Today,
W77-07062 5D

CHEMISTRY
Methane-Derived Carbonate Cements in Barrier and Beach Sands of a Subtropical Delta Complex,
W77-06677 2L

CHEMISTRY OF PRECIPITATION
The Distribution of Natural and Anthropogenic Elements and Compounds in Precipitation Across the U.S.; Theory and Quantitative Models,
W77-06675 2B

CHESAPEAKE BAY
Measurement in a Marine Environment Using Low Cost Sensors of Temperature and Dissolved Oxygen,
W77-06960 7B

CHICAGO (ILL)
Chicago Drives Large Bores to Control Combined Sewage Flow.
W77-06988 8E

CHINOOK SALMON
Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

CHLORINATED HYDROCARBONS
An Offshore Biomonitoring System for Chlorinated Hydrocarbons,
W77-06641 5A

CHLORINATION
Chlorine Reactions with Seawater Constituents and the Inhibition of Photosynthesis of Natural Marine Phytoplankton,
W77-06637 5C

How to Deal with Pitting and Corrosion.
W77-06869 8G

The Current Role of Wastewater Disinfection,
W77-07064 5D

CHLORINE
Chlorine Reactions with Seawater Constituents and the Inhibition of Photosynthesis of Natural Marine Phytoplankton,
W77-06637 5C

CHLOROPHYLL
Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

CHROMATOGRAPHY
Characterization of Soluble Organic Matter in Leachate,
W77-07039 5A

CHROMIUM
Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
W77-06639 5C

CHUKCHI SEA
Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
W77-06796 6G

The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
W77-06799 6G

Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska,
W77-06804 6G

Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chukchi Sea,
W77-06839 6G

Reconnaissance Characterization of Littoral Biota, Beaufort and Chukchi Seas,
W77-06843 6G

CHUKCHI SEA

Technical Trawl Survey of the Benthic Epifauna of the Chukchi Sea and Norton Sound.
W77-06848 6G

CHUM SALMON
The Growth of Young Salmonids (Onchorhynchus Keta): Controlled Ecosystem Pollution Experiment,
W77-06618 5A

CINCINNATI METROPOLITAN SEWER DISTRICT (OH)
Cincinnati's Preventive Maintenance Sewer Program.
W77-06989 5G

CIRCULATION
Mixing and Circulation of Lakes and Reservoirs with Air Plumes,
W77-06633 5G

The Observed Winter Circulation of Lake Ontario,
W77-06655 2H

Effect of the Nile Flood on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-06907 2L

CITY PLANNING
Design Study of Environmental and Human Cultural Information System Needs in Urban Water Resource Development,
W77-06634 6B

CLAMS
Razor Clam (Siliqua Patula, Dixon) Distribution and Population Assessment Study,
W77-06830 6G

Effects of Engineering Activities on the Ecology of Pismo Clams,
W77-06886 5C

CLAYS
Bonding of Calcium and Potassium by Vermiculite and Kaolinite Clays as Affected by H-Clay Addition,
W77-06872 2G

CLEANING
Cincinnati's Preventive Maintenance Sewer Program.
W77-06989 5G

Preventive Sewer Maintenance Helps Preserve Historic Annapolis.
W77-06990 8G

Copper Sulfate Fights Root Growth in Sewer Systems,
W77-06991 8G

Contract Services Stretch Sewer Maintenance Budget,
W77-06994 8G

Backwashing of Granular Filters,
W77-07037 5D

CLEAR LAKE (CALIF)
The Use of Remote Sensing to Detect How Wind Influences Planktonic Blue-Green Algal Distribution,
W77-06697 5C

CLIMATES
Indicator Values of Vascular Plants in Central Europe, (In German),
W77-06803 2I

CLIMATOLOGY
Climatology for Geographers,
W77-06659 2B

Devon Island Ice Cap: Core Stratigraphy and Paleoclimate,
W77-06890 2C

CLINTON QUADRANGLE (OKLA)
Reconnaissance of the Water Resources of the Clinton Quadrangle, West-Central Oklahoma,
W77-06959 7C

CLOUD SEEDING
Weather Modification in the Soviet Union--1976,
W77-06644 3B

On the Status of Hail Suppression,
W77-06645 3B

CLYDE SEA (SCOTLAND)
An Estimate of the Input of Atmospheric Trace Elements into the North Sea and the Clyde Sea (1972-3),
W77-06668 5B

COAGULATION
Adsorption, Coagulation and Filtration Make a Useful Treatment Combination-Part 2,
W77-07077 5D

Renovated Water from Municipal Sewage Treatment Plants,
W77-07086 5D

COAL CONVERSION
Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
W77-06957 6G

COAL LIQUEFICATION
Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
W77-06957 6G

COAL MINE WASTES
Debris Basins for Control of Surface Mine Sedimentation,
W77-06672 5G

COASTAL ZONE MANAGEMENT
State Information Needs Related to Onshore and Nearshore Effects of OCS Petroleum Development,
W77-06934 6G

Who's Minding the Shore. A Citizens' Guide to Coastal Management,
W77-06935 5G

Coastal Zone Management, Annotated Bibliography,
W77-06937 2L

COASTS
Monitoring the Marine Environment Through Sedimentation,
W77-06651 2L

A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

Continental Shelf Waves and Alongshore Variations in Bottom Topography and Coastline,
W77-06891 2L

Incipient Sediment Motion in Entrances with Shell Beds,
W77-06930 2L

Coastal Zone Management, Annotated Bibliography,
W77-06937 2L

COD
Rotary-Flow Technique for Testing Fitness of Fish,
W77-06608 5C

COHO SALMON
Changes in the Blood Chemistry of Coho Salmon Exposed to Malachite Green,
W77-06746 5C

COLLECTIVE UTILITY
Collective Utility: A Systems Approach to Water Pricing Policy,
W77-06712 6C

COLORADO
New Design Gives Denver District Iron-Free Well,
W77-06868 8A

Water Quality Investigations in the South Platte River Basin, Colorado, 1971-72.
W77-07076 5A

COLORADO RIVER BASIN
Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
W77-06957 6G

COLUMBIA RIVER
Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
W77-06924 5C

Dissolved Nitrogen, Dissolved Oxygen and Related Water Temperatures in the Columbia and Lower Snake Rivers, 1965-1969,
W77-06925 5C

Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

COMBINED SEWERS
Chicago Drives Large Bores to Control Combined Sewage Flow.
W77-06988 8E

Single P/C Unit Removal of Nutrients from Combined Sewer Overflows,
W77-07031 5D

Treatment of Combined Sewer Overflows Via Thin Film Chemistry,
W77-07034 5D

Short Course Proceedings: Applications of Stormwater Management Models,
W77-07066 5B

On-Line Adaptive Control for Combined Sewer Systems,
W77-07100 5D

COMMUNICATION CHANNELS
Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

COMPARATIVE PRODUCTIVITY
The Effect of Different Methods on Growth, Development and Yield of Cotton, (In German),
W77-06962 3F

COMPOSTING
Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

COMPREHENSIVE PLANNING
A Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment and Baseline Study Guidelines.
W77-06850 5A

COMPUTER MODELS
A General Model of Microbial Growth and Decomposition in Aquatic Ecosystems,
W77-06684 5C

Hybrid Computer Analysis of a Combined Surface Water--Groundwater System,
W77-06729 4B

Urbanization and Flooding in Shades Creek Basin, Jefferson County, Alabama,
W77-06977 4C

On-Line Adaptive Control for Combined Sewer Systems,
W77-07100 5D

COMPUTER PROGRAMS
Short Course Proceedings: Applications of Stormwater Management Models,
W77-07066 5B

CONDUCTIVITY
The Influence of Heated Effluent Waters on the Water Chemism of Konin Lakes, (In Polish),
W77-06753 5C

CONFERENCES
Conference on Research in Tunneling and Excavation Technology,
W77-06885 8E

Advanced Waste Treatment Seminar, Session III, Removal of Solids and Organics, Held at San Francisco, on October 28-29, 1970.
W77-07074 5D

CONJUCTIVE USE
Integration of Aquifers in Flood Control Projects,
W77-06723 4A

CONJUNCTIVE USE
The Conjunctive Use of a Multi-Reservoir System and a Dual-Purpose Desalting Plant,
W77-06714 4B

Conjunctive Use of the Tajo-Segura Aqueduct Surface System and the Aquifers of the La Mancha Area,
W77-06728 4B

Economic Analysis of Alternative Groundwater Withdrawal Rates in Conjunction with Surface Water Irrigation,
W77-06740 4B

CONNECTICUT
Monitoring Groundwater Quality: Illustrative Examples.
W77-06673 5A

CONOWINGO CREEK (MD-PA)
Influence of Gradient on the Distribution of Fishes in Conowingo Creek, Maryland and Pennsylvania,
W77-06635 2I

CONSERVATION
Place and Role of Plant Cover in Optimization of the Donbas Natural Environment, (In Ukranian),
W77-06858 4C

Energy Conservation and Heat Recovery in Waste Water Treatment Plants,
W77-07024 5D

CONSTRUCTION
Fast-Tracking Cuts Costs 16% on Advanced Waste Water Plant.
W77-07016 5D

Waste Water Treatment Plant Built in Wet Hole,
W77-07021 5D

CONSTRUCTION COSTS
Fast-Tracking Cuts Costs 16% on Advanced Waste Water Plant.
W77-07016 5D

Waste Water Treatment Plant Built in Wet Hole,
W77-07021 5D

CONSTRUCTION EQUIPMENT
Waste Water Treatment Plant Built in Wet Hole,
W77-07021 5D

CONSTRUCTION MATERIALS
Use of Remote Sensing to Quantify Construction Material and to Define Geologic Lineations; Dickey-Lincoln School Lakes Project, Maine,
W77-06888 8D

Waste Water Treatment Plant Built in Wet Hole,
W77-07021 5D

CONTINENTAL SHELF
Program Development Plan. Environmental Assessment of the Alaskan Continental Shelf,
W77-06878 6G

Continental Shelf Waves and Alongshore Variations in Bottom Topography and Coastline,
W77-06891 2L

An Analysis of Inertial Oscillations Observed Near Oregon Coast,
W77-06892 2L

Circulation and Hydrographic Structure Over the Ghana Continental Shelf During the 1974 Upwelling,
W77-06893 2L

CONTROL
Optimal Complex Use of Controlled Water Resources of a Basin,
W77-06718 4A

Design and Control of Secondary Settlement Tanks,
W77-07015 5D

CONTROL RULES
Streamflow Regulation by Artificial Recharge Fed from Upstream Surface Storage: Derivation of Control Rules,
W77-06725 4A

CONTROL STRUCTURES
Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
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CONTROL SYSTEMS
Study of Leachate at Landfill Sites 1975, Volume 1.
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CONTROLLED EXPERIMENTAL ECOSYSTEM
Zooplankton Sampling Variability: Controlled Ecosystem Pollution Experiment,
W77-06615 5A

Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

The Growth of Young Salmonids (Onchorhynchus Keta): Controlled Ecosystem Pollution Experiment,
W77-06618 5A

Experimental Observations on the Effects of Copper on Copepods and Other Zooplankton: Controlled Ecosystem Pollution Experiment,
W77-06619 5A

Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

CONTROLLED EXPERIMENTAL ECOSYSTEMS
Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06620 5A

Effects of Copper on the Dominance and the Diversity of Algae: Controlled Ecosystem Pollution Experiment,
W77-06625 5A

Temperature, Salinity and Light Penetration Structures: Controlled Ecosystem Pollution Experiment,
W77-06626 5A

Loch Ewe Bag Experiment, 1974,
W77-06627 5A

COOLING WATER
Chlorine Reactions with Seawater Constituents and the Inhibition of Photosynthesis of Natural Marine Phytoplankton,
W77-06637 5C

The Influence of Heated Effluent Waters on the Thermal-Oxygen Relations and Water Transparency in the Konin Lakes Complex, (In Polish),
W77-06756 5C

COPEPODS
Experimental Observations on the Effects of Copper on Copepods and Other Zooplankton: Controlled Ecosystem Pollution Experiment,
W77-06619 5A

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COPEPODS

Effects of Pressure, Temperature and Oxygen on the Oxygen-Consumption Rate of the Mid-water Copepod Gaussia Princeps,
W77-06642 5C

COPPER

Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

The Growth of Young Salmonids (Onchorhynchus Keta): Controlled Ecosystem Pollution Experiment,
W77-06618 5A

Experimental Observations on the Effects of Copper on Copepods and Other Zooplankton: Controlled Ecosystem Pollution Experiment,
W77-06619 5A

Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06620 5A

Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

Response of Natural Marine Bacterial Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06622 5A

Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

Effects of Copper on the Dominance and the Diversity of Algae: Controlled Ecosystem Pollution Experiment,
W77-06625 5A

Loch Ewe Bag Experiment, 1974,
W77-06627 5A

The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

Correlation Coefficients and Concentration Factors of Copper and Lead in Seawater and Benthic Algae,
W77-06783 5C

COPPER ION

Response of Natural Marine Bacterial Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06622 5A

COPPER SULFATE

Copper Sulfate Fights Root Growth in Sewer Systems,
W77-06991 8G

CORAL

Evidence for Strong Currents and Turbulence in a Deep Coral Reef Groove,
W77-06904 2L

CORAL REEF GROOVE

Evidence for Strong Currents and Turbulence in a Deep Coral Reef Groove,
W77-06904 2L

CORPUS CHRISTI (TX)

Control Sewer Corrosion with H2O2,
W77-06993 8G

CORROSION

Pumping Systems: The Simpler, The Better,
W77-06856 8C

New Design Gives Denver District Iron-Free Well,
W77-06868 8A

Control Sewer Corrosion with H2O2,
W77-06993 8G

CORROSION CONTROL

How to Deal with Pitting and Corrosion.
W77-06869 8G

Control Sewer Corrosion with H2O2,
W77-06993 8G

COST ANALYSIS

Cost Comparison Between Subterrene and Current Tunneling Methods,
W77-06662 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix A--Baseline Cost Analyses,
W77-06663 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix B--Subterrene Cost Analyses,
W77-06664 8A

COST COMPARISONS

Cost Comparison Between Subterrene and Current Tunneling Methods,
W77-06662 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix A--Baseline Cost Analyses,
W77-06663 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix B--Subterrene Cost Analyses,
W77-06664 8A

COSTS

Subsurface Injection-How Much Does It Cost,
W77-07011 5E

Municipal Waste Water Treatment as an Industrial Operation,
W77-07025 5D

COTTON

The Effect of Different Methods on Growth, Development and Yield of Cotton, (In German),
W77-06962 3F

CRABTREE CREEK WATERSHED (NC)

Open Space and Urban Water Management - Phase II: Case Studies and Findings,
W77-06917 6B

CRANKCASE WASTES

Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

CROP MANAGEMENT PRACTICES

The Impact of Fertilizer Use and Crop Management on Nitrogen Content of Subsurface Water Draining from Upland Agricultural Watersheds,
W77-06909 5B

CROP PRODUCTION

The Significance of Regulating the Water Regime of Agricultural Lands, (In Russian),
W77-06837 3F

CROP RESPONSE

Salinity Effects on Rice After the Boot Stage,
W77-06871 3C

The Effect of Different Methods on Growth, Development and Yield of Cotton, (In German),
W77-06962 3F

CRUSTACEANS

Adsorption of Polychlorinated Biphenyl (Aroclor 1254) on Shrimp,
W77-06758 5C

Algal Supplement Enhancement of Static and Recirculating System,
W77-06933 5C

CTENOPHORES

Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06620 5A

CUBIC SPLINES

Smoothing Data with Cubic Splines,
W77-06831 7C

CULTIVATION

The Significance of Regulating the Water Regime of Agricultural Lands, (In Russian),
W77-06837 3F

CUNNERS

Respiratory Response of Cunners to Silver,
W77-06789 5C

CURRENTS (WATER)

Lake Currents and Temperatures Near the Western Shore of Lake Michigan,
W77-06687 2H

Evidence for Strong Currents and Turbulence in a Deep Coral Reef Groove,
W77-06904 2L

Effect of the Nile Flood on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-06907 2L

CURVES

Tables and Type Curves for Analysis of Pump Tests in Leaky Parallel-Channel Aquifers,
W77-06941 4B

CUTTHROAT TROUT

A Preliminary Evaluation of the Effects of Gas Bubble Disease on Fish Populations in the Kootenai River Below Libby Dam,
W77-06919 5C

CYANOPHYTA

The Use of Remote Sensing to Detect How Wind Influences Planktonic Blue-Green Algal Distribution,
W77-06697 5C

CYCLING NUTRIENTS

Loch Ewe Bag Experiment, 1974,
W77-06627 5A

Stratification of Kinetic Origin and its Biological Consequences in a Neotropical Man-Made Lake,
W77-06683 2H

CYTOLOGICAL STUDIES
Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

Dependence of Water Absorption by the Cell Walls of Plant Leaves on the Volume of the Free Space, (In Russian),
W77-06827 2I

DAIRY INDUSTRY
Two-Goal Regional Environmental Policy: The Case of the Santa Ana River Basin,
W77-06707 5G

DAM CONSTRUCTION
Use of Remote Sensing to Quantify Construction Material and to Define Geologic Lineations; Dickey-Lincoln School Lakes Project, Maine,
W77-06888 8D

DAMS
Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

DATA COLLECTION
Dissolved Nitrogen, Dissolved Oxygen and Related Water Temperatures in the Columbia and Lower Snake Rivers, 1965-1969,
W77-06925 5C

DATA COLLECTIONS
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 1: Marine Mammals, Marine Birds.
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Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska,
W77-06795 6G

Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
W77-06796 6G

The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
W77-06799 6G

An Aerial Census of Spotted Seals, Phoca Vitulina Largha,
W77-06800 6G

Identification, Documentation, and Delineation of Coastal Migratory Bird Habitat in Alaska, and the Distribution, Abundance and Feeding Ecology of Birds Associated with Pack Ice,
W77-06805 6G

Ecosystem Dynamics Birds and Marine Mammals. Part I: Preliminary Estimates of Pinniped - Finfish Relationships in the Bering Sea,
W77-06806 6G

Ecosystem Dynamics Birds and Marine Mammals. Part II: Food Web Structure and Trophic Relations of Bering Sea Avifauna (Preliminary Report),
W77-06807 6G

Ecosystem Dynamics Birds and Marine Mammals. Part III: A Dynamic Numerical Marine Ecosystem Model for Evaluation of Marine Resources in Eastern Bering Sea,
W77-06808 6G

Reproductive Ecology of Pribilof Island Seabirds,
W77-06809 6G

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W77-06810 6G

Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, When Over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska During the Northern Summer,
W77-06814 6G

Review and Analysis of Literature and Unpublished Data on Marine Birds,
W77-06817 6G

Migration of Birds in Alaska Coastal and Marine Habitats Subject to Influence by OCS Development,
W77-06818 6G

Feeding Ecology and Trophic Relationships of Alaskan Marine Bird, and Population Dynamics of Marine Birds,
W77-06819 6G

Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

Studies of Populations, Community Structure and Colony of Marine Birds at King Island, Bering Strait Region, Alaska,
W77-06821 6G

Avian Community Ecology of the Akulik - Inglutalik River Delta, Norton Bay, Alaska,
W77-06822 6G

A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
W77-06824 6G

Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 2: Fish, Plankton, Benthos, Littoral.
W77-06825 6G

Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
W77-06828 6G

Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
W77-06829 6G

Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

Plankton of the Gulf of Alaska - Ichthyoplankton,
W77-06834 6G

Initial Zooplankton Investigations in Lower Cook Inlet,
W77-06835 6G

Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chukchi Sea,
W77-06839 6G

Beaufort Sea Estuarine Fishery Study,
W77-06840 6G

Assessment of Pelagic and Nearshore Fish in Three Bays on Southeast Kodiak Island,
W77-06846 6G

Littoral Drift Estimates Along the Coastline of Florida,
W77-06882 2L

DATA PROCESSING
Smoothing Data with Cubic Splines,
W77-06831 7C

The Influence of Wind on the Surface Layer of a Stratified Inlet: Part II. Analysis,
W77-06895 2L

DATA TRANSFER
Use of a Parametric Model as a Tool for Hydrometric Network Planning,
W77-06710 2A

DDT
An Offshore Biomonitoring System for Chlorinated Hydrocarbons,
W77-06641 5A

DEBRIS BASINS
Debris Basins for Control of Surface Mine Sedimentation,
W77-06672 5G

DECIDUOUS FORESTS
A Model for the Water Regime of a Deciduous Forest with Special Consideration of the Functional Interrelationships Among Meteorological Factors, Soil Water Content and Evapotranspiration, (In German),
W77-06864 2A

DECISION MAKING
Environmental Impact Statements in Water Resources Planning and Decision Making,
W77-06738 6E

Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

Subsurface Injection-How Much Does It Cost,
W77-07011 5E

DEEP WELLS
Submersible Pump Design: Dependent on Well Diameter and Depth.
W77-06867 8C

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DEFICIENT ELEMENTS
Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

DEGASSING TECHNIQUES
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

DEHYDRATION
Some Significant Regularities in Plant Hydroadaptation, (In Russian),
W77-06774 3B

DELAWARE RIVER
Delaware River: Evidence for Its Former Extension to Wilmington Submarine Canyon,
W77-06966 2E

DELMARVA PENINSULA
Improving Estimates of Streamflow Characteristics Using LANDSAT-1 (ERTS-1) Imagery,
W77-06972 4A

DELTAS
Construction and Adjustment of a Two-Layer Mathematical Model of the Llobregat Delta,
W77-06722 4A

DEMONSTRATION WATERSHEDS
An Executive Summary of Three EPA Demonstration Programs in Erosion and Sediment Control,
W77-06671 5G

DENSITY STRATIFICATION
Waste Injection into Stratified Ground Water Bodies,
W77-06855 5B

DENVER (COLORADO)
New Design Gives Denver District Iron-Free Well,
W77-06868 8A

DEPTH-AREA CURVES
Area-Depth Relations for Frequency Values of Rainfall,
W77-06647 2B

DEPTH-AREA-DURATION ANALYSIS
Area-Depth Relations for Frequency Values of Rainfall,
W77-06647 2B

DESALINATION PLANTS
The Conjunctive Use of a Multi-Reservoir System and a Dual-Purpose Desalting Plant,
W77-06714 4B

DESIGN
Rotary-Flow Technique for Testing Fitness of Fish,
W77-06608 5C

A Biological Monitoring System Employing Rheotaxis of Fish,
W77-06609 5C

An Electronic System to Monitor the Effects of Changes in Water Quality on Fish Opercular Rhythms,
W77-06610 5C

DESIGN CRITERIA
Design and Control of Secondary Settlement Tanks,
W77-07015 5D

Elimination of Anaerobic Digester Supernatant,
W77-07059 5D

Design Criteria for Waste Water Aerator Drives,
W77-07060 5D

Stabilisation Lagoons Including Experience in Brazil. Part 1,
W77-07063 5D

Advanced Waste Treatment Seminar, Session III, Removal of Solids and Organics, Held at San Francisco, on October 28-29, 1970.
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DESIGN FLOOD
Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
W77-06953 4A

DETERGENTS
Automated Method for the Determination of the Phosphorus Content of Detergents,
W77-06944 5A

DEVELOPING COUNTRIES (GROUNDWATER)
Preliminary Bibliography on Groundwater in Developing Countries,
W77-06852 2F

DEWATERING
Screenings Dewatering Press.
W77-07029 5D

Sludge Dewatering on Alaska's North Slope,
W77-07030 5D

The Use of Polymers for Improving Chemical Sludge Dewatering on Sand Beds,
W77-07033 5D

Anaerobic Filter Treats Waste Activated Sludge,
W77-07078 5D

Sludge Dewatering Pilot Plant Design. Part 2,
W77-07088 5D

Factors Influencing the Dewatering Characteristics of Sludge,
W77-07097 5D

DEWATERING PRESS
Screenings Dewatering Press.
W77-07029 5D

DICKEY-LINCOLN SCHOOL LAKE PROJECT (ME)
Use of Remote Sensing to Quantify Construction Material and to Define Geologic Lineations; Dickey-Lincoln School Lakes Project, Maine,
W77-06888 8D

DIFFUSION COEFFICIENT
Evidence for Strong Currents and Turbulence in a Deep Coral Reef Groove,
W77-06904 2L

DIGHA (INDIA)
A Study to Forecast the Waves at Digha,
W77-06648 2L

DIPTERA
A Pneumatic Grab for Obtaining Large, Undisturbed Mud Samples: Its Construction and Some Applications for Measuring the Growth of Larvae and Emergence of Adult Chironomidae,
W77-06613 5A

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin III. An Effort to Explain the Causes and Results of Changes in the Bottom Fauna of Lakes as Influenced by the Inflow of Heated Waters, (In Polish),
W77-06751 5C

DIRECT SEARCH METHOD
Streamflow Regulation by Artificial Recharge Fed from Upstream Surface Storage: Derivation of Control Rules,
W77-06725 4A

DISASTERS
Regulating Activities with Catastrophic Environmental Effects,
W77-06703 6G

DISCRIMINANT ANALYSIS
Phosphate Prediction Model for Streams by Means of Discriminant Analysis,
W77-06906 5B

DISEASES
Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

DISINFECTION
Water Decontamination in Northern Regions by Impulse Electric Charges, (In Russian),
W77-06791 5D

The Current Role of Wastewater Disinfection,
W77-07064 5D

DISPERSION
A Test Particle Dispersion Study in Massachusetts Bay.
W77-06880 2L

Dispersion of Liquid Waste from a Moving Barge,
W77-06913 5B

DISSOLVED GAS CONTENT
Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

DISSOLVED GASES
Interstitial Water Chemistry of Anoxic Long Island Sound Sediments. 1. Dissolved Gases,
W77-06900 5B

DISSOLVED OXYGEN
Mixing and Circulation of Lakes and Reservoirs with Air Plumes,
W77-06633 5G

Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

Dissolved Nitrogen, Dissolved Oxygen and Related Water Temperatures in the Columbia and Lower Snake Rivers, 1965-1969,
W77-06925 5C

Measurement in a Marine Environment Using Low Cost Sensors of Temperature and Dissolved Oxygen,
W77-06960 7B

DISSOLVED SOLIDS
Foam and Film of Fresh Waters as an Ecological Niche of Aquatic Hyphomycetes, (In Russian),
W77-06787 2I

DISTRIBUTION
Zooplankton Sampling Variability: Controlled Ecosystem Pollution Experiment,
W77-06615 5A

Influence of Gradient on the Distribution of Fishes in Conowingo Creek, Maryland and Pennsylvania,
W77-06635 2I

DISTRIBUTION PATTERNS
Influence of Gradient on the Distribution of Fishes in Conowingo Creek, Maryland and Pennsylvania,
W77-06635 2I

Temperature Relations of Puget Sound Thaids in Reference to Their Intertidal Distribution,
W77-06767 5C

Heat Resistance of Gametes of Marine Invertebrates in Relation to Temperature Conditions Under Which the Species Exist,
W77-06771 5C

Dispersal and Dispersion of Pond Snails in an Experimental Environment Varying to Three Factors, Singly and in Combination,
W77-06773 5C

The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
W77-06799 6G

Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
W77-06829 6G

Razor Clam (Siliqua Patula, Dixon) Distribution and Population Assessment Study,
W77-06830 6G

Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

Plankton of the Gulf of Alaska - Ichthyoplankton,
W77-06834 6G

Initial Zooplankton Investigations in Lower Cook Inlet,
W77-06835 6G

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
W77-06847 6G

The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

DOMESTIC WASTES
Anaerobic Digestion and Membrane Separation for the Treatment of Domestic Sewage,
W77-06631 5D

Canwel Can Do,
W77-06985 5D

Hydrocarbon Products Manufacture--By Carbonisation of Coal, Scrap Rubber or Plastic or Domestic Sewage Under Reduced Pressure.
W77-07000 5D

The Plight and Promise of On-Site Waste Water Treatment,
W77-07010 5D

Adsorption, Coagulation and Filtration Make a Useful Treatment Combination-Part 2,
W77-07077 5D

Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

DONETSK (UKRANIAN SSR)
Experience in Treating Waste Waters from the Donetsk Mines, (In Russion),
W77-07068 5D

DORR TYPE CLARIFIER
Study on Sewage Flow Dynamics Through Dorr Type Clarifier on Stream, (Synopsis),
W77-07048 5D

DRAINAGE
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

Debris Basins for Control of Surface Mine Sedimentation,
W77-06672 5G

DRAINAGE SYSTEMS
London's Stormwater Problem,
W77-06983 5D

DRAWDOWN
Hydraulics and Economics of Well Field Layout.
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DRILLING EQUIPMENT
Make Wire Rope Last-Treat it Like a Machine,
W77-06857 8G

One Good Idea Spurs Another.
W77-06860 8C

DRILLING PIPE CLAMPS
One Good Idea Spurs Another.
W77-06860 8C

DROUGHT RESISTANCE
Some Significant Regularities in Plant Hydroadaptation, (In Russian),
W77-06774 3B

DROUGHT TOLERANCE
Some Significant Regularities in Plant Hydroadaptation, (In Russian),
W77-06774 3B

DRYING
Causes of the Drying up of Forests in the Flood Plain of the Lower Reaches of the Ural River, (In Russian),
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Drying Potato Wastes for Animal Feed as an Alternative Disposal Method.
W77-06947 5D

DYES
Investigation of Flushing Time in the Lafayette River, Norfolk, Virginia,
W77-06881 2L

DYNAMIC PROGRAMMING
The Conjunctive Use of a Multi-Reservoir System and a Dual-Purpose Desalting Plant,
W77-06714 4B

Optimization of a Three-Reservoir System by Dynamic Programming,
W77-06720 4A

Optimal Seasonal and Short-Term Operation of a Reservoir Used for Flood Control and Water Supply,
W77-06724 4A

Streamflow Regulation by Artificial Recharge Fed from Upstream Surface Storage: Derivation of Control Rules,
W77-06725 4A

The Methods of Distribution of Water Resources in River Development Systems,
W77-06726 4A

DYNAMICS
Study on Sewage Flow Dynamics Through Dorr Type Clarifier on Stream, (Synopsis),
W77-07048 5D

E COLI
Escherichia Coli as a Sanitary-Indicator Microorganism, (In Russian),
W77-07067 5A

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Stable Elements of Radioecological Importance in Certain Echinoderm Species,
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Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 1: Marine Mammals, Marine Birds.
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The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
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Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
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Shorebird Dependence on Arctic Littoral Habitats,
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Avifaunal Utilization of the Offshore Island Area Near Prudhoe Bay, Alaska,
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Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, When Over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska During the Northern Summer,
W77-06814 6G

Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

Preliminary Catalog of Seabird Colonies and Photographic Mapping of Seabird Colonies,
W77-06816 6G

Review and Analysis of Literature and Unpublished Data on Marine Birds,
W77-06817 6G

Migration of Birds in Alaska Coastal and Marine Habitats Subject to Influence by OCS Development,
W77-06818 6G

Feeding Ecology and Trophic Relationships of Alaskan Marine Bird, and Population Dynamics of Marine Birds,
W77-06819 6G

Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
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Studies of Populations, Community Structure and Colony of Marine Birds at King Island, Bering Strait Region, Alaska,
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Avian Community Ecology of the Akulik - Inglutalik River Delta, Norton Bay, Alaska,
W77-06822 6G

A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
W77-06824 6G

ECOLOGY

Evaluation of the Environmental Impact to Appalachian Pennsylvania Waters of the 1972 Flood and Subsequent Stream Channelization with Future Policy Recommendations.
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Indicator Values of Vascular Plants in Central Europe, (In German),
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The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
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The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
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Place and Role of Plant Cover in Optimization of the Donbas Natural Environment, (In Ukranian),
W77-06858 4C

ECONOMIC EFFICIENCY

Uncertainty and the Choice of Pollution Control Instruments,
W77-06704 6G

Hydraulics and Economics of Well Field Layout.
W77-06863 8B

Water Quality Management and the Distribution of Emission Rights by Sealed Tender Markets,
W77-06976 5E

ECONOMIC GROWTH

An Input-Output Analysis of Environmental Preservation,
W77-06706 6G

ECONOMICS

A Sector Model for Regional and National Water Resources Planning,
W77-06731 6A

Economic Analysis of Alternative Groundwater Withdrawal Rates in Conjunction with Surface Water Irrigation,
W77-06740 4B

ECOSYSTEMS

Ecosystem Dynamics Birds and Marine Mammals. Part I: Preliminary Estimates of Pinniped - Finfish Relationships in the Bering Sea,
W77-06806 6G

The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
W77-06826 6G

The Mammalian and Fish Fauna of the Nature Preserve of Martely, (In Hungarian),
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ECOTYPES

Ecological Data on Continental Aquatic Vegetation, (In Spanish),
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EFFECTS

Effect of the Nile Flood on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-06907 2L

EFFICIENCIES

Optimization Model of a System of Two Open-Channel Hydroplants,
W77-06716 4A

EFFLUENTS

The Generation of Residual Flows in Norway: An Input-Output Approach,
W77-06698 5G

Activated Sludge Treatment of High Strength NSSC Mill Effluent,
W77-06945 5D

Water Quality Management and the Distribution of Emission Rights by Sealed Tender Markets,
W77-06976 5E

EGYPT

Effect of the Nile Flood on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-06907 2L

EIFEL MOUNTAINS (GERMANY)

Phosphate Prediction Model for Streams by Means of Discriminant Analysis,
W77-06906 5B

EKMAN-TYPE MODELS

Numerical Models of Wind-Driven Circulation in Lakes,
W77-06958 2H

EL PASO AREA (TEX)

Hydrologic Interpretation of Geophysical Data from the Southeastern Hueco Bolson, El Paso and Hudspeth Counties, Texas,
W77-06970 4B

ELASTIC MODULUS

Laboratory Study of the Flexural Strength and Elastic Modulus of Freshwater and Saline Ice,
W77-06661 2C

ELASTICITY (MECHANICAL)

Laboratory Study of the Flexural Strength and Elastic Modulus of Freshwater and Saline Ice,
W77-06661 2C

ELECTRIC MOTORS
It's All on the Nameplate: Everything You Always Wanted to Know About Jet Pumps,
W77-06854 8C

ELECTRIC POWER PRODUCTION
The Influence of Heated Effluent Waters on the Water Chemism of Konin Lakes, (In Polish),
W77-06753 5C

Long-Term Changes of the Pelagic Primary Production in Heated Lakes, (In Polish),
W77-06755 5C

The Influence of Heated Effluent Waters on the Thermal-Oxygen Relations and Water Transparency in the Konin Lakes Complex, (In Polish),
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ELECTRICAL EQUIPMENT
Pumping Systems: The Simpler, The Better,
W77-06856 8C

ELECTRICAL WELL LOGGING
Electric Logging,
W77-06865 8G

ELECTROLYSIS
Water Decontamination in Northern Regions by Impulse Electric Charges, (In Russian),
W77-06791 5D

The Electrolytic Respirometer-II. Use in Water Pollution Control Plant Laboratories,
W77-07081 5D

ELECTROLYTES
The Influence of Heated Effluent Waters on the Water Chemism of Konin Lakes, (In Polish),
W77-06753 5C

ELECTRON TREATMENT
Treatment of Sewage by Electrons and Gammas,
W77-07012 5D

ELECTRONIC EQUIPMENT
Bits and Pieces,
W77-06866 8G

EMBRYOGENESIS
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

EMBRYONIC GROWTH STAGE
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

ENERGY
Evaporation and Advection II: Evaporation Downwind of a Boundary Separating Regions Having Different Surface Resistances and Available Energies,
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Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
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Energy Conservation and Heat Recovery in Waste Water Treatment Plants,
W77-07024 5D

ENERGY BUDGET
Comprehensive Monitoring of Meteorology, Hydraulics, and Thermal Regime of the San Diego Aqueduct, California,
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Quantitative Analysis of Enteroviruses in Water with Various Degrees of Pollution, (In Russian),
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ENVIRONMENTAL ASSESSMENT
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 1: Marine Mammals, Marine Birds.
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The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
W77-06826 6G

Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
W77-06828 6G

Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
W77-06829 6G

Razor Clam (Siliqua Patula, Dixon) Distribution and Population Assessment Study,
W77-06830 6G

Resources of Non-Salmonid Pelagic Fish of the Eastern Bering Sea and the Gulf of Alaska,
W77-06832 6G

Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

Plankton of the Gulf of Alaska - Ichthyoplankton,
W77-06834 6G

Initial Zooplankton Investigations in Lower Cook Inlet,
W77-06835 6G

Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chukchi Sea,
W77-06839 6G

Beaufort Sea Estuarine Fishery Study,
W77-06840 6G

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W77-06842 6G

Reconnaissance Characterization of Littoral Biota, Beaufort and Chukchi Seas,
W77-06843 6G

Ichthyoplankton of the Eastern Bering Sea,
W77-06845 6G

Assessment of Pelagic and Nearshore Fish in Three Bays on Southeast Kodiak Island,
W77-06846 6G

Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
W77-06847 6G

Technical Trawl Survey of the Benthic Epifauna of the Chukchi Sea and Norton Sound.
W77-06848 6G

The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

Program Development Plan. Environmental Assessment of the Alaskan Continental Shelf,
W77-06878 6G

ENVIRONMENTAL CONTROL
Two-Goal Regional Environmental Policy: The Case of the Santa Ana River Basin,
W77-06707 5G

ENVIRONMENTAL DEVELOPMENT
Assessment of Pelagic and Nearshore Fish in Three Bays on Southeast Kodiak Island,
W77-06846 6G

ENVIRONMENTAL EFFECTS
The Growth Shapers: The Land Use Impacts of Infrastructure Investments.
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Influence of Gradient on the Distribution of Fishes in Conowingo Creek, Maryland and Pennsylvania,
W77-06635 2I

The Fauna of the Polluted River Tees Estuary,
W77-06638 5C

Optimal Oil Tanker Size with Regard to Environmental Impact of Oil Spills,
W77-06702 5G

Regulating Activities with Catastrophic Environmental Effects,
W77-06703 6G

Fish Diseases and Parasites in Relation to the Environment,
W77-06744 5C

The Measurement of Temperature Tolerance: Verification of an Index,
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Environmental Factors Affecting Survival and Growth of Vibrio Parahaemolyticus. A Review,
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Growth and Movement of Fish in the Vicinity of a Thermal Discharge,
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Temperature Relations of Puget Sound Thaids in Reference to Their Intertidal Distribution,
W77-06767 5C

Seasonal changes in the Respiration of Pumpkinseed, Lepomis Gibbosus, Correlated with Temperature, Day Length, and Stage of Reproductive Development,
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Effect of Two Rearing Conditions on Growth and Body Composition in Carp (Cyprinus Carpio L), (Influence de Deux Modes d'Elevage sur la Croissance et la Composition Corporelle de la Carpe Commune),
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The Algal Flora in the Thermal Baths of Montegrotto Terme (Padua). Its Distribution Over One-Year Period,
W77-06770 5C

Heat Resistance of Gametes of Marine Invertebrates in Relation to Temperature Conditions Under Which the Species Exist,
W77-06771 5C

Effect of Salinity on Spore Germination of Terrestrial and Marine Fungi,
W77-06772 5C

Dispersal and Dispersion of Pond Snails in an Experimental Environment Varying to Three Factors, Singly and in Combination,
W77-06773 5C

Health Effects of Multipurpose Use of Water,
W77-06775 5C

Long-Term Lead Accumulation in Abalone (Haliotis Spp.) Fed on Lead-Treated Brown Algae (Egregia Laevigata),
W77-06776 5C

Effects of Various Ecological Factors on Radiostrontium Uptake in Two Euryhaline Teleosts: Mugil Auratus Risso and Pleuronectes Platessal, (Influence de Divers Facteurs Ecologiques Sur L'Accumulation du Radiostrontium Chez Deux Teleosteens Euryhalins: Mugil Auratus Risso et Pleuronectes Platessa L.),
W77-06777 5C

Reproductive Cycle of Trout and Tench: Effect of Experimental Variations of the Temperature, (Etude Sur le Cycle Reproducteur do la Truite Arc-En-Ciel et de la Tanche: Effet de Variations Experimentales de la Temperature),
W77-06779 5C

Median Tolerance Limits of Some Chemicals to the Fresh Water Fish Cyprinus-Carpio,
W77-06780 5C

Heavy Metal Concentrations in Water, Sediments, and Fish from Mediterranean Coastal Area, Israel,
W77-06782 5C

Correlation Coefficients and Concentration Factors of Copper and Lead in Seawater and Benthic Algae,
W77-06783 5C

A Preliminary Survey of Mercury in Fish from Bombay and Thana Environment,
W77-06785 5C

Changes in the Structure of Phytoplankton During the First Years of Existence of the Derdap Storage Reservoir, (In Serbo-Croatian),
W77-06786 2H

Laboratory Studies on the Effect of Metals on Oxygen Uptake by Sewage Sludge in Brackish Water,
W77-06788 5C

Respiratory Response of Cunners to Silver,
W77-06789 5C

Heavy Metals in Macroinvertebrates and Fish from the Lower Medway Estuary, Kent,
W77-06790 5C

Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 1: Marine Mammals, Marine Birds.
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Baseline Characterization of Marine Mammals in the Bering Sea,
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Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska,
W77-06795 6G

Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
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Ecosystem Dynamics Birds and Marine Mammals. Part III: A Dynamic Numerical Marine Ecosystem Model for Evaluation of Marine Resources in Eastern Bering Sea,
W77-06808 6G

Reproductive Ecology of Pribilof Island Seabirds,
W77-06809 6G

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W77-06810 6G

Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

Avifaunal Utilization of the Offshore Island Area Near Prudhoe Bay, Alaska,
W77-06812 6G

Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, When Over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska During the Northern Summer,
W77-06814 6G

Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

Preliminary Catalog of Seabird Colonies and Photographic Mapping of Seabird Colonies,
W77-06816 6G

Review and Analysis of Literature and Unpublished Data on Marine Birds,
W77-06817 6G

Migration of Birds in Alaska Coastal and Marine Habitats Subject to Influence by OCS Development,
W77-06818 6G

Feeding Ecology and Trophic Relationships of Alaskan Marine Bird, and Population Dynamics of Marine Birds,
W77-06819 6G

Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

Studies of Populations, Community Structure and Colony of Marine Birds at King Island, Bering Strait Region, Alaska,
W77-06821 6G

Avian Community Ecology of the Akulik - Inglutalik River Delta, Norton Bay, Alaska,
W77-06822 6G

A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
W77-06824 6G

Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 2: Fish, Plankton, Benthos, Littoral.
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The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
W77-06826 6G

Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
W77-06828 6G

Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
W77-06829 6G

Razor Clam (Siliqua Patula, Dixon) Distribution and Population Assessment Study,
W77-06830 6G

Resources of Non-Salmonid Pelagic Fish of the Eastern Bering Sea and the Gulf of Alaska,
W77-06832 6G

Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

Plankton of the Gulf of Alaska - Ichthyoplankton,
W77-06834 6G

Initial Zooplankton Investigations in Lower Cook Inlet,
W77-06835 6G

Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

The Mammalian and Fish Fauna of the Nature Preserve of Martely, (In Hungarian),
W77-06838 6G

Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chukchi Sea,
W77-06839 6G

Beaufort Sea Estuarine Fishery Study,
W77-06840 6G

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W77-06842 6G

Ichthyoplankton of the Eastern Bering Sea,
W77-06845 6G

Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
W77-06847 6G

Technical Trawl Survey of the Benthic Epifauna of the Chukchi Sea and Norton Sound.
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The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
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The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
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Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
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The Fauna of the Polluted River Tees Estuary,
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Rotary-Flow Technique for Testing Fitness of Fish,
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FILTERS
Backwashing of Granular Filters,
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Anaerobic Filter Treats Waste Activated Sludge,
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Backwashing of Granular Filters,
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Comparison of Iterative Methods of Solving Two-Dimensional Groundwater Flow Equations,
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Influence of Gradient on the Distribution of Fishes in Conowingo Creek, Maryland and Pennsylvania,
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Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
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A Biological Monitoring System Employing Rheotaxis of Fish,
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Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

FISH DISEASE
A Preliminary Evaluation of the Effects of Gas Bubble Disease on Fish Populations in the Kootenai River Below Libby Dam,
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Effect of Malachite Green and Formalin on the Survival of Largemouth Bass Eggs and Fry,
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Rotary-Flow Technique for Testing Fitness of Fish,
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The Growth of Young Salmonids (Onchorhynchus Keta): Controlled Ecosystem Pollution Experiment,
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Ammonia Concentration in Relation to Ammonia Toxicity During a Rainbow Trout Rearing Experiment in a Closed Freshwater-Seawater System,
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First Reported Incidence of Gas-Bubble Disease in the Heated Effluent of a Steam Generating Station,
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FISH MIGRATION
Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
W77-06828 6G

Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
W77-06924 5C

FISH PATHOLOGY
First Reported Incidence of Gas-Bubble Disease in the Heated Effluent of a Steam Generating Station,
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The Accumulation of Organic Mercury from Sea Water by the Plaice, Pleuronectes platessa L.,
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Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
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Fish Diseases and Parasites in Relation to the Environment,
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Changes in the Blood Chemistry of Coho Salmon Exposed to Malachite Green,
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Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
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FISH POPULATIONS
Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
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Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
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FISHES
Assessment of Pelagic and Nearshore Fish in Three Bays on Southeast Kodiak Island,
W77-06846 6G

Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
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FLAME IONIZATION DETECTOR
Determination of Free Formic and Acetic Acids by Gas Chromatography Using the Flame Ionization Detector,
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Identity, Origin and Development of Off-Flavors in Great Lakes Anadromous Fish,
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FLOOD CONTROL

Integration of Aquifers in Flood Control Projects,
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Causes of the Drying up of Forests in the Flood Plain of the Lower Reaches of the Ural River, (In Russian),
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FLOOD FORECASTING

Forecasting Floods in Hawaii (Excluding Hawaii Island),
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Urbanization and Flooding in Shades Creek Basin, Jefferson County, Alabama,
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Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
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FLOOD PLAIN INSURANCE

Flood Management Study.
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FLOOD PLAIN MANAGEMENT

Flood Management Study.
W77-06952 6F

FLOOD PLAIN ZONING

Flood Management Study.
W77-06952 6F

FLOOD PLAINS

Causes of the Drying up of Forests in the Flood Plain of the Lower Reaches of the Ural River, (In Russian),
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Hydraulics of Sheet Flow in Wetlands,
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Flood Management Study.
W77-06952 6F

Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
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Flood Hazard Information: Cave Creek, Arizona Canal to 19th Avenue, Phoenix, Arizona.
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FLOOD PROFILES

Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
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Flood Hazard Information: Cave Creek, Arizona Canal to 19th Avenue, Phoenix, Arizona.
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Integration of Aquifers in Flood Control Projects,
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The Mammalian and Fish Fauna of the Nature Preserve of Martely, (In Hungarian),
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Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
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FLOODING

Forecasting Floods in Hawaii (Excluding Hawaii Island),
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Effect of the Nile Flood on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
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Evaluation of the Environmental Impact to Appalachian Pennsylvania Waters of the 1972 Flood and Subsequent Stream Channelization with Future Policy Recommendations.
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Flood Management Study.
W77-06952 6F

Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
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Flood Hazard Information: Cave Creek, Arizona Canal to 19th Avenue, Phoenix, Arizona.
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London's Stormwater Problem,
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FLOODWAYS

Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
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FLORIDA

Littoral Drift Estimates Along the Coastline of Florida,
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Incipient Sediment Motion in Entrances with Shell Beds,
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Coastal Facility Guidelines: A Methodology for Development with Environmental Case Studies on Marinas and Power Plants,
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Analog-Model Simulations for Secondary Canal Controls and Forward Pumping Water-Management Schemes in Southeast Florida,
W77-06968 4B

Expansion Comes Quickly to AWT Plant,
W77-07009 5D

FLOW

Optimal Planning of Flows in Multi-Reservoir Hydro-Power Systems,
W77-06730 4A

FLOW CONTROL

Analog-Model Simulations for Secondary Canal Controls and Forward Pumping Water-Management Schemes in Southeast Florida,
W77-06968 4B

Evaluation of In-Line and Side-Line Flow Equalization Systems,
W77-07041 5D

FLOW EQUALIZATION

Evaluation of In-Line and Side-Line Flow Equalization Systems,
W77-07041 5D

FLOW RATES

Evaluation of In-Line and Side-Line Flow Equalization Systems,
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Study on Sewage Flow Dynamics Through Dorr Type Clarifier on Stream, (Synopsis),
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Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
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FLUORIDES

Toxicity of Fluoride to Brown Trout Fry (Salmo trutta),
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FLUOSOLIDS

Fluosolids Incinerator Commissioned at Esher,
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FLUSHING

Investigation of Flushing Time in the Lafayette River, Norfolk, Virginia,
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FOAM

Foam and Film of Fresh Waters as an Ecological Niche of Aquatic Hyphomycetes, (In Russian),
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FOG

Compressed Air for Supercooled Fog Dispersal,
W77-06674 3B

FOG DISPERSAL

Compressed Air for Supercooled Fog Dispersal,
W77-06674 3B

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A Study on the Role of Herbivorous Zooplankton Community as Primary Consumers of Phytoplankton in Dutch Lakes,
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Ecosystem Dynamics Birds and Marine Mammals. Part II: Food Web Structure and Trophic Relations of Bering Sea Avifauna (Preliminary Report),
W77-06807 6G

FOOD WEBS
Ecosystem Dynamics Birds and Marine Mammals. Part II: Food Web Structure and Trophic Relations of Bering Sea Avifauna (Preliminary Report),
W77-06807 6G

FORECASTING
Sediment Yield Prediction Based on Watershed Hydrology,
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Forecasting Floods in Hawaii (Excluding Hawaii Island),
W77-06873 4A

A Test Particle Dispersion Study in Massachusetts Bay.
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Phosphate Prediction Model for Streams by Means of Discriminant Analysis,
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Hydraulics of Sheet Flow in Wetlands,
W77-06929 8B

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Antierosion Role of Forest Plantings in the Steppe Zone of the Moldavian SSR, (In Russian),
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A Note on Temperature and Humidity Profile Measurement Over Forests Using Diodes,
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Causes of the Drying up of Forests in the Flood Plain of the Lower Reaches of the Ural River, (In Russian),
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A Model for the Water Regime of a Deciduous Forest with Special Consideration of the Functional Interrelationships Among Meteorological Factors, Soil Water Content and Evapotranspiration, (In German),
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ORMALIN
Effect of Malachite Green and Formalin on the Survival of Largemouth Bass Eggs and Fry,
W77-06612 5C

ORMIC ACID
Determination of Free Formic and Acetic Acids by Gas Chromatography Using the Flame Ionization Detector,
W77-06961 5A

ORMULAS
Simple Formulae for the Estimation of Wet Bulb Temperature and Precipitable Water,
W77-06646 2B

FOSSIL FUELS
Guidelines for the Preparation of Environmental Reports for Fossil-Fueled Steam Electric Generating Stations,
W77-06918 6G

FREEZING SOILS
Suprapermafrost Water,
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FREQUENCY ANALYSIS
Floods in Louisiana, Magnitude and Frequency, Third Edition,
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Foam and Film of Fresh Waters as an Ecological Niche of Aquatic Hyphomycetes, (In Russian),
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FRESHWATER FISH
Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
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Experiment with a Multipoint System for Judging Carp Fattening Ponds, (In Russian),
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FRY
Effect of Malachite Green and Formalin on the Survival of Largemouth Bass Eggs and Fry,
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Toxicity of Fluoride to Brown Trout Fry (Salmo trutta),
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FUELS
Fuel Gas and Electricity from Municipal Sewage,
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Effect of Salinity on Spore Germination of Terrestrial and Marine Fungi,
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Adenosine Triphosphate (ATP) Levels in Microbial Cultures and a Review of the ATP Biomass Estimation Technique,
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FUNGICIDES
Effect of Malachite Green and Formalin on the Survival of Largemouth Bass Eggs and Fry,
W77-06612 5C

Changes in the Blood Chemistry of Coho Salmon Exposed to Malachite Green,
W77-06746 5C

GAMMA RAY TREATMENT
Treatment of Sewage by Electrons and Gammas,
W77-07012 5D

GAS BUBBLE DISEASE
A Preliminary Evaluation of the Effects of Gas Bubble Disease on Fish Populations in the Kootenai River Below Libby Dam,
W77-06919 5C

Gas Bubble Disease of Salmonids: A Critical Review,
W77-06920 5

Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
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Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
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Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
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GAS BUBBLE DISEASES
First Reported Incidence of Gas-Bubble Disease in the Heated Effluent of a Steam Generating Station,
W77-06922 5C

GAS CHROMATOGRAPHY
Determination of Free Formic and Acetic Acids by Gas Chromatography Using the Flame Ionization Detector,
W77-06961 5A

GASES
Fuel Gas and Electricity from Municipal Sewage,
W77-07065 5D

GASTROPODS
The Fauna of the Polluted River Tees Estuary,
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A Dynamic Multisector Programming Approach to Regional Water Resource Management,
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W77-06659 2B

GEOLOGIC LINEATIONS
Use of Remote Sensing to Quantify Construction Material and to Define Geologic Lineations; Dickey-Lincoln School Lakes Project, Maine,
W77-06888 8D

GEORGIA
Loss of 2,4-D in Runoff from Plots Receiving Simulated Rainfall and from a Small Agricultural Watershed,
W77-06908 5B

Sand Stabilization on the Dunes, Beach and Shoreface of a Historically Eroding Barrier Island. Wassaw Island Erosion Study, Part III,
W77-06940 8G

GEOTHERMAL BRINES
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

GEOTHERMAL STUDIES
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

GEOTHERMAL WATERS
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

GERMANIUM DIODES
A Note on Temperature and Humidity Profile Measurement Over Forests Using Diodes,
W77-06653 7B

LIBRARY U. OF I. URBANA-CHAMPAIGN

GERMANY
Phosphate Prediction Model for Streams by Means of Discriminant Analysis,
W77-06906 5B

GHANA
Circulation and Hydrographic Structure Over the Ghana Continental Shelf During the 1974 Upwelling,
W77-06893 2L

GLADSTONE (MO)
Contract Services Stretch Sewer Maintenance Budget,
W77-06994 8G

GLUSZYCA (POLAND)
Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

GRADATION
Influence of Gradient on the Distribution of Fishes in Conowingo Creek, Maryland and Pennsylvania,
W77-06635 2I

GRADIENTS (STREAMS)
Influence of Gradient on the Distribution of Fishes in Conowingo Creek, Maryland and Pennsylvania,
W77-06635 2I

GRANDE RONDE DRAINAGE BASIN (OR)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

GRAZING
Experimental Observations on the Effects of Copper on Copepods and Other Zooplankton: Controlled Ecosystem Pollution Experiment,
W77-06619 5A

GREAT LAKES
The Observed Winter Circulation of Lake Ontario,
W77-06655 2H

GROUNDWATER
Monitoring Groundwater Quality: Illustrative Examples.
W77-06673 5A

Depth and Seasonal Fluctuations in the Condition of the Groundwater of the Area Around the City of Ghent (Belgium), (In Dutch),
W77-06681 2G

Irrigation of the Nebit-Dag Plantings by Mineralized Ground Water, (In Russian),
W77-06691 3C

Hybrid Computer Analysis of a Combined Surface Water--Groundwater System,
W77-06729 4B

Further Development and Testing of a Stream-Aquifer System Model,
W77-06762 2F

Preliminary Bibliography on Groundwater in Developing Countries,
W77-06852 2F

GROUNDWATER MINING
Economic Analysis of Alternative Groundwater Withdrawal Rates in Conjunction with Surface Water Irrigation,
W77-06740 4B

GROUNDWATER MOVEMENT
Pollutant Movement to Shallow Ground Water Tables from Swine Waste Lagoons,
W77-06742 5B

Comparison of Iterative Methods of Solving Two-Dimensional Groundwater Flow Equations,
W77-06965 2F

Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W77-06975 5B

Application of Digital Modelling to the Prediction of Radioisotope Migration in Groundwater,
W77-06981 5B

GROUNDWATER RECHARGE
Performance of a Recharge and Recovery System in an Aquifer with Uniform Flow,
W77-06905 2F

GROUNDWATER RESOURCES
On Large-Scale Simulation of Groundwater Flow Systems,
W77-06713 4B

Reconnaissance of the Water Resources of the Clinton Quadrangle, West-Central Oklahoma,
W77-06959 7C

Hydrologic Interpretation of Geophysical Data from the Southeastern Hueco Bolson, El Paso and Hudspeth Counties, Texas,
W77-06970 4B

GROUTING
Testing and Grouting Leaking Joints,
W77-06986 8G

GROWTH RATES
Occurrence and Growth of Dreissena Polymorpha Pall. in Lakes Included in a Cooling System, (In Polish),
W77-06754 5C

UNOX System for Waste Water Treatment,
W77-07014 5D

Some Factors Affecting Floc Formation by Zoogloea Ramigera, Strain I-16-M,
W77-07042 5D

GULF OF ALASKA
Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska,
W77-06795 6G

Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska,
W77-06804 6G

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W77-06810 6G

Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, When Over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska During the Northern Summer,
W77-06814 6G

Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

Feeding Ecology and Trophic Relationships of Alaskan Marine Bird, and Population Dynamics of Marine Birds,
W77-06819 6G

Resources of Non-Salmonid Pelagic Fish of the Eastern Bering Sea and the Gulf of Alaska,
W77-06832 6G

Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

Plankton of the Gulf of Alaska - Ichthyoplankton,
W77-06834 6G

Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W77-06842 6G

HABITATS
Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
W77-06824 6G

Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

HAIL
Weather Modification in the Soviet Union--1976,
W77-06644 3B

On the Status of Hail Suppression,
W77-06645 3B

HAIL SUPPRESSION
Weather Modification in the Soviet Union--1976,
W77-06644 3B

On the Status of Hail Suppression,
W77-06645 3B

HARDNESS (WATER)
Toxicity of Fluoride to Brown Trout Fry (Salmo trutta),
W77-06628 5C

HARZ MOUNTAINS (FEDERAL REPUBLIC OF GERMANY)
Optimal Operations of Reservoirs in the Harz Mountains,
W77-06715 4A

HAWAII
Forecasting Floods in Hawaii (Excluding Hawaii Island),
W77-06873 4A

HEAT
Energy Conservation and Heat Recovery in Waste Water Treatment Plants,
W77-07024 5D

HEAT PUMPS
Energy Conservation and Heat Recovery in Waste Water Treatment Plants,
W77-07024 5D

HEAT SINKS
An Annular Flow Ice-Water Model Heat Sink,
W77-06889 2C

HEAT TREATMENT
Anaerobic Filter Treats Waste Activated Sludge,
W77-07078 5D

HEATED WATER
Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

HEAVY METALS
Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

The Growth of Young Salmonids (Onchorhynchus Keta): Controlled Ecosystem Pollution Experiment,
W77-06618 5A

Experimental Observations on the Effects of Copper on Copepods and Other Zooplankton: Controlled Ecosystem Pollution Experiment,
W77-06619 5A

Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06620 5A

Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

Response of Natural Marine Bacterial Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06622 5A

Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

Effects of Copper on the Dominance and the Diversity of Algae: Controlled Ecosystem Pollution Experiment,
W77-06625 5A

Loch Ewe Bag Experiment, 1974,
W77-06627 5A

The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

The Toxic Effects of Selected Heavy Metals on Unadapted Populations of Vorticella Convallaria Var Similis,
W77-06636 5C

Heavy Metals in Macroinvertebrates and Fish from the Lower Medway Estuary, Kent,
W77-06790 5C

Acid Solubilization of Sewage Sludge and Ash Constituents for Possible Recovery,
W77-07017 5E

Accumulation of Heavy Metals in Soils from Extended Waste Water Irrigation,
W77-07049 5B

Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

HELIX ASPERSA
The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

HEMATOLOGY
Changes in the Blood Chemistry of Coho Salmon Exposed to Malachite Green,
W77-06746 5C

HERBICIDES
Loss of 2,4-D in Runoff from Plots Receiving Simulated Rainfall and from a Small Agricultural Watershed,
W77-06908 5B

HEXAVALENT CHROMIUM
Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
W77-06639 5C

HIGHWAYS
The Growth Shapers: The Land Use Impacts of Infrastructure Investments.
W77-06601 6D

HISTOLOGY
Changes in the Blood Chemistry of Coho Salmon Exposed to Malachite Green,
W77-06746 5C

HISTORIC FLOODS
Floods in Louisiana, Magnitude and Frequency, Third Edition,
W77-06979 2E

HISTORY
Delaware River: Evidence for Its Former Extension to Wilmington Submarine Canyon,
W77-06966 2E

HUMIDITY
A Note on Temperature and Humidity Profile Measurement Over Forests Using Diodes,
W77-06653 7B

HUNGARY (MARTELY)
The Mammalian and Fish Fauna of the Nature Preserve of Martely, (In Hungarian),
W77-06838 6G

HURRICANE AGNES
Evaluation of the Environmental Impact to Appalachian Pennsylvania Waters of the 1972 Flood and Subsequent Stream Channelization with Future Policy Recommendations.
W77-06676 4A

HURRICANE AGNES (1972)
Flood Management Study.
W77-06952 6F

HYBRID COMPUTERS
Hybrid Computer Analysis of a Combined Surface Water--Groundwater System,
W77-06729 4B

HYDRAULIC CONDUCTIVITY
Suprapermafrost Water,
W77-06630 2C

HYDRAULIC HEAD
A Device for Measuring Seepage Flux in Lakes and Estuaries,
W77-06903 7B

HYDRAULIC SYSTEMS
Pumping Systems: The Simpler, The Better,
W77-06856 8C

HYDRO-POWER SYSTEMS
Optimal Planning of Flows in Multi-Reservoir Hydro-Power Systems,
W77-06730 4A

HYDROCRYLE
The Influence of Acrolein and Hydrocryle on the Development Dynamics of Aquatic Bacteria,
W77-06690 5C

HYDROGEN PEROXIDE
Control Sewer Corrosion with H2O2,
W77-06993 8G

HYDROGEN SULFIDE
Control Sewer Corrosion with H2O2,
W77-06993 8G

Biogenic Elements and Sulfate Reduction in Water Oil Carbonate Layer, (In Russian),
W77-07040 5B

HYDROGEOLOGY
Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W77-06975 5B

HYDROLOGIC BUDGET
Water in the Palouse River Basin, Washington,
W77-06978 4B

HYDROLOGIC CYCLE
Comprehensive Monitoring of Meteorology, Hydraulics, and Thermal Regime of the San Diego Aqueduct, California,
W77-06973 2D

HYDROLOGY
Sediment Yield Prediction Based on Watershed Hydrology,
W77-06656 4D

Mathematical Models in Hydrology.
W77-06708 2A

Optimization of a Three-Reservoir System by Dynamic Programming,
W77-06720 4A

Hydrological Evaluation of Changes in Runoff Characteristics,
W77-06732 4A

HYDROMETRIC NETWORKS
Use of a Parametric Model as a Tool for Hydrometric Network Planning,
W77-06710 2A

HYDROPLANTS
Optimization Model of a System of Two Open-Channel Hydroplants,
W77-06716 4A

HYPHOMYCETES
Foam and Film of Fresh Waters as an Ecological Niche of Aquatic Hyphomycetes, (In Russian),
W77-06787 2I

ICE
Laboratory Study of the Flexural Strength and Elastic Modulus of Freshwater and Saline Ice,
W77-06661 2C

LIBRARY U. OF I. URBANA-CHAMPAIGN

ICE

An Annular Flow Ice-Water Model Heat Sink,
W77-06889 2C

Devon Island Ice Cap: Core Stratigraphy and Paleoclimate,
W77-06890 2C

ICE CAPS
Devon Island Ice Cap: Core Stratigraphy and Paleoclimate,
W77-06890 2C

ICE-WATER INTERFACES
An Annular Flow Ice-Water Model Heat Sink,
W77-06889 2C

ILLINOIS
Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

Underflow from Sludge-Irrigated Cropland,
W77-07056 5B

IMPULSE ELECTRIC CHARGES
Water Decontamination in Northern Regions by Impulse Electric Charges, (In Russian),
W77-06791 5D

INCINERATION
Burning Waste Chlorinated Hydrocarbons in a Cement Kiln,
W77-06946 5E

Fluosolids Incinerator Commissioned at Esher,
W77-07018 5E

INCINERATORS
Sludge Incineration at Esher.
W77-07020 5E

INCUBATION
Egg Incubation and Larval Rearing of Navaga (Eleginus Navaga Pall.), Polar Cod (Boreogadus Saida Lepechin) and Arctic Flounder (Liopsetta Glacialis Pall.) in the Laboratory,
W77-06792 8I

INDIA
Area-Depth Relations for Frequency Values of Rainfall,
W77-06647 2B

A Study to Forecast the Waves at Digha,
W77-06648 2L

INDIAN RESERVATIONS
Preliminary Assessment of the Water Resources of the Tulalip Indian Reservation, Washington,
W77-06971 4A

INDIANA
A Study of the Utilization of EREP Data from the Wabash River Basin,
W77-06670 7B

Growth and Movement of Fish in the Vicinity of a Thermal Discharge,
W77-06766 5C

Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

INDICATORS
Distribution and Indicatory Value of the Submerged Macrophytes in the Flowing Waters of the Friedberger Au, (In German),
W77-06802 5C

INDUSTRIAL WASTES
Dispersion of Liquid Waste from a Moving Barge,
W77-06913 5B

Activated Sludge Treatment of High Strength NSSC Mill Effluent,
W77-06945 5D

Water Quality Management and the Distribution of Emission Rights by Sealed Tender Markets,
W77-06976 5E

Municipal Waste Water Treatment as an Industrial Operation,
W77-07025 5D

Plastic Spheres for Waste Water Treatment.
W77-07028 5D

Hygienic Effectiveness of Measures for Decontaminating Effluents at Petrochemical Plants, (In Russian),
W77-07069 5D

Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

INERTIAL OSCILLATIONS
An Analysis of Inertial Oscillations Observed Near Oregon Coast,
W77-06892 2L

INFILTRATION
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

INFILTRATION RATES
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

INFLOW
Hydrochemistry of the Lake Magadi Basin, Kenya,
W77-06967 2K

INFORMATION EXCHANGE
Design Study of Environmental and Human Cultural Information System Needs in Urban Water Resource Development,
W77-06634 6B

Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

INFRASTRUCTURE
The Growth Shapers: The Land Use Impacts of Infrastructure Investments.
W77-06601 6D

INJECTION
Subsurface Injection-How Much Does It Cost,
W77-07011 5E

INJECTION WELLS
Waste Injection into Stratified Ground Water Bodies,
W77-06855 5B

INLETS (WATERWAYS)
The Influence of Wind on the Surface Layer of a Stratified Inlet: Part I. Observations,
W77-06894 2L

The Influence of Wind on the Surface Layer of a Stratified Inlet: Part II. Analysis,
W77-06895 2L

Characteristics of Water Flow at the North End of the Wassaw Barrier Island Complex. Wassaw Island Erosion Study, Part II,
W77-06939 2L

INORGANIC COMPOUNDS
Water Quality Simulation of Tahoe-Truckee System, Nevada-California-Volume I,
W77-07075 5B

INPUT-OUTPUT ANALYSIS
The Generation of Residual Flows in Norway An Input-Output Approach,
W77-06698 5C

An Input-Output Analysis of Environmental Preservation,
W77-06706 6C

Economic Analysis of Alternative Groundwater Withdrawal Rates in Conjunction with Surface Water Irrigation,
W77-06740 4B

INSECTICIDES
Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

INSECTS
The Mining Fauna in Four Macrophyte Species in Mikolajskie Lake,
W77-06688 5C

INSPECTION
Cincinnati's Preventive Maintenance Sewer Program.
W77-06989 5D

Preventive Sewer Maintenance Helps Preserve Historic Annapolis.
W77-06990 8A

INSTRUMENTATION
Coastal Meteorological Networks to Determine Effects of Nuclear Plant Cooling Systems,
W77-06643 7C

A Study of the Utilization of EREP Data from the Wabash River Basin,
W77-06670 7B

A Device for Measuring Seepage Flux in Lakes and Estuaries,
W77-06903 7B

Optic Device for Observations of Small Organisms Under Water, (In Russian),
W77-06926 7B

A Universal Calibration Equation for Price Meters and Similar Instruments,
W77-06943 7B

Hydrologic Interpretation of Geophysical Data from the Southeastern Hueco Bolson, El Paso and Hudspeth Counties, Texas,
W77-06970 4B

New Programs Improve Sensitive Areas of Water and Sewer Systems,
W77-06995 8G

INTERCEPTOR SEWERS
Sewerage for a Rural Resort Area,
W77-06987 5D

INTERMEDIATE REGIONAL FLOOD
Flood Hazard Information: Cave Creek, Arizona Canal to 19th Avenue, Phoenix, Arizona.
W77-06954 4A

INTERMUNICIPAL TAX SHARING
Flood Management Study.
W77-06952 6F

INTERNAL TIDES
Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

INTERNAL WAVES
An Analysis of Inertial Oscillations Observed Near Oregon Coast,
W77-06892 2L

INVERTEBRATES
The Effects of Methoxychlor on Riffle Invertebrate Populations and Communities,
W77-06614 5C

Ecological Relations Between Invertebrates and Submerged Macrophytes in the Lake Littoral,
W77-06694 5C

Heat Resistance of Gametes of Marine Invertebrates in Relation to Temperature Conditions Under Which the Species Exist,
W77-06771 5C

Technical Trawl Survey of the Benthic Epifauna of the Chukchi Sea and Norton Sound.
W77-06848 6G

The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

INVESTIGATIONS
Investigation of Precipitation Within Forest Ecosystems, (In Hungarian),
W77-06797 2B

INVESTMENT
A Sector Model for Regional and National Water Resources Planning,
W77-06731 6A

ION EXCHANGE
Quantitative Analysis of Enteroviruses in Water with Various Degrees of Pollution, (In Russian),
W77-07070 5A

IONIZATION
Treatment of Sewage by Electrons and Gammas,
W77-07012 5D

IRON BACTERIA
New Design Gives Denver District Iron-Free Well,
W77-06868 8A

IRRADIATION
Electron-Beam Irradiation of Waste Products--e.g., For Sterilization of Sewage Sludge and Waste Industrial Products.
W77-06997 5D

Treatment of Sewage by Electrons and Gammas,
W77-07012 5D

IRREVERSIBLE EFFECTS
Regulating Activities with Catastrophic Environmental Effects,
W77-06703 6G

IRRIGATION
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

Economic Analysis of Alternative Groundwater Withdrawal Rates in Conjunction with Surface Water Irrigation,
W77-06740 4B

Water in the Palouse River Basin, Washington,
W77-06978 4B

Accumulation of Heavy Metals in Soils from Extended Waste Water Irrigation,
W77-07049 5B

Underflow from Sludge-Irrigated Cropland,
W77-07056 5B

IRRIGATION EFFECTS
The Effect of Different Methods on Growth, Development and Yield of Cotton, (In German),
W77-06962 3F

IRRIGATION PRACTICES
Irrigation of the Nebit-Dag Plantings by Mineralized Ground Water, (In Russian),
W77-06691 3C

IRRIGATION SYSTEMS
The Effect of Different Methods on Growth, Development and Yield of Cotton, (In German),
W77-06962 3F

ISOBORNYL THIOCYANOACETATE
Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

ITALY (PADUA)
The Algal Flora in the Thermal Baths of Montegrotto Terme (Padua). Its Distribution Over One-Year Period,
W77-06770 5C

JAMAICA BAY (NY)
Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

JAPAN (MIYAKE-JIMA)
Notes on the Nesting Success and Fecundity of the Anemonefish Amphiprion Clarkii at Miyake-Jima, Japan,
W77-06763 5C

JET PUMPS
It's All on the Nameplate: Everything You Always Wanted to Know About Jet Pumps,
W77-06854 8C

JETS
Method of Treating Waste Water with Jet Nozzles,
W77-07090 5D

JUVENILE FISH
The Growth of Young Salmonids (Onchorhynchus Keta): Controlled Ecosystem Pollution Experiment,
W77-06618 5A

KANSAS
Land Forming Systems to Improve Water Use Efficiency,
W77-06761 3F

Further Development and Testing of a Stream-Aquifer System Model,
W77-06762 2F

KAOLINITE
Bonding of Calcium and Potassium by Vermiculite and Kaolinite Clays as Affected by H-Clay Addition,
W77-06872 2G

KATHAROBIC WATERS
Distribution and Indicatory Value of the Submerged Macrophytes in the Flowing Waters of the Friedberger Au, (In German),
W77-06802 5C

KENTUCKY
Debris Basins for Control of Surface Mine Sedimentation,
W77-06672 5G

KENYA (RIFT VALLEY)
Hydrochemistry of the Lake Magadi Basin, Kenya,
W77-06967 2K

KEYSTONE RESERVOIR (OK)
A New Reservoir and Recreational Behavior,
W77-06956 6B

KINETICS
The Effect of High Purity Oxygen on the Activated Sludge Process,
W77-07043 5D

Phosphates in Soils Treated with Sewage Water: III. Kinetic Studies on the Reaction of Phosphates with Aluminum Compounds,
W77-07054 5B

LIBRARY U. OF I. URBANA-CHAMPAIGN

KODIAK ISLAND (ALAS)
Assessment of Pelagic and Nearshore Fish in Three Bays on Southeast Kodiak Island,
W77-06846 6G

Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
W77-06847 6G

The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

KOOTENAI RIVER (MONT)
A Preliminary Evaluation of the Effects of Gas Bubble Disease on Fish Populations in the Kootenai River Below Libby Dam,
W77-06919 5C

KOTZEBUE SOUND (ALAS)
Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

LABORATORY TESTS
Rotary-Flow Technique for Testing Fitness of Fish,
W77-06608 5C

A Biological Monitoring System Employing Rheotaxis of Fish,
W77-06609 5C

Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
W77-06639 5C

Laboratory Study of the Flexural Strength and Elastic Modulus of Freshwater and Saline Ice,
W77-06661 2C

Some Effects on Integral Photosynthesis of Artificial Circulation of Phytoplankton Through Light Gradients,
W77-06696 5C

Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

Reproductive Cycle of Trout and Tench: Effect of Experimental Variations of the Temperature, (Etude Sur le Cycle Reproducteur do la Truite Arc-En-Ciel et de la Tanche: Effet de Variations Experimentales de la Temperature),
W77-06779 5C

Laboratory Studies on the Effect of Metals on Oxygen Uptake by Sewage Sludge in Brackish Water,
W77-06788 5C

Egg Incubation and Larval Rearing of Navaga (Eleginus Navaga Pall.), Polar Cod (Boreogadus Saida Lepechin) and Arctic Flounder (Liopsetta Glacialis Pall.) in the Laboratory,
W77-06792 8I

LAKE BIKCZE (POLAND)
Dynamics of Phytoplankton Biomass in Two Lakes of Different Limnological Character,
W77-06685 5C

The Share of Algae with Different Dimensions in the Plankton of Two Lakes of Different Trophic Character in the Annual Cycle,
W77-06692 5C

LAKE CARL BLACKWELL (OKLA)
Measurements of Planktonic Biomass in a Reservoir,
W77-06679 5A

LAKE CIRCULATION
The Observed Winter Circulation of Lake Ontario,
W77-06655 2H

LAKE GEORGE (NEW YORK)
Nutrient Removal and Sludge Disposal Within Septic Systems-Phase III,
W77-06686 5D

LAKE GEORGE (NY)
Means for Protecting the Drinking Water Quality of Lake George, New York,
W77-06682 5G

A General Model of Microbial Growth and Decomposition in Aquatic Ecosystems,
W77-06684 5C

LAKE HURON
Application of Landsat to the Surveillance and Control of Eutrophication in Saginaw Bay,
W77-06665 5A

LAKE IN THE CLOUDS (MINN)
Iron-Rich Rhythmically Laminated Sediments in Lake of the Clouds, Northeastern Minnesota,
W77-06901 2J

LAKE MAGADI BASIN (KENYA)
Hydrochemistry of the Lake Magadi Basin, Kenya,
W77-06967 2K

LAKE MICHIGAN
Coastal Meteorological Networks to Determine Effects of Nuclear Plant Cooling Systems,
W77-06643 2B

Lake Currents and Temperatures Near the Western Shore of Lake Michigan,
W77-06687 2H

LAKE MONROE (IND)
Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

LAKE ONTARIO
The Observed Winter Circulation of Lake Ontario,
W77-06655 2H

Lake Ontario Atlas: Surface Waves,
W77-06884 2H

LAKE PIASECZNO (POLAND)
Dynamics of Phytoplankton Biomass in Two Lakes of Different Limnological Character,
W77-06685 5C

The Share of Algae with Different Dimensions in the Plankton of Two Lakes of Different Trophic Character in the Annual Cycle,
W77-06692 5C

LAKE RESTORATION
Lake Restoration by Bottom Water Siphoning (In German),
W77-06689 5G

LAKE SEDIMENTS
Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

LAKE ST. CLAIR
Lake St. Clair Hydrologic Transfer Factors.
W77-06879 2H

LAKE TJEUKEMEER (NETHERLANDS)
A Study on the Role of Herbivorous Zooplankton Community as Primary Consumers of Phytoplankton in Dutch Lakes,
W77-06695 5C

LAKE VECHTEN (NETHERLANDS)
A Study on the Role of Herbivorous Zooplankton Community as Primary Consumers of Phytoplankton in Dutch Lakes,
W77-06695 5C

LAKES
Mixing in Upper Layer of a Lake During Heating Cycle,
W77-06649 2H

Means for Protecting the Drinking Water Quality of Lake George, New York,
W77-06682 5G

The Share of Algae with Different Dimensions in the Plankton of Two Lakes of Different Trophic Character in the Annual Cycle,
W77-06692 5C

Ecological Relations Between Invertebrates and Submerged Macrophytes in the Lake Littoral,
W77-06694 5C

A Study on the Role of Herbivorous Zooplankton Community as Primary Consumers of Phytoplankton in Dutch Lakes,
W77-06695 5C

Optimal Complex Use of Controlled Water Resources of a Basin,
W77-06718 4A

Lake St. Clair Hydrologic Transfer Factors.
W77-06879 2H

Lake Ontario Atlas: Surface Waves,
W77-06884 2H

Iron-Rich Rhythmically Laminated Sediments in Lake of the Clouds, Northeastern Minnesota,
W77-06901 2J

Numerical Models of Wind-Driven Circulation in Lakes,
W77-06958 2H

Hydrochemistry of the Lake Magadi Basin, Kenya,
W77-06967 2K

Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

LAMINATED SEDIMENTS
Iron-Rich Rhythmically Laminated Sediments in Lake of the Clouds, Northeastern Minnesota,
W77-06901 2J

LAND DEVELOPMENT
The Growth Shapers: The Land Use Impacts of Infrastructure Investments.
W77-06601 6D

LAND FORMING
Land Forming Systems to Improve Water Use Efficiency,
W77-06761 3F

LAND MANAGEMENT
The Growth Shapers: The Land Use Impacts of Infrastructure Investments.
W77-06601 6D

Diminution Ratios for Planning Construction-Area Sediment Controls,
W77-06980 4D

LAND RESOURCES
The Growth Shapers: The Land Use Impacts of Infrastructure Investments.
W77-06601 6D

LAND USE
The Growth Shapers: The Land Use Impacts of Infrastructure Investments.
W77-06601 6D

Design Study of Environmental and Human Cultural Information System Needs in Urban Water Resource Development,
W77-06634 6B

Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

A Study of the Utilization of EREP Data from the Wabash River Basin,
W77-06670 7B

Open Space and Urban Water Management - Phase II: Case Studies and Findings,
W77-06917 6B

Flood Management Study.
W77-06952 6F

LANDFILLS
Study of Leachate at Landfill Sites 1975, Volume 1.
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What's New in Landfill Liners.
W77-07051 5G

LANDSAT
Application of Landsat to the Surveillance and Control of Eutrophication in Saginaw Bay,
W77-06665 5A

Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

A Study of the Utilization of EREP Data from the Wabash River Basin,
W77-06670 7B

LARVAE
Occurrence and Growth of Dreissena Polymorpha Pall. in Lakes Included in a Cooling System, (In Polish),
W77-06754 5C

Ichthyoplankton of the Eastern Bering Sea,
W77-06845 6G

LARVAL GROWTH STAGE
Egg Incubation and Larval Rearing of Navaga (Eleginus Navaga Pall.), Polar Cod (Boreogadus Saida Lepechin) and Arctic Flounder (Liopsetta Glacialis Pall.) in the Laboratory,
W77-06792 8I

LAURENTIAN CHANNEL
Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

LEACHATE MIGRATION
Study of Leachate at Landfill Sites 1975, Volume 1.
W77-06851 5B

LEACHATES
Characterization of Soluble Organic Matter in Leachate,
W77-07039 5A

LEAD
The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

The Toxic Effects of Selected Heavy Metals on Unadapted Populations of Vorticella Convallaria Var Similis,
W77-06636 5C

Long-Term Lead Accumulation in Abalone (Haliotis Spp.) Fed on Lead-Treated Brown Algae (Egregia Laevigata),
W77-06776 5C

Correlation Coefficients and Concentration Factors of Copper and Lead in Seawater and Benthic Algae,
W77-06783 5C

LEAF MESOPHYLL
Dependence of Water Absorption by the Cell Walls of Plant Leaves on the Volume of the Free Space, (In Russian),
W77-06827 2I

LEAKAGE
Tables and Type Curves for Analysis of Pump Tests in Leaky Parallel-Channel Aquifers,
W77-06941 4B

Testing and Grouting Leaking Joints,
W77-06986 8G

LEAKY AQUIFERS
Tables and Type Curves for Analysis of Pump Tests in Leaky Parallel-Channel Aquifers,
W77-06941 4B

LEGISLATION
Environmental Impact Statements in Water Resources Planning and Decision Making,
W77-06738 6E

LEPOMIS SSP
Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

LETHAL LIMIT
Toxicity of Fluoride to Brown Trout Fry (Salmo trutta),
W77-06628 5C

LIFE SPAN
Occurrence and Growth of Dreissena Polymorpha Pall. in Lakes Included in a Cooling System, (In Polish),
W77-06754 5C

LIGHT
Process for the Treatment of Waste Water by Heterogeneous Photosensitized Oxidation,
W77-07006 5D

LIGHT PENETRATION
Temperature, Salinity and Light Penetration Structures: Controlled Ecosystem Pollution Experiment,
W77-06626 5A

Some Effects on Integral Photosynthesis of Artificial Circulation of Phytoplankton Through Light Gradients,
W77-06696 5C

LINEAR ALKYLATE SULFONATES
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

LINEAR PROGRAMMING
Integration of Aquifers in Flood Control Projects,
W77-06723 4A

LININGS
The Fabric-Lined Purification Basin.
W77-07035 5D

What's New in Landfill Liners.
W77-07051 5G

LIQUID WASTES
Process for the Treatment of Waste Water by Heterogeneous Photosensitized Oxidation,
W77-07006 5D

Underflow from Sludge-Irrigated Cropland,
W77-07056 5B

Application of Municipal Refuse and Liquid Sewage Sludge to Agricultural Land: II. Lysimeter Study,
W77-07080 5D

LITERATURE REVIEWS
Literature Review of Wastewater Characteristics and Abatement Technology in the Wood and Timber Processing Industry.
W77-06951 5D

LITTORAL
Ecological Relations Between Invertebrates and Submerged Macrophytes in the Lake Littoral,
W77-06694 5C

LITTORAL DRIFT
Littoral Drift Estimates Along the Coastline of Florida,
W77-06882 2L

LOCK EWE (SCOTLAND)
Loch Ewe Bag Experiment, 1974,
W77-06627 5A

LONG ISLAND SOUND
Interstitial Water Chemistry of Anoxic Long Island Sound Sediments. 1. Dissolved Gases,
W77-06900 5B

LONG-TERM PLANNING
Optimal Planning of Flows in Multi-Reservoir Hydro-Power Systems,
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Application of Municipal Refuse and Liquid Sewage Sludge to Agricultural Land: II. Lysimeter Study,
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Algal Supplement Enhancement of Static and Recirculating System,
W77-06933 5C

MACROPHYTES
Ecological Relations Between Invertebrates and Submerged Macrophytes in the Lake Littoral,
W77-06694 5C

MACROPHYTES (SUBMERGED)
Distribution and Indicatory Value of the Submerged Macrophytes in the Flowing Waters of the Friedberger Au, (In German),
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MADDEN LAKE (PANAMA CANAL ZONE)
Stratification of Kinetic Origin and its Biological Consequences in a Neotropical Man-Made Lake,
W77-06683 2H

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The Historic and Present Relationships Between Phytoplankton, Limiting Nutrients, and Sediment-Water Geochemical Processes in Selected Maine Lakes,
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Use of Remote Sensing to Quantify Construction Material and to Define Geologic Lineations; Dickey-Lincoln School Lakes Project, Maine,
W77-06888 8D

MAINTENANCE
Cincinnati's Preventive Maintenance Sewer Program.
W77-06989 5G

Preventive Sewer Maintenance Helps Preserve Historic Annapolis.
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Contract Services Stretch Sewer Maintenance Budget,
W77-06994 8G

MALACHITE GREEN
Effect of Malachite Green and Formalin on the Survival of Largemouth Bass Eggs and Fry,
W77-06612 5C

Changes in the Blood Chemistry of Coho Salmon Exposed to Malachite Green,
W77-06746 5C

MALHEUR RIVER DRAINAGE BASIN (OR)
Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
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MAMMALS
Baseline Characterization of Marine Mammals in the Bering Sea,
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Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska,
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The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
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MANAGEMENT
Design Study of Environmental and Human Cultural Information System Needs in Urban Water Resource Development,
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La Science des Systemes dans la Planification des Ressources en Eau,
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Improvement of Planning for Post-Development Water Resource Management: A Study of the Weber Basin Project,
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Open Space and Urban Water Management - Phase II: Case Studies and Findings,
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Coastal Zone Management, Annotated Bibliography,
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MAPPING
Application of Landsat to the Surveillance and Control of Eutrophication in Saginaw Bay,
W77-06665 5A

Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

River Basin Snow Mapping at the National Environmental Satellite Service,
W77-06915 2C

MARINE ANIMALS
Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

MARINE BACTERIA
Response of Natural Marine Bacterial Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06622 5A

Effects of Four Oils on Marine Bacterial Populations: Controlled Ecosystem Pollution Experiment,
W77-06623 5A

MARINE BIOLOGY
Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

MARINE ECOSYSTEMS
Stable Elements of Radioecological Importance in Certain Echinoderm Species,
W77-06640 5A

MARINE ENVIRONMENTS
Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

MARINE FUNGI
Effect of Salinity on Spore Germination of Terrestrial and Marine Fungi,
W77-06772 5C

MARINE MICROORGANISMS
Temperature, Salinity and Light Penetration Structures: Controlled Ecosystem Pollution Experiment,
W77-06626 5A

MARKOV PROCESSES
Optimal Complex Use of Controlled Water Resources of a Basin,
W77-06718 4A

MARYLAND
An Executive Summary of Three EPA Demonstration Programs in Erosion and Sediment Control,
W77-06671 5G

Measurement in a Marine Environment Using Low Cost Sensors of Temperature and Dissolved Oxygen,
W77-06960 7B

Preventive Sewer Maintenance Helps Preserve Historic Annapolis.
W77-06990 8G

MASSACHUSETTS
A Test Particle Dispersion Study in Massachusetts Bay.
W77-06880 2L

Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5C

New Programs Improve Sensitive Areas of Water and Sewer Systems,
W77-06995 8G

MASSACHUSETTS BAY
A Test Particle Dispersion Study in Massachusetts Bay.
W77-06880 2L

MATHEMATICAL MODELS
An Approximating Polynomial for the Computation of Saturation Vapor Pressure,
W77-06652 2D

The Distribution of Natural and Anthropogenic Elements and Compounds in Precipitation Across the U.S.; Theory and Quantitative Models,
W77-06675 2

A General Model of Microbial Growth and Decomposition in Aquatic Ecosystems,
W77-06684 5

Mathematical Models in Hydrology.
W77-06708 2

Mathematical Model of Water Resource Utilization in a River Basin,
W77-06719 4

Construction and Adjustment of a Two-Layer Mathematical Model of the Llobregat Delta,
W77-06722 4

Further Development and Testing of a Stream Aquifer System Model,
W77-06762 2

A Model for the Water Regime of a Deciduous Forest with Special Consideration of the Functional Interrelationships Among Meteorologic

Factors, Soil Water Content and Evapotranspiration, (In German),
W77-06864 2A

A Test Particle Dispersion Study in Massachusetts Bay.
W77-06880 2L

Numerical Models of Wind-Driven Circulation in Lakes,
W77-06958 2H

Comparison of Iterative Methods of Solving Two-Dimensional Groundwater Flow Equations,
W77-06965 2F

IATHEMATICAL SMOOTHING
Smoothing Data with Cubic Splines,
W77-06831 7C

IATHEMATICAL STUDIES
Smoothing Data with Cubic Splines,
W77-06831 7C

EASUREMENT
Measurements of Planktonic Biomass in a Reservoir,
W77-06679 5A

A Universal Calibration Equation for Price Meters and Similar Instruments,
W77-06943 7B

Measurement in a Marine Environment Using Low Cost Sensors of Temperature and Dissolved Oxygen,
W77-06960 7B

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Heavy Metal Concentrations in Water, Sediments, and Fish from Mediterranean Coastal Area, Israel,
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Nile Cone: Late Quaternary Stratigraphy and Sediment Dispersal,
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Effect of the Nile Flood on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-06907 2L

EDWAY ESTUARY (ENG)
Heavy Metals in Macroinvertebrates and Fish From the Lower Medway Estuary, Kent,
W77-06790 5C

EMBRANE PROCESSES
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

ENHADEN
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

ERCURY
The Accumulation of Organic Mercury from Sea Water by the Plaice, Pleuronectes platessa ...,
W77-06607 5C

Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

The Toxic Effects of Selected Heavy Metals on Unadapted Populations of Vorticella Convallaria Var Similis,
W77-06636 5C

A Preliminary Survey of Mercury in Fish from Bombay and Thana Environment,
W77-06785 5C

METABOLISM
Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

Effect of Two Rearing Conditions on Growth and Body Composition in Carp (Cyprinus Carpio L), (Influence de Deux Modes d'Elevage sur la Croissance et la Composition Corporelle de la Carpe Commune),
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Gas Bubble Disease of Salmonids: A Critical Review,
W77-06920 5

METAL FINISHING INDUSTRY
Proceedings Technology Transfer Seminar on Waste Handling, Disposal and Recovery in the Metal Finishing Industry, November 12-13, 1975, Toronto, Ontario.
W77-06950 5D

METALS
The Accumulation of Organic Mercury from Sea Water by the Plaice, Pleuronectes platessa L.,
W77-06607 5C

The Toxic Effects of Selected Heavy Metals on Unadapted Populations of Vorticella Convallaria Var Similis,
W77-06636 5C

Partial Extraction of Metals from Aquatic Sediments,
W77-06781 5A

Laboratory Studies on the Effect of Metals on Oxygen Uptake by Sewage Sludge in Brackish Water,
W77-06788 5C

Proceedings Technology Transfer Seminar on Waste Handling, Disposal and Recovery in the Metal Finishing Industry, November 12-13, 1975, Toronto, Ontario.
W77-06950 5D

METEOROLOGICAL DATA
Simple Formulae for the Estimation of Wet Bulb Temperature and Precipitable Water,
W77-06646 2B

Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
W77-06829 6G

A Test Particle Dispersion Study in Massachusetts Bay.
W77-06880 2L

METHANE
Microbial Methane Consumption Reactions and Their Effect on Methane Distributions in Freshwater and Marine Environments,
W77-06899 5C

Interstitial Water Chemistry of Anoxic Long Island Sound Sediments. 1. Dissolved Gases,
W77-06900 5B

Fuel Gas and Electricity from Municipal Sewage,
W77-07065 5D

METHANE BACTERIA
Microbial Methane Consumption Reactions and Their Effect on Methane Distributions in Freshwater and Marine Environments,
W77-06899 5C

METHANE CONTENT
Interstitial Water Chemistry of Anoxic Long Island Sound Sediments. 1. Dissolved Gases,
W77-06900 5B

METHANE FORMATION
Microbial Methane Consumption Reactions and Their Effect on Methane Distributions in Freshwater and Marine Environments,
W77-06899 5C

METHANE OXIDIZING BACTERIA
Microbial Methane Consumption Reactions and Their Effect on Methane Distributions in Freshwater and Marine Environments,
W77-06899 5C

METHANE PRODUCERS
Microbial Methane Consumption Reactions and Their Effect on Methane Distributions in Freshwater and Marine Environments,
W77-06899 5C

METHODOLOGY
Rotary-Flow Technique for Testing Fitness of Fish,
W77-06608 5C

A Biological Monitoring System Employing Rheotaxis of Fish,
W77-06609 5C

An Electronic System to Monitor the Effects of Changes in Water Quality on Fish Opercular Rhythms,
W77-06610 5C

A Pneumatic Grab for Obtaining Large, Undisturbed Mud Samples: Its Construction and Some Applications for Measuring the Growth of Larvae and Emergence of Adult Chironomidae,
W77-06613 5A

Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

Loch Ewe Bag Experiment, 1974,
W77-06627 5A

An Offshore Biomonitoring System for Chlorinated Hydrocarbons,
W77-06641 5A

Climatology for Geographers,
W77-06659 2B

Presenting Trends in Lake Eutrophication,
W77-06693 5C

Mathematical Models in Hydrology.
W77-06708 2A

Simplified Methods of Computing the Quantity of Urban Runoff,
W77-07072 5B

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METHOXYCHLOR
The Effects of Methoxychlor on Riffle Invertebrate Populations and Communities,
W77-06614 5C

MIAMI-DADE (FLORIDA) WATER AND SEWER AUTHORITY
Expansion Comes Quickly to AWT Plant,
W77-07009 5D

MICHIGAN
Coastal Meteorological Networks to Determine Effects of Nuclear Plant Cooling Systems,
W77-06643 2B

MICRO-ZOOPLANKTON
Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

MICROBIAL DEGRADATION
A General Model of Microbial Growth and Decomposition in Aquatic Ecosystems,
W77-06684 5C

Microbial Methane Consumption Reactions and Their Effect on Methane Distributions in Freshwater and Marine Environments,
W77-06899 5C

MICROORGANISMS
Effects of Four Oils on Marine Bacterial Populations: Controlled Ecosystem Pollution Experiment,
W77-06623 5A

Escherichia Coli as a Sanitary-Indicator Microorganism, (In Russian),
W77-07067 5A

MICROWAVES
Waste Water System Uses Microwaves,
W77-07019 5D

MIGRATORY BIRDS
Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska,
W77-06804 6G

Avifaunal Utilization of the Offshore Island Area Near Prudhoe Bay, Alaska,
W77-06812 6G

Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
W77-06824 6G

MIKOLAJSKIE LAKE (POLAND)
Ecological Relations Between Invertebrates and Submerged Macrophytes in the Lake Littoral,
W77-06694 5C

MILLET
Dependence of Water Absorption by the Cell Walls of Plant Leaves on the Volume of the Free Space, (In Russian),
W77-06827 2I

MINE WASTES
Experience in Treating Waste Waters from the Donetsk Mines, (In Russion),
W77-07068 5D

MINERAL CONTENT
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

MINERAL EXTRACTION
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

MINERAL QUALITY
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

MINERAL WATER
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

MINERALIZED GROUNDWATER
Irrigation of the Nebit-Dag Plantings by Mineralized Ground Water, (In Russian),
W77-06691 3C

MINERALOGY
Irrigation of the Nebit-Dag Plantings by Mineralized Ground Water, (In Russian),
W77-06691 3C

MINNESOTA
Iron-Rich Rhythmically Laminated Sediments in Lake of the Clouds, Northeastern Minnesota,
W77-06901 2J

A Device for Measuring Seepage Flux in Lakes and Estuaries,
W77-06903 7B

Sewerage for a Rural Resort Area,
W77-06987 5D

MISSISSIPPI DELTA
Methane-Derived Carbonate Cements in Barrier and Beach Sands of a Subtropical Delta Complex,
W77-06677 2L

MISSISSIPPI RIVER
Methane-Derived Carbonate Cements in Barrier and Beach Sands of a Subtropical Delta Complex,
W77-06677 2L

MISSISSIPPI SOUND
Mississippi Sound Temporal and Spatial Distribution of Nutrients,
W77-06932 5B

MISSOURI RIVER BASIN
Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
W77-06957 6G

MITOCHONDRIA
Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

MIXING
Mixing and Circulation of Lakes and Reservoirs with Air Plumes,
W77-06633 5G

Mixing in Upper Layer of a Lake During Heating Cycle,
W77-06649 2H

MODE OF ACTION
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

MODEL STUDIES
The Distribution of Natural and Anthropogenic Elements and Compounds in Precipitation Across the U.S.; Theory and Quantitative Models,
W77-06675 2B

Investigation of the Effects of Nonhomogeneous (or Nonstationary) Behavior on the Spectra of Atmospheric Turbulence,
W77-06678 2B

Adjustment Costs and Optimal Waste Treatment,
W77-06699 5D

Optimal Oil Tanker Size with Regard to Environmental Impact of Oil Spills,
W77-06702 5C

Regulating Activities with Catastrophic Environmental Effects,
W77-06703 6C

Optimal Investment in Pollution Control Capital in a Neoclassical Growth Context,
W77-06705 6C

Observations of Wind-Generated Waves over Variable Current,
W77-06896 2E

Phosphate Prediction Model for Streams by Means of Discriminant Analysis,
W77-06906 5B

Comparison of Iterative Methods of Solving Two-Dimensional Groundwater Flow Equations,
W77-06965 2F

Analog-Model Simulations for Secondary Canal Controls and Forward Pumping Water-Management Schemes in Southeast Florida,
W77-06968 4A

Application of Digital Modelling to the Prediction of Radioisotope Migration in Groundwater,
W77-06981 5B

The Effect of High Purity Oxygen on the Activated Sludge Process,
W77-07043 5D

Short Course Proceedings: Applications of Stormwater Management Models,
W77-07066 5G

Introduction to Urban Storm Water Runoff Models,
W77-07071 5G

The WRE Storm Model,
W77-07073 5G

Water Quality Simulation of Tahoe-Truckee System, Nevada-California-Volume I,
W77-07075 5B

A Nonlinear Multilevel Transportation Model for Water Resource-Water Quality Management,
W77-07096 5G

On-Line Adaptive Control for Combined Sewer Systems,
W77-07100 5G

MODIFIED UNIVERSAL SOIL LOSS EQUATION
Sediment Yield Prediction Based on Watershed Hydrology,
W77-06656

MOISTURE CONTENT
Some Significant Regularities in Plant Hydroadaptation, (In Russian),
W77-06774 3B

A Method of Evaluating a Field Water Capacity Using PF-3, (In French),
W77-06844 2G

MOLDAVIAN SSR
Antierosion Role of Forest Plantings in the Steppe Zone of the Moldavian SSR, (In Russian),
W77-06745 4C

MOLLUSKS
The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

Occurrence and Growth of Dreissena Polymorpha Pall. in Lakes Included in a Cooling System, (In Polish),
W77-06754 5C

MONITORING
A Biological Monitoring System Employing Rheotaxis of Fish,
W77-06609 5C

An Electronic System to Monitor the Effects of Changes in Water Quality on Fish Opercular Rhythms,
W77-06610 5C

An Offshore Biomonitoring System for Chlorinated Hydrocarbons,
W77-06641 5A

Monitoring the Marine Environment Through Sedimentation,
W77-06651 2L

Monitoring Groundwater Quality: Illustrative Examples.
W77-06673 5A

Study of Leachate at Landfill Sites 1975, Volume 1.
W77-06851 5B

NASA Develops Water Monitoring System,
W77-06912 5A

Algal Supplement Enhancement of Static and Recirculating System,
W77-06933 5C

Comprehensive Monitoring of Meteorology, Hydraulics, and Thermal Regime of the San Diego Aqueduct, California,
W77-06973 2D

The Chemical Characteristics of the City of Winnipeg Waste Water,
W77-07047 5A

MONTANA
A Preliminary Evaluation of the Effects of Gas Bubble Disease on Fish Populations in the Kootenai River Below Libby Dam,
W77-06919 5C

MONTE CARLO METHOD
Optimal Design and Operation of Reservoir Systems,
W77-06721 4A

MONTEREY BAY (CALIF)
Effects of Engineering Activities on the Ecology of Pismo Clams,
W77-06886 5C

In Situ Acoustic Measurements of Microbubbles at Sea,
W77-06916 2L

MORTALITY
Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

Environmental Factors Affecting Survival and Growth of Vibrio Parahaemolyticus. A Review,
W77-06765 5C

Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

MORTANDAD CANYON (NM)
Chemical Quality of Effluents and Their Influence on Water Quality in a Shallow Aquifer,
W77-06658 5B

MOUNTAIN WHITEFISH
A Preliminary Evaluation of the Effects of Gas Bubble Disease on Fish Populations in the Kootenai River Below Libby Dam,
W77-06919 5C

MULTI-LEVEL SECTOR MODEL
A Sector Model for Regional and National Water Resources Planning,
W77-06731 6A

MULTIPLE PURPOSE
Methods for Control of the Regimes for Water Resources Systems,
W77-06717 4A

MULTIPLE-PURPOSE RESERVOIRS
The Conjunctive Use of a Multi-Reservoir System and a Dual-Purpose Desalting Plant,
W77-06714 4B

MULTIPLE WELLS
Hydraulics and Economics of Well Field Layout.
W77-06863 8B

MULTISPECTRAL SCANNING
The Use of Remote Sensing to Detect How Wind Influences Planktonic Blue-Green Algal Distribution,
W77-06697 5C

MUNICIPAL WASTE WATER
Waste Water Reuse Practice in the United States,
W77-07087 5D

MUNICIPAL WASTES
The Plight and Promise of On-Site Waste Water Treatment,
W77-07010 5D

Municipal Waste Water Treatment as an Industrial Operation,
W77-07025 5D

Upgrading Biological Sewage Treatment Plants Today,
W77-07062 5D

The Current Role of Wastewater Disinfection,
W77-07064 5D

Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

Effect of Water Work's Sludge on Waste Water Treatment,
W77-07085 5D

MUSSELS
An Offshore Biomonitoring System for Chlorinated Hydrocarbons,
W77-06641 5A

A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

MYTILUS CALIFORNIANUS
An Offshore Biomonitoring System for Chlorinated Hydrocarbons,
W77-06641 5A

NATIONAL ENVIRONMENTAL POLICY ACT
Environmental Impact Statements in Water Resources Planning and Decision Making,
W77-06738 6E

NATIONAL ENVIRONMENTAL SATELLITE SERVICE (NESS)
River Basin Snow Mapping at the National Environmental Satellite Service,
W77-06915 2C

NATURAL RESOURCES
Regulating Activities with Catastrophic Environmental Effects,
W77-06703 6G

NEBIT-DAG (TURKMAN SSR)
Irrigation of the Nebit-Dag Plantings by Mineralized Ground Water, (In Russian),
W77-06691 3C

NEMATODES
The Fauna of the Polluted River Tees Estuary,
W77-06638 5C

NETS
Zooplankton Sampling Variability: Controlled Ecosystem Pollution Experiment,
W77-06615 5A

NETWORK DESIGN
Surface Water Network Design by Regression Analysis Simulation,
W77-06963 2E

NETWORKS
Coastal Meteorological Networks to Determine Effects of Nuclear Plant Cooling Systems,
W77-06643 2B

Use of a Parametric Model as a Tool for Hydrometric Network Planning,
W77-06710 2A

NEW JERSEY
Impact of Oil Spillage from World War II Tanker Sinkings,
W77-06877 5C

LIBRARY U. OF I. URBANA-CHAMP.

NEW JERSEY

Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
W77-06953 4A

NEW MEXICO

Chemical Quality of Effluents and Their Influence on Water Quality in a Shallow Aquifer,
W77-06658 5B

Review and Analysis of Hydrogeologic Conditions Near the Site of a Potential Nuclear-Waste Repository, Eddy and Lea Counties, New Mexico,
W77-06974 5B

NEW YORK

Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

Monitoring Groundwater Quality: Illustrative Examples.
W77-06673 5A

Means for Protecting the Drinking Water Quality of Lake George, New York,
W77-06682 5G

Nutrient Removal and Sludge Disposal Within Septic Systems-Phase III,
W77-06686 5D

Correlation Coefficients and Concentration Factors of Copper and Lead in Seawater and Benthic Algae,
W77-06783 5C

Study of Leachate at Landfill Sites 1975, Volume 1.
W77-06851 5B

NEW YORK BIGHT

A Self-Contained Facility for Analyzing Near-Bottom Flow and Associated Sediment Transport,
W77-06874 2L

The New York Bight Project - 1975; Stony Brook, Long Island, New York.
W77-06876 5G

NILE CONE

Nile Cone: Late Quaternary Stratigraphy and Sediment Dispersal,
W77-06650 2L

NILE RIVER

Nile Cone: Late Quaternary Stratigraphy and Sediment Dispersal,
W77-06650 2L

Effect of the Nile Flood on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-06907 2L

NITRATE LEACHING

The Impact of Fertilizer Use and Crop Management on Nitrogen Content of Subsurface Water Draining from Upland Agricultural Watersheds,
W77-06909 5B

NITRATES

USGS Scientists Bring California Water Supply into Compliance with Federal Regulations,
W77-06853 5G

Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

NITRIFICATION

UNOX System for Waste Water Treatment,
W77-07014 5D

NITROGEN

The Solubility of Nitrogen, Oxygen and Argon in Water and Seawater,
W77-06923 5C

Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
W77-06924 5C

Dissolved Nitrogen, Dissolved Oxygen and Related Water Temperatures in the Columbia and Lower Snake Rivers, 1965-1969,
W77-06925 5C

Apparatus and Process for Removing Ammonia Nitrogen from Waste Water,
W77-07008 5D

NITROGEN COMPOUNDS

Ammonia Concentration in Relation to Ammonia Toxicity During a Rainbow Trout Rearing Experiment in a Closed Freshwater-Seawater System,
W77-06743 5C

The Impact of Fertilizer Use and Crop Management on Nitrogen Content of Subsurface Water Draining from Upland Agricultural Watersheds,
W77-06909 5B

Fate of Nitrogen and Phosphorus in Soils Under Septic Tank Waste Disposal Fields,
W77-06914 5B

Land Application of Sewage Sludge: IV. Wheat Growth, N Content, N Fertilizer Value, and N Use Efficiency as Influenced by Sewage Sludge and Wood Waste Mixtures,
W77-07079 5D

NITROGEN CONTENT

The Impact of Fertilizer Use and Crop Management on Nitrogen Content of Subsurface Water Draining from Upland Agricultural Watersheds,
W77-06909 5B

NITROGEN SOLUBILITIES

The Solubility of Nitrogen, Oxygen and Argon in Water and Seawater,
W77-06923 5C

NITROGEN SUPERSATURATION

Gas Bubble Disease of Salmonids: A Critical Review,
W77-06920 5

NOAA-4

A Single Field of View Method for Retrieving Tropospheric Temperature Profiles from Cloud-Contaminated Radiance Data,
W77-06887 2B

NON-STRUCTURAL ALTERNATIVES

Flood Management Study.
W77-06952 6F

Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
W77-06953 4A

NONLINEAR PROGRAMMING

Optimal Planning of Flows in Multi-Reservoir Hydro-Power Systems,
W77-06730 4A

NORTH ATLANTIC

High Seas Oil Pollution: Particulate Petroleum Residues in the North Atlantic,
W77-06911 5B

NORTH CAROLINA

Exchange Through a Barrier Island Inlet: Additional Evidence of Upwelling Off the Northeast Coast of North Carolina,
W77-06654 2L

Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

Impact of Oil Spillage from World War II Tanker Sinkings,
W77-06877 5C

A Device for Measuring Seepage Flux in Lakes and Estuaries,
W77-06903 7B

NORTH SEA

An Estimate of the Input of Atmospheric Trace Elements into the North Sea and the Clyde Sea (1972-3),
W77-06668 5B

NORTH SLOPE (ALAS)

Sludge Dewatering on Alaska's North Slope,
W77-07030 5D

NORTON BAY (ALAS)

Avian Community Ecology of the Akulik - Inglutalik River Delta, Norton Bay, Alaska,
W77-06822 6G

NORTON SOUND (ALAS)

Technical Trawl Survey of the Benthic Epifauna of the Chukchi Sea and Norton Sound.
W77-06848 6G

NORWAY

The Generation of Residual Flows in Norway: An Input-Output Approach,
W77-06698 5G

NOVA SCOTIA

A Device for Measuring Seepage Flux in Lakes and Estuaries,
W77-06903 7B

NOXFISH

Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

NUCLEAR POWERPLANT EFFECTS

Coastal Meteorological Networks to Determine Effects of Nuclear Plant Cooling Systems,
W77-06643 2B

NUCLEAR POWERPLANTS

Coastal Meteorological Networks to Determine Effects of Nuclear Plant Cooling Systems,
W77-06643 2B

NUTRIENT REMOVAL

Nutrient Removal and Sludge Disposal Within Septic Systems-Phase III,
W77-06686 5D

Lake Restoration by Bottom Water Siphoning (In German),
W77-06689 5G

Nutrient Removal by Water Hyacinths,
W77-07036 5G

NUTRIENT REQUIREMENTS

The Historic and Present Relationships Between Phytoplankton, Limiting Nutrients and Sediment-Water Geochemical Processes in Selected Maine Lakes,
W77-06741 5C

NUTRIENTS
Mississippi Sound Temporal and Spatial Distribution of Nutrients,
W77-06932 5B

Blank and Salinity Corrections for Automated Nutrient Analysis of Estuarine and Sea Waters,
W77-06938 5A

Single P/C Unit Removal of Nutrients from Combined Sewer Overflows,
W77-07031 5D

OCEAN CURRENTS
An Analysis of Inertial Oscillations Observed Near Oregon Coast,
W77-06892 2L

OCEAN DUMPING
Dispersion of Liquid Waste from a Moving Barge,
W77-06913 5B

OCEAN WAVES
A Study to Forecast the Waves at Digha,
W77-06648 2L

Continental Shelf Waves and Alongshore Variations in Bottom Topography and Coastline,
W77-06891 2L

OCEANOGRAPHIC DATA
A Test Particle Dispersion Study in Massachusetts Bay.
W77-06880 2L

OCEANS
Monitoring the Marine Environment Through Sedimentation,
W77-06651 2L

An Estimate of the Input of Atmospheric Trace Elements into the North Sea and the Clyde Sea (1972-3),
W77-06668 5B

Dispersion of Liquid Waste from a Moving Barge,
W77-06913 5B

In Situ Acoustic Measurements of Microbubbles at Sea,
W77-06916 2L

ODOR
Control Sewer Corrosion with H2O2,
W77-06993 8G

OHIO
The Impact of Fertilizer Use and Crop Management on Nitrogen Content of Subsurface Water Draining from Upland Agricultural Watersheds,
W77-06909 5B

Cincinnati's Preventive Maintenance Sewer Program.
W77-06989 5G

Agricultural Disposal of Aerobic Wastewater Sludges in an Urban County,
W77-07057 5D

Conditioning and Land Application of Aerobically Digested Sludge,
W77-07058 5D

OIL POLLUTION
Effects of Four Oils on Marine Bacterial Populations: Controlled Ecosystem Pollution Experiment,
W77-06623 5A

Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

Avifaunal Utilization of the Offshore Island Area Near Prudhoe Bay, Alaska,
W77-06812 6G

A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

High Seas Oil Pollution: Particulate Petroleum Residues in the North Atlantic,
W77-06911 5B

Identity, Origin and Development of Off-Flavors in Great Lakes Anadromous Fish,
W77-06931 5A

Who's Minding the Shore. A Citizens' Guide to Coastal Management,
W77-06935 5G

OIL SHALE
Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
W77-06957 6G

OIL SPILLS
Optimal Oil Tanker Size with Regard to Environmental Impact of Oil Spills,
W77-06702 5G

Impact of Oil Spillage from World War II Tanker Sinkings,
W77-06877 5C

OIL TANKERS
Optimal Oil Tanker Size with Regard to Environmental Impact of Oil Spills,
W77-06702 5G

OIL WASTES
Effects of Four Oils on Marine Bacterial Populations: Controlled Ecosystem Pollution Experiment,
W77-06623 5A

Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

OKLAHOMA
Measurements of Planktonic Biomass in a Reservoir,
W77-06679 5A

A New Reservoir and Recreational Behavior,
W77-06956 6B

Reconnaissance of the Water Resources of the Clinton Quadrangle, West-Central Oklahoma,
W77-06959 7C

OLIGOCHAETA
The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin II. Changes in Time of Bottom Fauna, (In Polish),
W77-06750 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin III. An Effort to Explain the Causes and Results of Changes in the Bottom Fauna of Lakes as Influenced by the Inflow of Heated Waters, (In Polish),
W77-06751 5C

OLIGOCHAETES
The Mining Fauna in Four Macrophyte Species in Mikolajskie Lake,
W77-06688 5C

ON-SITE DATA COLLECTIONS
Loch Ewe Bag Experiment, 1974,
W77-06627 5A

ON-SITE INVESTIGATIONS
A Pneumatic Grab for Obtaining Large, Undisturbed Mud Samples: Its Construction and Some Applications for Measuring the Growth of Larvae and Emergence of Adult Chironomidae,
W77-06613 5A

The Effects of Methoxychlor on Riffle Invertebrate Populations and Communities,
W77-06614 5C

The Influence of Wind on the Surface Layer of a Stratified Inlet: Part I. Observations,
W77-06894 2L

In Situ Acoustic Measurements of Microbubbles at Sea,
W77-06916 2L

Optic Device for Observations of Small Organisms Under Water, (In Russian),
W77-06926 7B

ON-SITE WASTE WATER TREATMENT
The Plight and Promise of On-Site Waste Water Treatment,
W77-07010 5D

New Visibility for On-Site Waste Treatment Systems,
W77-07013 5D

OPEN CHANNELS
Optimization Model of a System of Two Open-Channel Hydroplants,
W77-06716 4A

OPEN SPACES PRESERVATION
Open Space and Urban Water Management - Phase II: Case Studies and Findings,
W77-06917 6B

OPERATION AND MAINTENANCE
The Operations Section of Lincoln Sewage Division,
W77-07023 5D

Municipal Waste Water Treatment as an Industrial Operation,
W77-07025 5D

OPERATIONS RESEARCH
Mathematical Models in Hydrology.
W77-06708 2A

OPERCULAR RHYTHMS (FISH)
An Electronic System to Monitor the Effects of Changes in Water Quality on Fish Opercular Rhythms,
W77-06610 5C

OPTIC DEVICE
Optic Device for Observations of Small Organisms Under Water, (In Russian),
W77-06926 7B

OPTIMIZATION
Adjustment Costs and Optimal Waste Treatment,
W77-06699 5D

OPTIMIZATION

Optimal Oil Tanker Size with Regard to Environmental Impact of Oil Spills,
W77-06702 5G

Mathematical Models in Hydrology.
W77-06708 2A

On the Application of Optimization Techniques to Conceptual Catchment Models,
W77-06709 2A

Optimization Model of a System of Two Open-Channel Hydroplants,
W77-06716 4A

The Multi-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06734 4A

The Out-of-Kilter Algorithm as a Single-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06735 4A

A Dynamic Multisector Programming Approach to Regional Water Resource Management,
W77-06737 6A

OPTIMUM DEVELOPMENT PLANS

Optimal Investment in Pollution Control Capital in a Neoclassical Growth Context,
W77-06705 6G

General Description of the Vistula River Project and Basic Planning Data,
W77-06733 4A

OREGON

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

An Analysis of Inertial Oscillations Observed Near Oregon Coast,
W77-06892 2L

OREGON INLET (NC)

Exchange Through a Barrier Island Inlet: Additional Evidence of Upwelling Off the Northeast Coast of North Carolina,
W77-06654 2L

ORGANIC COMPOUNDS

Foam and Film of Fresh Waters as an Ecological Niche of Aquatic Hyphomycetes, (In Russian),
W77-06787 2I

Hydrocarbon Products Manufacture--By Carbonisation of Coal, Scrap Rubber or Plastic or Domestic Sewage Under Reduced Pressure.
W77-07000 5D

ORGANIC MATTER

The Removal of Organic Matter from Water Supplies by Ion Exchange,
W77-06760 5F

Characterization of Soluble Organic Matter in Leachate,
W77-07039 5A

Advanced Waste Treatment Seminar, Session III, Removal of Solids and Organics, Held at San Francisco, on October 28-29, 1970.
W77-07074 5D

ORGANIC WASTES

Particle Characteristics and Dispersal Patterns of Sugar Cane Wastes in Selected Rivers and Estuaries of Puerto Rico,
W77-06632 5B

ORGANOLEPTIC PROPERTIES

Identity, Origin and Development of Off-Flavors in Great Lakes Anadromous Fish,
W77-06931 5A

OUT-OF-KILTER ALGORITHMS

The Out-of-Kilter Algorithm as a Single-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06735 4A

OUTER CONTINENTAL

Reconnaissance Characterization of Littoral Biota, Beaufort and Chukchi Seas,
W77-06843 6G

OUTER CONTINENTAL SHELF

Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 1: Marine Mammals, Marine Birds.
W77-06793 6G

Baseline Characterization of Marine Mammals in the Bering Sea,
W77-06794 6G

Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska,
W77-06795 6G

Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
W77-06796 6G

The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
W77-06799 6G

An Aerial Census of Spotted Seals, Phoca Vitulina Largha,
W77-06800 6G

Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska,
W77-06804 6G

Identification, Documentation, and Delineation of Coastal Migratory Bird Habitat in Alaska, and the Distribution, Abundance and Feeding Ecology of Birds Associated with Pack Ice,
W77-06805 6G

Ecosystem Dynamics Birds and Marine Mammals. Part I: Preliminary Estimates of Pinniped - Finfish Relationships in the Bering Sea,
W77-06806 6G

Ecosystem Dynamics Birds and Marine Mammals. Part II: Food Web Structure and Trophic Relations of Bering Sea Avifauna (Preliminary Report),
W77-06807 6G

Ecosystem Dynamics Birds and Marine Mammals. Part III: A Dynamic Numerical Marine Ecosystem Model for Evaluation of Marine Resources in Eastern Bering Sea,
W77-06808 6G

Reproductive Ecology of Pribilof Island Seabirds,
W77-06809 6G

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W77-06810 6G

Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

Avifaunal Utilization of the Offshore Island Area Near Prudhoe Bay, Alaska,
W77-06812 6G

Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, When Over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska During the Northern Summer,
W77-06814 6G

Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

Preliminary Catalog of Seabird Colonies and Photographic Mapping of Seabird Colonies,
W77-06816 6G

Review and Analysis of Literature and Unpublished Data on Marine Birds,
W77-06817 6G

Migration of Birds in Alaska Coastal and Marine Habitats Subject to Influence by OCS Development,
W77-06818 6G

Feeding Ecology and Trophic Relationships of Alaskan Marine Bird, and Population Dynamics of Marine Birds,
W77-06819 6G

Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

Studies of Populations, Community Structure and Colony of Marine Birds at King Island, Bering Strait Region, Alaska,
W77-06821 6G

Avian Community Ecology of the Akulik - Inglutalik River Delta, Norton Bay, Alaska,
W77-06822 6G

A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
W77-06824 6G

Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 2: Fish, Plankton, Benthos, Littoral.
W77-06825 6G

The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
W77-06826 6G

Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
W77-06828 6G

Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
W77-06829 6G

Razor Clam (Siliqua Patula, Dixon) Distribution and Population Assessment Study,
W77-06830 6G

Resources of Non-Salmonid Pelagic Fish of the Eastern Bering Sea and the Gulf of Alaska,
W77-06832 6G

Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

Plankton of the Gulf of Alaska - Ichthyoplankton,
W77-06834 6G

Initial Zooplankton Investigations in Lower Cook Inlet,
W77-06835 6G

Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chukchi Sea,
W77-06839 6G

Beaufort Sea Estuarine Fishery Study,
W77-06840 6G

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W77-06842 6G

Ichthyoplankton of the Eastern Bering Sea,
W77-06845 6G

Assessment of Pelagic and Nearshore Fish in Three Bays on Southeast Kodiak Island,
W77-06846 6G

Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
W77-06847 6G

Technical Trawl Survey of the Benthic Epifauna of the Chukchi Sea and Norton Sound.
W77-06848 6G

The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

A Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment and Baseline Study Guidelines.
W77-06850 5A

Program Development Plan. Environmental Assessment of the Alaskan Continental Shelf,
W77-06878 6G

State Information Needs Related to Onshore and Nearshore Effects of OCS Petroleum Development,
W77-06934 6G

OVERFLOW

Chicago Drives Large Bores to Control Combined Sewage Flow.
W77-06988 8E

Single P/C Unit Removal of Nutrients from Combined Sewer Overflows,
W77-07031 5D

Treatment of Combined Sewer Overflows Via Thin Film Chemistry,
W77-07034 5D

OWYHEE DRAINAGE BASIN (OR)

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

OXIDATION

Oxidation and Ozonation Chamber,
W77-06999 5D

Waste Treatment Apparatus,
W77-07005 5D

Process for the Treatment of Waste Water by Heterogeneous Photosensitized Oxidation,
W77-07006 5D

Method of Applying Ozone and Sonic Energy to Sterilize and Oxidize Waste Water,
W77-07007 5D

Waste Treatment Process,
W77-07091 5D

Ozone Oxidation of Waste Water,
W77-07094 5D

OXIDATION LAGOONS

Stabilisation Lagoons Including Experience in Brazil. Part 1,
W77-07063 5D

OXYGEN

The Solubility of Nitrogen, Oxygen and Argon in Water and Seawater,
W77-06923 5C

The Effect of High Purity Oxygen on the Activated Sludge Process,
W77-07043 5D

OXYGEN DEMAND

The Electrolytic Respirometer-II. Use in Water Pollution Control Plant Laboratories,
W77-07081 5D

OXYGEN MINIMUM LAYER

Effects of Pressure, Temperature and Oxygen on the Oxygen-Consumption Rate of the Midwater Copepod Gaussia Princeps,
W77-06642 5C

OXYGEN REQUIREMENTS

Effects of Pressure, Temperature and Oxygen on the Oxygen-Consumption Rate of the Midwater Copepod Gaussia Princeps,
W77-06642 5C

Fish Diseases and Parasites in Relation to the Environment,
W77-06744 5C

The Electrolytic Respirometer-II. Use in Water Pollution Control Plant Laboratories,
W77-07081 5D

OXYGEN SOLUBILITIES

The Solubility of Nitrogen, Oxygen and Argon in Water and Seawater,
W77-06923 5C

OXYGEN STRATIFICATION

Occurrence and Growth of Dreissena Polymorpha Pall. in Lakes Included in a Cooling System, (In Polish),
W77-06754 5C

OXYGENATION

The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

Plug-In Concept for Pilot Sewage Treatment Plant,
W77-07026 5D

Design Criteria for Waste Water Aerator Drives,
W77-07060 5D

OYSTERS

Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

OZONATION

Oxidation and Ozonation Chamber,
W77-06999 5D

OZONE

Oxidation and Ozonation Chamber,
W77-06999 5D

Method of Applying Ozone and Sonic Energy to Sterilize and Oxidize Waste Water,
W77-07007 5D

OZONE MATTER

Ozone Oxidation of Waste Water,
W77-07094 5D

PACIFIC OCEAN

An Analysis of Inertial Oscillations Observed Near Oregon Coast,
W77-06892 2L

Particulate Transport of Radionuclides 14C and 55Fe to Deep Waters in the Pacific Ocean,
W77-06902 5B

PACK ICE

Identification, Documentation, and Delineation of Coastal Migratory Bird Habitat in Alaska, and the Distribution, Abundance and Feeding Ecology of Birds Associated with Pack Ice,
W77-06805 6G

PALOUSE RIVER BASIN (WASH)

Water in the Palouse River Basin, Washington,
W77-06978 4B

LIBRARY U. OF I. URBANA-CHAMPAIGN

PARALLEL-CHANNEL AQUIFERS
Tables and Type Curves for Analysis of Pump Tests in Leaky Parallel-Channel Aquifers,
W77-06941 4B

PARAMETRIC HYDROLOGY
On the Application of Optimization Techniques to Conceptual Catchment Models,
W77-06709 2A

Use of a Parametric Model as a Tool for Hydrometric Network Planning,
W77-06710 2A

PARASITISM
The Mining Fauna in Four Macrophyte Species in Mikolajskie Lake,
W77-06688 5C

PARTICLE SIZE
Factors Influencing the Dewatering Characteristics of Sludge,
W77-07097 5D

PARTICULATE PETROLEUM RESIDUES
High Seas Oil Pollution: Particulate Petroleum Residues in the North Atlantic,
W77-06911 5B

PATENTS
Electron-Beam Irradiation of Waste Products--e.g., For Sterilization of Sewage Sludge and Waste Industrial Products.
W77-06997 5D

Sludge Separator.
W77-06998 5D

Oxidation and Ozonation Chamber,
W77-06999 5D

Hydrocarbon Products Manufacture--By Carbonisation of Coal, Scrap Rubber or Plastic or Domestic Sewage Under Reduced Pressure.
W77-07000 5D

Sewage Aeration Impeller-With Automatic De-Icing and Anti-Clogging System,
W77-07001 5D

Apparatus for Disposal of Effluents.
W77-07002 5E

Method of Waste Treatment and Algae Recovery,
W77-07003 5D

Renovation of Waste Water,
W77-07004 5D

Waste Treatment Apparatus,
W77-07005 5D

Process for the Treatment of Waste Water by Heterogeneous Photosensitized Oxidation,
W77-07006 5D

Method of Applying Ozone and Sonic Energy to Sterilize and Oxidize Waste Water,
W77-07007 5D

Apparatus and Process for Removing Ammonia Nitrogen from Waste Water,
W77-07008 5D

Device for Sucking the Upper Layer of a Polluted Water Surface,
W77-07089 5G

Method of Treating Waste Water with Jet Nozzles,
W77-07090 5D

Waste Treatment Process,
W77-07091 5D

Clarifier with Overflow Scum Removal,
W77-07092 5D

Process for the Purification of Waste Waters with Activated Carbon,
W77-07093 5D

Ozone Oxidation of Waste Water,
W77-07094 5D

PATH OF POLLUTANTS
Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

Effects of Copper on the Dominance and the Diversity of Algae: Controlled Ecosystem Pollution Experiment,
W77-06625 5A

Stable Elements of Radioecological Importance in Certain Echinoderm Species,
W77-06640 5A

Lake Currents and Temperatures Near the Western Shore of Lake Michigan,
W77-06687 2H

Pollutant Movement to Shallow Ground Water Tables from Swine Waste Lagoons,
W77-06742 5B

Adsorption of Polychlorinated Biphenyl (Aroclor 1254) on Shrimp,
W77-06758 5C

Study of Leachate at Landfill Sites 1975, Volume 1.
W77-06851 5B

Particulate Transport of Radionuclides 14C and 55Fe to Deep Waters in the Pacific Ocean,
W77-06902 5B

Phosphate Prediction Model for Streams by Means of Discriminant Analysis,
W77-06906 5B

Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

Dispersion of Liquid Waste from a Moving Barge,
W77-06913 5B

Mississippi Sound Temporal and Spatial Distribution of Nutrients,
W77-06932 5B

Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W77-06975 5B

Application of Digital Modelling to the Prediction of Radioisotope Migration in Groundwater,
W77-06981 5B

PATHOGENIC FUNGI
Fish Diseases and Parasites in Relation to the Environment,
W77-06744 5C

PATHOLOGY
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

PELAGIC ECOSYSTEMS
Temperature, Salinity and Light Penetration Structures: Controlled Ecosystem Pollution Experiment,
W77-06626 5A

PENNSYLVANIA
Evaluation of the Environmental Impact to Appalachian Pennsylvania Waters of the 1972 Flood and Subsequent Stream Channelization with Future Policy Recommendations.
W77-06676 4A

Flood Management Study.
W77-06952 6F

Sediment Discharge from an Area of Highway Construction, Applemans Run Basin, Columbia County, Pennsylvania,
W77-06969 4C

Time-Distribution of Storm Rainfall in Pennsylvania,
W77-07022 2B

PERMAFROST
Suprapermafrost Water,
W77-06630 2C

PERMEABILITY
Antierosion Role of Forest Plantings in the Steppe Zone of the Moldavian SSR, (In Russian),
W77-06745 4C

PERSONNEL
The Operations Section of Lincoln Sewage Division,
W77-07023 5D

PESTICIDES
The Effects of Methoxychlor on Riffle Invertebrate Populations and Communities,
W77-06614 5C

Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

PETROCHEMICAL WASTES
Hygienic Effectiveness of Measures for Decontaminating Effluents at Petrochemical Plants, (In Russian),
W77-07069 5D

PETROLEUM HYDROCARBONS
Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

PHAEOPHYTA
Long-Term Lead Accumulation in Abalone (Haliotis Spp.) Fed on Lead-Treated Brown Algae (Egregia Laevigata),
W77-06776 5C

PHENOLS
Concentration and Determination of Trace Organic Pollutants in Water,
W77-07098 5A

PHOENIX (AZ)
Flood Hazard Information: Cave Creek, Arizona Canal to 19th Avenue, Phoenix, Arizona.
W77-06954 4A

PHOSPHATE
Phosphates in Soils Treated with Sewage Water: III. Kinetic Studies on the Reaction of Phosphates with Aluminum Compounds,
W77-07054 5B

PHOSPHATE REMOVAL
Recycling of Aluminum Used for Phosphate Removal in Domestic Waste Water Treatment,
W77-07099 5D

PHOSPHATES
Phosphate Prediction Model for Streams by Means of Discriminant Analysis,
W77-06906 5B

Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

Phosphates in Soils Treated with Sewage Water: I. General Information on Sewage Farm, Soil, and Treatment Results,
W77-07052 5G

Phosphates in Soils Treated with Sewage Water: II. Fractionation of Accumulated Phosphates,
W77-07053 5B

Recycling of Aluminum Used for Phosphate Removal in Domestic Waste Water Treatment,
W77-07099 5D

PHOSPHORUS
Automated Method for the Determination of the Phosphorus Content of Detergents,
W77-06944 5A

Influence of Phosphorus Removal on Solids Budget,
W77-07032 5D

Process Technological Background Regarding New Protective Regulations of Water Bodies-Results of Nitrification and Phosphorus Elimination Experiments in Zurich and Bern. III. Filtration by Flocculation for the Elimination of Phosphorus from Communal Waste Water (Verfahrenstechnische Unterlagen im Hinblick auf die neuen Gewaesserschutzanforderungen-Ergebnisse der Versuche ueber die Nitrifikation und Phosphorelimination in Zuerich und Bern. III. Flockungsfiltration zur Elimination von Phosphor aus Kommunalem Abwasser),
W77-07082 5D

Recycling of Aluminum Used for Phosphate Removal in Domestic Waste Water Treatment,
W77-07099 5D

PHOSPHORUS COMPOUNDS
Fate of Nitrogen and Phosphorus in Soils Under Septic Tank Waste Disposal Fields,
W77-06914 5B

PHOTOGRAMMETRY
Improving Estimates of Streamflow Characteristics Using LANDSAT-1 (ERTS-1) Imagery,
W77-06972 4A

PHOTOLYSIS
Process for the Treatment of Waste Water by Heterogeneous Photosensitized Oxidation,
W77-07006 5D

PHOTOMETRY
The Use of Remote Sensing to Detect How Wind Influences Planktonic Blue-Green Algal Distribution,
W77-06697 5C

PHOTOSYNTHESIS
Some Effects on Integral Photosynthesis of Artificial Circulation of Phytoplankton Through Light Gradients,
W77-06696 5C

PHYTOPLANKTON
Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

Response of Natural Marine Bacterial Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06622 5A

Effects of Copper on the Dominance and the Diversity of Algae: Controlled Ecosystem Pollution Experiment,
W77-06625 5A

Chlorine Reactions with Seawater Constituents and the Inhibition of Photosynthesis of Natural Marine Phytoplankton,
W77-06637 5C

Limnological and Planktonic Studies in the Waterton Lakes, Alberta,
W77-06680 5C

Dynamics of Phytoplankton Biomass in Two Lakes of Different Limnological Character,
W77-06685 5C

The Share of Algae with Different Dimensions in the Plankton of Two Lakes of Different Trophic Character in the Annual Cycle,
W77-06692 5C

A Study on the Role of Herbivorous Zooplankton Community as Primary Consumers of Phytoplankton in Dutch Lakes,
W77-06695 5C

Long-Term Changes of the Pelagic Primary Production in Heated Lakes, (In Polish),
W77-06755 5C

Changes in the Structure of Phytoplankton During the First Years of Existence of the Derdap Storage Reservoir, (In Serbo-Croatian),
W77-06786 2H

Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

PIEDMONT REGION (NC)
Open Space and Urban Water Management - Phase II: Case Studies and Findings,
W77-06917 6B

PILGRIM NUCLEAR POWER STATION (MASS)
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

PILOT PLANTS
Plug-In Concept for Pilot Sewage Treatment Plant,
W77-07026 5D

Sludge Dewatering Pilot Plant Design. Part 2,
W77-07088 5D

PIMEPHALES PROMELAS
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

PISMO CLAMS
Effects of Engineering Activities on the Ecology of Pismo Clams,
W77-06886 5C

PITLESS ADAPTERS
Bits and Pieces,
W77-06866 8G

PITTING (CORROSION)
How to Deal with Pitting and Corrosion.
W77-06869 8G

PLAICE
The Accumulation of Organic Mercury from Sea Water by the Plaice, Pleuronectes platessa L.,
W77-06607 5C

PLANKTON
Chlorine Reactions with Seawater Constituents and the Inhibition of Photosynthesis of Natural Marine Phytoplankton,
W77-06637 5C

Effects of Pressure, Temperature and Oxygen on the Oxygen-Consumption Rate of the Midwater Copepod Gaussia Princeps,
W77-06642 5C

Measurements of Planktonic Biomass in a Reservoir,
W77-06679 5A

Ichthyoplankton of the Eastern Bering Sea,
W77-06845 6G

PLANNING
Use of a Parametric Model as a Tool for Hydrometric Network Planning,
W77-06710 2A

La Science des Systemes dans la Planification des Ressources en Eau,
W77-06736 6A

Environmental Impact Statements in Water Resources Planning and Decision Making,
W77-06738 6E

Improvement of Planning for Post-Development Water Resource Management: A Study of the Weber Basin Project,
W77-06739 6B

Open Space and Urban Water Management - Phase II: Case Studies and Findings,
W77-06917 6B

Who's Minding the Shore. A Citizens' Guide to Coastal Management,
W77-06935 5G

Fail-Safe Waste Treatment System,
W77-07027 5D

PLANTING MANAGEMENT
Antierosion Role of Forest Plantings in the Steppe Zone of the Moldavian SSR, (In Russian),
W77-06745 4C

PLASTICS
Plastic Spheres for Waste Water Treatment.
W77-07028 5D

The Fabric-Lined Purification Basin.
W77-07035 5D

LIBRARY U. OF I. URBANA-CHAMP...

PLEISTOCENE EPOCH
Delaware River: Evidence for Its Former Extension to Wilmington Submarine Canyon,
W77-06966 2E

PNEUMATIC GRAB
A Pneumatic Grab for Obtaining Large, Undisturbed Mud Samples: Its Construction and Some Applications for Measuring the Growth of Larvae and Emergence of Adult Chironomidae,
W77-06613 5A

POIKILOTHERMS
Heat Resistance of Gametes of Marine Invertebrates in Relation to Temperature Conditions Under Which the Species Exist,
W77-06771 5C

POLAND
Long-Term Changes of the Pelagic Primary Production in Heated Lakes, (In Polish),
W77-06755 5C

POLAND (KONIN AREA LAKES)
The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin I. Quantitative Relations and Qualitative Composition of the Bottom Fauna of the Konin Lakes Complex, (In Polish),
W77-06749 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin III. An Effort to Explain the Causes and Results of Changes in the Bottom Fauna of Lakes as Influenced by the Inflow of Heated Waters, (In Polish),
W77-06751 5C

The Influence of Heated Effluent Waters on the Water Chemism of Konin Lakes, (In Polish),
W77-06753 5C

Occurrence and Growth of Dreissena Polymorpha Pall. in Lakes Included in a Cooling System, (In Polish),
W77-06754 5C

The Influence of Heated Effluent Waters on the Thermal-Oxygen Relations and Water Transparency in the Konin Lakes Complex, (In Polish),
W77-06756 5C

POLAR REGIONS
Devon Island Ice Cap: Core Stratigraphy and Paleoclimate,
W77-06890 2C

POLIOVIRUS 1
Persistence of Poliovirus 1 in Soil and on Vegetables Grown in Soil Previously Flooded with Inoculated Sewage Sludge or Effluent,
W77-07050 5C

POLITICAL ASPECTS
Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

POLITICAL CONSTRAINTS
Polluters' Profits and Political Response: Direct Control Versus Taxes: Comments and Reply,
W77-06700 5G

POLLUTANT IDENTIFICATION
Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

The Measurement of Temperature Tolerance: Verification of an Index,
W77-06764 5C

Water Chemistry and Water Quality,
W77-06778 5A

Identity, Origin and Development of Off-Flavors in Great Lakes Anadromous Fish,
W77-06931 5A

Blank and Salinity Corrections for Automated Nutrient Analysis of Estuarine and Sea Waters,
W77-06938 5A

Adenosine Triphosphate (ATP) Levels in Microbial Cultures and a Review of the ATP Biomass Estimation Technique,
W77-06942 5A

Automated Method for the Determination of the Phosphorus Content of Detergents,
W77-06944 5A

Determination of Free Formic and Acetic Acids by Gas Chromatography Using the Flame Ionization Detector,
W77-06961 5A

Characterization of Soluble Organic Matter in Leachate,
W77-07039 5A

Forms of Sulfur in Sewage Sludge,
W77-07044 5A

Drugs and Drug Metabolites as Environmental Contaminants: Chlorophenoxyisobutyrate and Salicylic Acid in Sewage Water Effluent,
W77-07045 5A

The Chemical Characteristics of the City of Winnipeg Waste Water,
W77-07047 5A

Escherichia Coli as a Sanitary-Indicator Microorganism, (In Russian),
W77-07067 5A

Quantitative Analysis of Enteroviruses in Water with Various Degrees of Pollution, (In Russian),
W77-07070 5A

Water Quality Investigations in the South Platte River Basin, Colorado, 1971-72.
W77-07076 5A

The Electrolytic Respirometer-II. Use in Water Pollution Control Plant Laboratories,
W77-07081 5D

Concentration and Determination of Trace Organic Pollutants in Water,
W77-07098 5A

POLLUTANTS
Loss of 2,4-D in Runoff from Plots Receiving Simulated Rainfall and from a Small Agricultural Watershed,
W77-06908 5B

POLLUTION ABATEMENT
The Generation of Residual Flows in Norway: An Input-Output Approach,
W77-06698 5G

Uncertainty and the Choice of Pollution Control Instruments,
W77-06704 6G

Optimal Investment in Pollution Control Capital in a Neoclassical Growth Context,
W77-06705 6G

An Input-Output Analysis of Environmental Preservation,
W77-06706 6G

USGS Scientists Bring California Water Supply into Compliance with Federal Regulations,
W77-06853 5G

Pollution Prevention, Not Control Called Key to a Clean Environment.
W77-06861 5G

Chicago Drives Large Bores to Control Combined Sewage Flow.
W77-06988 8E

POLLUTION LICENSES
Polluters' Profits and Political Response: Direct Control Versus Taxes: Comments and Reply,
W77-06700 5G

POLLUTION SOURCE CONTROL
Pollution Prevention, Not Control Called Key to a Clean Environment.
W77-06861 5G

POLLUTION TAXES (CHARGES)
Polluters' Profits and Political Response: Direct Control Versus Taxes: Comments and Reply,
W77-06700 5G

Effluent Charges and Pollution Control: A Case Study,
W77-06701 5G

Uncertainty and the Choice of Pollution Control Instruments,
W77-06704 6G

POLLUTION THRESHOLD
Regulating Activities with Catastrophic Environmental Effects,
W77-06703 6G

POLYCHLORINATED BIPHENYLS
An Offshore Biomonitoring System for Chlorinated Hydrocarbons,
W77-06641 5A

Adsorption of Polychlorinated Biphenyl (Aroclor 1254) on Shrimp,
W77-06758 5C

Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

Burning Waste Chlorinated Hydrocarbons in a Cement Kiln,
W77-06946 5E

POLYMERS
Process for the Treatment of Waste Water by Heterogeneous Photosensitized Oxidation,
W77-07006 5D

The Use of Polymers for Improving Chemical Sludge Dewatering on Sand Beds,
W77-07033 5D

Purifying Water,
W77-07061 5D

POLYNOMIAL PROCEDURE
An Approximating Polynomial for the Computation of Saturation Vapor Pressure,
W77-06652 2B

PONDS
Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

Experiment with a Multipoint System for Judging Carp Fattening Ponds, (In Russian),
W77-06798 2H

Method of Waste Treatment and Algae Recovery,
W77-07003 5D

POP-EYE
First Reported Incidence of Gas-Bubble Disease in the Heated Effluent of a Steam Generating Station,
W77-06922 5C

POPULATION
Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

PORT SAID
Effect of the Nile Flood on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-06907 2L

POTABLE WATER
Means for Protecting the Drinking Water Quality of Lake George, New York,
W77-06682 5G

POTASSIUM
Potassium in an Arid Loessial Soil: Changes in Availability as Related to Cropping and Fertilization,
W77-06870 3F

Bonding of Calcium and Potassium by Vermiculite and Kaolinite Clays as Affected by H-Clay Addition,
W77-06872 2G

POTATO PROCESSING WASTES
State-of-the-Art Review of Processes for Treatment and Reuse of Potato Wastes,
W77-06949 5D

POTATOES
Drying Potato Wastes for Animal Feed as an Alternative Disposal Method.
W77-06947 5D

POTENTIAL FLOW
Performance of a Recharge and Recovery System in an Aquifer with Uniform Flow,
W77-06905 2F

POWDER DRAINAGE BASIN (OR)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

POWER OPERATIONS AND MAINTENANCE
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

POWER PLANTS
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

POWERPLANTS
Optimization Model of a System of Two Open-Channel Hydroplants,
W77-06716 4A

An Annular Flow Ice-Water Model Heat Sink,
W77-06889 2C

PRECIPITATION (ATMOSPHERIC)
The Distribution of Natural and Anthropogenic Elements and Compounds in Precipitation Across the U.S.; Theory and Quantitative Models,
W77-06675 2B

Lake St. Clair Hydrologic Transfer Factors.
W77-06879 2H

PREDATION
Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06620 5A

PRESERVATION
The Mammalian and Fish Fauna of the Nature Preserve of Martely, (In Hungarian),
W77-06838 6G

PRESSURE
Effects of Pressure, Temperature and Oxygen on the Oxygen-Consumption Rate of the Midwater Copepod Gaussia Princeps,
W77-06642 5C

PRIBILOF ISLANDS
Reproductive Ecology of Pribilof Island Seabirds,
W77-06809 6G

PRICE CURRENT METERS
A Universal Calibration Equation for Price Meters and Similar Instruments,
W77-06943 7B

PRICING
Collective Utility: A Systems Approach to Water Pricing Policy,
W77-06712 6C

PRIMARY PRODUCTION
Loch Ewe Bag Experiment, 1974,
W77-06627 5A

Long-Term Changes of the Pelagic Primary Production in Heated Lakes, (In Polish),
W77-06755 5C

PRIMARY PRODUCTIVITY
Primary and Secondary Production of Plankton in Heated Lakes, (In Polish),
W77-06752 5C

Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

PRODUCTIVITY
The Fauna of the Polluted River Tees Estuary,
W77-06638 5C

Foam and Film of Fresh Waters as an Ecological Niche of Aquatic Hyphomycetes, (In Russian),
W77-06787 2I

Experiment with a Multipoint System for Judging Carp Fattening Ponds, (In Russian),
W77-06798 2H

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

PROFILES
Profiles and Evaporation,
W77-06898 2D

PROJECTIONS
Presenting Trends in Lake Eutrophication,
W77-06693 5C

PROJECTS
General Description of the Vistula River Project and Basic Planning Data,
W77-06733 4A

PROTOZOA
Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

The Toxic Effects of Selected Heavy Metals on Unadapted Populations of Vorticella Convallaria Var Similis,
W77-06636 5C

PRUDHOE BAY
Avifaunal Utilization of the Offshore Island Area Near Prudhoe Bay, Alaska,
W77-06812 6G

PUBLIC HEALTH
Health Effects of Multipurpose Use of Water,
W77-06775 5C

PUBLIC INVESTMENT
The Growth Shapers: The Land Use Impacts of Infrastructure Investments.
W77-06601 6D

PUBLIC PARTICIPATION
Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

PUBLICATIONS
Preliminary Bibliography on Groundwater in Developing Countries,
W77-06852 2F

PUERTO RICO
Particle Characteristics and Dispersal Patterns of Sugar Cane Wastes in Selected Rivers and Estuaries of Puerto Rico,
W77-06632 5B

PUGET SOUND
A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

PULP AND PAPER INDUSTRY
Literature Review of Wastewater Characteristics and Abatement Technology in the Wood and Timber Processing Industry.
W77-06951 5D

PULP WASTES
Activated Sludge Treatment of High Strength NSSC Mill Effluent,
W77-06945 5D

PUMPING
Hydraulics and Economics of Well Field Layout.
W77-06863 8B

Tables and Type Curves for Analysis of Pump Tests in Leaky Parallel-Channel Aquifers,
W77-06941 4B

PUMPKINSEED
Seasonal changes in the Respiration of Pumpkinseed, Lepomis Gibbosus, Correlated with Temperature, Day Length, and Stage of Reproductive Development,
W77-06768 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

PUMPS
It's All on the Nameplate: Everything You Always Wanted to Know About Jet Pumps,
W77-06854 8C

Pumping Systems: The Simpler, The Better,
W77-06856 8C

Submersible Pump Design: Dependent on Well Diameter and Depth.
W77-06867 8C

How to Deal with Pitting and Corrosion.
W77-06869 8G

QUANTITATIVE MODELS
The Distribution of Natural and Anthropogenic Elements and Compounds in Precipitation Across the U.S.; Theory and Quantitative Models,
W77-06675 2B

QUATERNARY PERIOD
Nile Cone: Late Quaternary Stratigraphy and Sediment Dispersal,
W77-06650 2L

QUEBEC
A Note on Temperature and Humidity Profile Measurement Over Forests Using Diodes,
W77-06653 7B

RADIO-CHEMICAL ANALYSIS
Stable Elements of Radioecological Importance in Certain Echinoderm Species,
W77-06640 5A

RADIOACTIVE WASTE DISPOSAL
Review and Analysis of Hydrogeologic Conditions Near the Site of a Potential Nuclear-Waste Repository, Eddy and Lea Counties, New Mexico,
W77-06974 5B

RADIOACTIVE WASTES
Stable Elements of Radioecological Importance in Certain Echinoderm Species,
W77-06640 5A

RADIOECOLOGY
Stable Elements of Radioecological Importance in Certain Echinoderm Species,
W77-06640 5A

RADIOISOTOPES
Effects of Various Ecological Factors on Radiostrontium Uptake in Two Euryhaline Teleosts: Mugil Auratus Risso and Pleuronectes Platessal, (Influence de Divers Facteurs Ecologiques Sur L'Accumulation du Radiostrontium Chez Deux Teleosteens Euryhalins: Mugil Auratus Risso et Pleuronectes Platessa L.),
W77-06777 5C

Particulate Transport of Radionuclides 14C and 55Fe to Deep Waters in the Pacific Ocean,
W77-06902 5B

Application of Digital Modelling to the Prediction of Radioisotope Migration in Groundwater,
W77-06981 5B

RAIN
Investigation of Precipitation Within Forest Ecosystems, (In Hungarian),
W77-06797 2B

RAINBOW TROUT
Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
W77-06639 5C

Ammonia Concentration in Relation to Ammonia Toxicity During a Rainbow Trout Rearing Experiment in a Closed Freshwater-Seawater System,
W77-06743 5C

Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

RAINFALL
Weather Modification in the Soviet Union--1976,
W77-06644 3B

Area-Depth Relations for Frequency Values of Rainfall,
W77-06647 2B

Investigation of Precipitation Within Forest Ecosystems, (In Hungarian),
W77-06797 2B

Time-Distribution of Storm Rainfall in Pennsylvania,
W77-07022 2B

RAINWATER MEASUREMENT
Investigation of Precipitation Within Forest Ecosystems, (In Hungarian),
W77-06797 2B

RARITAN BAY (NY)
Correlation Coefficients and Concentration Factors of Copper and Lead in Seawater and Benthic Algae,
W77-06783 5C

RARITAN RIVER (NJ)
Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
W77-06953 4A

RECHARGE WELLS
Performance of a Recharge and Recovery System in an Aquifer with Uniform Flow,
W77-06905 2F

RECLAIMED WATER
Renovated Water from Municipal Sewage Treatment Plants,
W77-07086 5D

RECREATION
A New Reservoir and Recreational Behavior,
W77-06956 6B

RECREATION PARTICIPATION RATES
A New Reservoir and Recreational Behavior,
W77-06956 6B

RECYCLING
State-of-the-Art Review of Processes for Treatment and Reuse of Potato Wastes,
W77-06949 5D

Recycling of Aluminum Used for Phosphate Removal in Domestic Waste Water Treatment,
W77-07099 5D

REDLANDS (CALIF)
USGS Scientists Bring California Water Supply into Compliance with Federal Regulations,
W77-06853 5G

REEFS
Evidence for Strong Currents and Turbulence in a Deep Coral Reef Groove,
W77-06904 2L

REGENERATION BRINES
Septic Tank Study is Off and Running.
W77-06859 5D

REGIONAL ANALYSIS
Two-Goal Regional Environmental Policy: The Case of the Santa Ana River Basin,
W77-06707 5G

REGIONAL DEVELOPMENT
Two-Goal Regional Environmental Policy: The Case of the Santa Ana River Basin,
W77-06707 5G

A Sector Model for Regional and National Water Resources Planning,
W77-06731 6A

REGIONAL PLANNING
Use of a Parametric Model as a Tool for Hydrometric Network Planning,
W77-06710 2A

REGRESSION ANALYSIS
Surface Water Network Design by Regression Analysis Simulation,
W77-06963 2E

REGULATION
Regulating Activities with Catastrophic Environmental Effects,
W77-06703 6G

Methods for Control of the Regimes for Water Resources Systems,
W77-06717 4A

Streamflow Regulation by Artificial Recharge Fed from Upstream Surface Storage: Derivation of Control Rules,
W77-06725 4A

The Significance of Regulating the Water Regime of Agricultural Lands, (In Russian),
W77-06837 3F

RELEASE RULES
Optimal Seasonal and Short-Term Operation of a Reservoir Used for Flood Control and Water Supply,
W77-06724 4A

REMOTE SENSING
Application of Landsat to the Surveillance and Control of Eutrophication in Saginaw Bay,
W77-06665 5A

Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

A Study of the Utilization of EREP Data from the Wabash River Basin,
W77-06670 7B

The Use of Remote Sensing to Detect How Wind Influences Planktonic Blue-Green Algal Distribution,
W77-06697 5C

A Single Field of View Method for Retrieving Tropospheric Temperature Profiles from Cloud-Contaminated Radiance Data,
W77-06887 2B

Use of Remote Sensing to Quantify Construction Material and to Define Geologic Lineations; Dickey-Lincoln School Lakes Project, Maine,
W77-06888 8D

Hydrologic Interpretation of Geophysical Data from the Southeastern Hueco Bolson, El Paso and Hudspeth Counties, Texas,
W77-06970 4B

Improving Estimates of Streamflow Characteristics Using LANDSAT-1 (ERTS-1) Imagery,
W77-06972 4A

REPAIRING
Cincinnati's Preventive Maintenance Sewer Program.
W77-06989 5G

REPRODUCTION
Notes on the Nesting Success and Fecundity of the Anemonefish Amphiprion Clarkii at Miyake-Jima, Japan,
W77-06763 5C

Reproductive Cycle of Trout and Tench: Effect of Experimental Variations of the Temperature, (Etude Sur le Cycle Reproducteur do la Truite Arc-En-Ciel et de la Tanche: Effet de Variations Experimentales de la Temperature),
W77-06779 5C

RESEARCH
Mathematical Models in Hydrology.
W77-06708 2A

RESERVOIR OPERATION
Optimal Operations of Reservoirs in the Harz Mountains,
W77-06715 4A

Optimal Design and Operation of Reservoir Systems,
W77-06721 4A

Optimal Seasonal and Short-Term Operation of a Reservoir Used for Flood Control and Water Supply,
W77-06724 4A

RESERVOIR RELEASES
Optimal Operations of Reservoirs in the Harz Mountains,
W77-06715 4A

RESERVOIR STORAGE
Optimal Operations of Reservoirs in the Harz Mountains,
W77-06715 4A

RESERVOIRS
Measurements of Planktonic Biomass in a Reservoir,
W77-06679 5A

Stratification of Kinetic Origin and its Biological Consequences in a Neotropical Man-Made Lake,
W77-06683 2H

On the Application of Optimization Techniques to Conceptual Catchment Models,
W77-06709 2A

Optimization of a Three-Reservoir System by Dynamic Programming,
W77-06720 4A

Optimal Planning of Flows in Multi-Reservoir Hydro-Power Systems,
W77-06730 4A

The Multi-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06734 4A

The Out-of-Kilter Algorithm as a Single-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06735 4A

Changes in the Structure of Phytoplankton During the First Years of Existence of the Derdap Storage Reservoir, (In Serbo-Croatian),
W77-06786 2H

A New Reservoir and Recreational Behavior,
W77-06956 6B

RESISTANCE
Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

RESOURCE DEVELOPMENT
Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
W77-06829 6G

Razor Clam (Siliqua Patula, Dixon) Distribution and Population Assessment Study,
W77-06830 6G

RESOURCES DEVELOPMENT
Design Study of Environmental and Human Cultural Information System Needs in Urban Water Resource Development,
W77-06634 6B

Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 1: Marine Mammals, Marine Birds.
W77-06793 6G

Baseline Characterization of Marine Mammals in the Bering Sea,
W77-06794 6G

Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska,
W77-06795 6G

Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
W77-06796 6G

The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
W77-06799 6G

An Aerial Census of Spotted Seals, Phoca Vitulina Largha,
W77-06800 6G

Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska,
W77-06804 6G

Identification, Documentation, and Delineation of Coastal Migratory Bird Habitat in Alaska, and the Distribution, Abundance and Feeding Ecology of Birds Associated with Pack Ice,
W77-06805 6G

Ecosystem Dynamics Birds and Marine Mammals. Part I: Preliminary Estimates of Pinniped - Finfish Relationships in the Bering Sea,
W77-06806 6G

Ecosystem Dynamics Birds and Marine Mammals. Part II: Food Web Structure and Trophic Relations of Bering Sea Avifauna (Preliminary Report),
W77-06807 6G

Ecosystem Dynamics Birds and Marine Mammals. Part III: A Dynamic Numerical Marine Ecosystem Model for Evaluation of Marine Resources in Eastern Bering Sea,
W77-06808 6G

Reproductive Ecology of Pribilof Island Seabirds,
W77-06809 6G

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W77-06810 6G

Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

Preliminary Catalog of Seabird Colonies and Photographic Mapping of Seabird Colonies,
W77-06816 6G

Review and Analysis of Literature and Unpublished Data on Marine Birds,
W77-06817 6G

Migration of Birds in Alaska Coastal and Marine Habitats Subject to Influence by OCS Development,
W77-06818 6G

Feeding Ecology and Trophic Relationships of Alaskan Marine Bird, and Population Dynamics of Marine Birds,
W77-06819 6G

Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

Studies of Populations, Community Structure and Colony of Marine Birds at King Island, Bering Strait Region, Alaska,
W77-06821 6G

Avian Community Ecology of the Akulik - Inglutalik River Delta, Norton Bay, Alaska,
W77-06822 6G

A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
W77-06824 6G

Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports July-September 1976. Volume 2: Fish, Plankton, Benthos, Littoral.
W77-06825 6G

The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
W77-06826 6G

Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
W77-06828 6G

Resources of Non-Salmonid Pelagic Fish of the Eastern Bering Sea and the Gulf of Alaska,
W77-06832 6G

Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

LIBRARY U. OF I. URBANA-CHAMPAIGN

Plankton of the Gulf of Alaska - Ichthyoplankton,
W77-06834 6G

Initial Zooplankton Investigations in Lower Cook Inlet,
W77-06835 6G

Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chukchi Sea,
W77-06839 6G

Beaufort Sea Estuarine Fishery Study,
W77-06840 6G

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W77-06842 6G

Reconnaissance Characterization of Littoral Biota, Beaufort and Chukchi Seas,
W77-06843 6G

Ichthyoplankton of the Eastern Bering Sea,
W77-06845 6G

Assessment of Pelagic and Nearshore Fish in Three Bays on Southeast Kodiak Island,
W77-06846 6G

Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
W77-06847 6G

Technical Trawl Survey of the Benthic Epifauna of the Chukchi Sea and Norton Sound.
W77-06848 6G

The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

A Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment and Baseline Study Guidelines.
W77-06850 5A

The New York Bight Project - 1975; Stony Brook, Long Island, New York.
W77-06876 5G

A Test Particle Dispersion Study in Massachusetts Bay.
W77-06880 2L

Mississippi Sound Temporal and Spatial Distribution of Nutrients,
W77-06932 5B

State Information Needs Related to Onshore and Nearshore Effects of OCS Petroleum Development,
W77-06934 6G

Who's Minding the Shore. A Citizens' Guide to Coastal Management,
W77-06935 5G

RESPIRATION

Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

Seasonal changes in the Respiration of Pumpkinseed, Lepomis Gibbosus, Correlated with Temperature, Day Length, and Stage of Reproductive Development,
W77-06768 5C

Respiratory Response of Cunners to Silver,
W77-06789 5C

The Electrolytic Respirometer-II. Use in Water Pollution Control Plant Laboratories,
W77-07081 5D

RETENTION

A Method of Evaluating a Field Water Capacity Using PF-3, (In French),
W77-06844 2G

REVIEWS

Climatology for Geographers,
W77-06659 2B

State-of-the-Art Review of Processes for Treatment and Reuse of Potato Wastes,
W77-06949 5D

Literature Review of Wastewater Characteristics and Abatement Technology in the Wood and Timber Processing Industry.
W77-06951 5D

RHEOTAXIS

A Biological Monitoring System Employing Rheotaxis of Fish,
W77-06609 5C

RICE

Salinity Effects on Rice After the Boot Stage,
W77-06871 3C

RICE PADDY

Salinity Effects on Rice After the Boot Stage,
W77-06871 3C

RIFFLE INVERTEBRATES

The Effects of Methoxychlor on Riffle Invertebrate Populations and Communities,
W77-06614 5C

RISKS

Uncertainty and the Choice of Pollution Control Instruments,
W77-06704 6G

RIVER BASIN DEVELOPMENT

Hydrological Evaluation of Changes in Runoff Characteristics,
W77-06732 4A

General Description of the Vistula River Project and Basic Planning Data,
W77-06733 4A

RIVER BASINS

Two-Goal Regional Environmental Policy: The Case of the Santa Ana River Basin,
W77-06707 5G

Mathematical Model of Water Resources Utilization in a River Basin,
W77-06719 4A

Modele Mathematique de Simulation du Systeme des Ressources Hydrauliques Superficielles du Llobregat,
W77-06727 4A

Conjunctive Use of the Tajo-Segura Aqueduct Surface System and the Aquifers of the La Mancha Area,
W77-06728 4B

The Multi-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06734 4A

The Out-of-Kilter Algorithm as a Single-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06735 4A

River Basin Snow Mapping at the National Environmental Satellite Service,
W77-06915 2C

RIVER FLOW

Delaware River: Evidence for Its Former Extension to Wilmington Submarine Canyon,
W77-06966 2E

RIVER LLOBREGAT (SPAIN)

Modele Mathematique de Simulation du Systeme des Ressources Hydrauliques Superficielles du Llobregat,
W77-06727 4A

RIVER SYSTEMS

Optimization of a Three-Reservoir System by Dynamic Programming,
W77-06720 4A

The Methods of Distribution of Water Resources in River Development Systems,
W77-06726 4A

RIVER TEES ESTUARY (ENGLAND)

The Fauna of the Polluted River Tees Estuary,
W77-06638 5C

RIVERS

Water Quality Simulation of Tahoe-Truckee System, Nevada-California-Volume I,
W77-07075 5B

Water Quality Investigations in the South Platte River Basin, Colorado, 1971-72.
W77-07076 5A

RNA SYNTHESIS

LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

ROAD CONSTRUCTION

Sediment Discharge from an Area of Highway Construction, Applemans Run Basin, Columbia County, Pennsylvania,
W77-06969 4C

ROCK MECHANICS

Conference on Research in Tunneling and Excavation Technology,
W77-06885 8E

ROOT DISTRIBUTION

Copper Sulfate Fights Root Growth in Sewer Systems,
W77-06991 8G

ROOT SYSTEMS

Copper Sulfate Fights Root Growth in Sewer Systems,
W77-06991 8G

ROTARY DRILLING

One Good Idea Spurs Another.
W77-06860 8C

ROTENONE
Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

RUNOFF
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

Hydrological Evaluation of Changes in Runoff Characteristics,
W77-06732 4A

Antierosion Role of Forest Plantings in the Steppe Zone of the Moldavian SSR, (In Russian),
W77-06745 4C

Lake St. Clair Hydrologic Transfer Factors.
W77-06879 2H

Chicago Drives Large Bores to Control Combined Sewage Flow.
W77-06988 8E

SAGINAW BAY (MICH)
Application of Landsat to the Surveillance and Control of Eutrophication in Saginaw Bay,
W77-06665 5A

SALINE WATER-FRESHWATER INTERFACES
Waste Injection into Stratified Ground Water Bodies,
W77-06855 5B

SALINITY
Temperature, Salinity and Light Penetration Structures: Controlled Ecosystem Pollution Experiment,
W77-06626 5A

Effect of Salinity on Spore Germination of Terrestrial and Marine Fungi,
W77-06772 5C

Effects of Various Ecological Factors on Radiostrontium Uptake in Two Euryhaline Teleosts: Mugil Auratus Risso and Pleuronectes Platessal, (Influence de Divers Facteurs Ecologiques Sur L'Accumulation du Radiostrontium Chez Deux Teleosteens Euryhalins: Mugil Auratus Risso et Pleuronectes Platessa L.),
W77-06777 5C

Salinity Effects on Rice After the Boot Stage,
W77-06871 3C

Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

Blank and Salinity Corrections for Automated Nutrient Analysis of Estuarine and Sea Waters,
W77-06938 5A

SALMON
Changes in the Blood Chemistry of Coho Salmon Exposed to Malachite Green,
W77-06746 5C

Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

Identity, Origin and Development of Off-Flavors in Great Lakes Anadromous Fish,
W77-06931 5A

SALMONIDS
Ammonia Concentration in Relation to Ammonia Toxicity During a Rainbow Trout Rearing Experiment in a Closed Freshwater-Seawater System,
W77-06743 5C

SALT TOLERANCE
Salinity Effects on Rice After the Boot Stage,
W77-06871 3C

SALTS
Some Factors Affecting Floc Formation by Zoogloea Ramigera, Strain I-16-M,
W77-07042 5D

SAMPLING
A Pneumatic Grab for Obtaining Large, Undisturbed Mud Samples: Its Construction and Some Applications for Measuring the Growth of Larvae and Emergence of Adult Chironomidae,
W77-06613 5A

Zooplankton Sampling Variability: Controlled Ecosystem Pollution Experiment,
W77-06615 5A

An Estimate of the Input of Atmospheric Trace Elements into the North Sea and the Clyde Sea (1972-3),
W77-06668 5B

Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

Electrically Powered Sampler for Benthic Macroinvertebrates,
W77-06757 7B

High Seas Oil Pollution: Particulate Petroleum Residues in the North Atlantic,
W77-06911 5B

SAN BERNADINO (CALIF)
USGS Scientists Bring California Water Supply into Compliance with Federal Regulations,
W77-06853 5G

SAN DIEGO AQUEDUCT (CALIF)
Comprehensive Monitoring of Meteorology, Hydraulics, and Thermal Regime of the San Diego Aqueduct, California,
W77-06973 2D

SANDS
Methane-Derived Carbonate Cements in Barrier and Beach Sands of a Subtropical Delta Complex,
W77-06677 2L

Depth and Seasonal Fluctuations in the Condition of the Groundwater of the Area Around the City of Ghent (Belgium), (In Dutch),
W77-06681 2G

SANTA ANA RIVER BASIN (CALIF)
Two-Goal Regional Environmental Policy: The Case of the Santa Ana River Basin,
W77-06707 5G

SATELLITE (ARTIFICIAL)
Improving Estimates of Streamflow Characteristics Using LANDSAT-1 (ERTS-1) Imagery,
W77-06972 4A

SATELLITES (ARTIFICIAL)
A Study of the Utilization of EREP Data from the Wabash River Basin,
W77-06670 7B

A Single Field of View Method for Retrieving Tropospheric Temperature Profiles from Cloud-Contaminated Radiance Data,
W77-06887 2B

SATURATION
An Approximating Polynomial for the Computation of Saturation Vapor Pressure,
W77-06652 2B

SCHEDULING
A Sector Model for Regional and National Water Resources Planning,
W77-06731 6A

SCHINDLER PLANKTON TRAP
Zooplankton Sampling Variability: Controlled Ecosystem Pollution Experiment,
W77-06615 5A

SCREENS
Screenings Dewatering Press.
W77-07029 5D

SEA-CLIFF BIRDS
A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

SEA WATER
Temperature, Salinity and Light Penetration Structures: Controlled Ecosystem Pollution Experiment,
W77-06626 5A

The Solubility of Nitrogen, Oxygen and Argon in Water and Seawater,
W77-06923 5C

Blank and Salinity Corrections for Automated Nutrient Analysis of Estuarine and Sea Waters,
W77-06938 5A

SEALS (SPOTTED)
An Aerial Census of Spotted Seals, Phoca Vitulina Largha,
W77-06800 6G

SEASONAL
Seasonal changes in the Respiration of Pumpkinseed, Lepomis Gibbosus, Correlated with Temperature, Day Length, and Stage of Reproductive Development,
W77-06768 5C

SECONDARY PRODUCTIVITY
Primary and Secondary Production of Plankton in Heated Lakes, (In Polish),
W77-06752 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

SEDIMENT CONTROL
Debris Basins for Control of Surface Mine Sedimentation,
W77-06672 5G

Diminution Ratios for Planning Construction-Area Sediment Controls,
W77-06980 4D

SEDIMENT DISCHARGE
Antierosion Role of Forest Plantings in the Steppe Zone of the Moldavian SSR, (In Russian),
W77-06745 4C

SEDIMENT-RUNOFF MODEL
Sediment Yield Prediction Based on Watershed Hydrology,
W77-06656 4D

SEDIMENT TRANSPORT
A Self-Contained Facility for Analyzing Near-Bottom Flow and Associated Sediment Transport,
W77-06874 2L

A Test Particle Dispersion Study in Massachusetts Bay.
W77-06880 2L

Littoral Drift Estimates Along the Coastline of Florida,
W77-06882 2L

Incipient Sediment Motion in Entrances with Shell Beds,
W77-06930 2L

Characteristics of Water Flow at the North End of the Wassaw Barrier Island Complex. Wassaw Island Erosion Study, Part II,
W77-06939 2J

Changing Needs and Opportunities in the Sediment Field,
W77-06964 2J

Sediment Discharge from an Area of Highway Construction, Applemans Run Basin, Columbia County, Pennsylvania,
W77-06969 4C

SEDIMENT-WATER INTERFACES
The Historic and Present Relationships Between Phytoplankton, Limiting Nutrients, and Sediment-Water Geochemical Processes in Selected Maine Lakes,
W77-06741 5C

SEDIMENT YIELD
Sediment Yield Prediction Based on Watershed Hydrology,
W77-06656 4D

Current Methods Used in the Soil Conservation Service to Estimate Sediment Yield,
W77-06657 4D

Changing Needs and Opportunities in the Sediment Field,
W77-06964 2J

Sediment Discharge from an Area of Highway Construction, Applemans Run Basin, Columbia County, Pennsylvania,
W77-06969 4C

SEDIMENTATION
Nile Cone: Late Quaternary Stratigraphy and Sediment Dispersal,
W77-06650 2L

Monitoring the Marine Environment Through Sedimentation,
W77-06651 2L

An Executive Summary of Three EPA Demonstration Programs in Erosion and Sediment Control,
W77-06671 5G

Characteristics of Water Flow at the North End of the Wassaw Barrier Island Complex. Wassaw Island Erosion Study, Part II,
W77-06939 2J

Sand Stabilization on the Dunes, Beach and Shoreface of a Historically Eroding Barrier Island. Wassaw Island Erosion Study, Part III,
W77-06940 8G

Changing Needs and Opportunities in the Sediment Field,
W77-06964 2J

Design and Control of Secondary Settlement Tanks,
W77-07015 5D

Renovated Water from Municipal Sewage Treatment Plants,
W77-07086 5D

SEDIMENTATION RATES
Current Methods Used in the Soil Conservation Service to Estimate Sediment Yield,
W77-06657 4D

Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

SEDIMENTS
Effects of Various Ecological Factors on Radiostrontium Uptake in Two Euryhaline Teleosts: Mugil Auratus Risso and Pleuronectes Platessal, (Influence de Divers Facteurs Ecologiques Sur L'Accumulation du Radiostrontium Chez Deux Teleosteens Euryhalins: Mugil Auratus Risso et Pleuronectes Platessa L.),
W77-06777 5C

Iron-Rich Rhythmically Laminated Sediments in Lake of the Clouds, Northeastern Minnesota,
W77-06901 2J

Particulate Transport of Radionuclides 14C and 55Fe to Deep Waters in the Pacific Ocean,
W77-06902 5B

SEEPAGE
Pollutant Movement to Shallow Ground Water Tables from Swine Waste Lagoons,
W77-06742 5B

A Device for Measuring Seepage Flux in Lakes and Estuaries,
W77-06903 7B

SEEPAGE FLUX
A Device for Measuring Seepage Flux in Lakes and Estuaries,
W77-06903 7B

SEISMIC STUDIES
Delaware River: Evidence for Its Former Extension to Wilmington Submarine Canyon,
W77-06966 2E

SELF PURIFICATION
Mixing and Circulation of Lakes and Reservoirs with Air Plumes,
W77-06633 5G

On the Self-Purification of Natural Waters, (In German),
W77-07038 5G

SENSORS
NASA Develops Water Monitoring System,
W77-06912 5A

SEPARATION TECHNIQUE
Clarifier with Overflow Scum Removal,
W77-07092 5D

SEPARATION TECHNIQUES
Partial Extraction of Metals from Aquatic Sediments,
W77-06781 5A

Sludge Separator.
W77-06998 5D

Apparatus for Disposal of Effluents.
W77-07002 5E

Device for Sucking the Upper Layer of a Polluted Water Surface,
W77-07089 5G

SEPTIC TANKS
Anaerobic Digestion and Membrane Separation for the Treatment of Domestic Sewage,
W77-06631 5D

Nutrient Removal and Sludge Disposal Within Septic Systems-Phase III,
W77-06686 5D

Septic Tank Study is Off and Running.
W77-06859 5D

Fate of Nitrogen and Phosphorus in Soils Under Septic Tank Waste Disposal Fields,
W77-06914 5B

The Plight and Promise of On-Site Waste Water Treatment,
W77-07010 5D

SETTLING BASINS
Design and Control of Secondary Settlement Tanks,
W77-07015 5D

The Fabric-Lined Purification Basin.
W77-07035 5D

SEWAGE
New Programs Improve Sensitive Areas of Water and Sewer Systems,
W77-06995 8G

SEWAGE BACTERIA
Septic Tank Study is Off and Running.
W77-06859 5D

SEWAGE DISPOSAL
Phosphates in Soils Treated with Sewage Water: II. Fractionation of Accumulated Phosphates,
W77-07053 5B

Land Application of Sewage Sludge: IV. Wheat Growth, N Content, N Fertilizer Value, and N Use Efficiency as Influenced by Sewage Sludge and Wood Waste Mixtures,
W77-07079 5D

Sludge Dewatering Pilot Plant Design. Part 2,
W77-07088 5D

SEWAGE EFFLUENTS
NASA Develops Water Monitoring System,
W77-06912 5A

Elimination of Anaerobic Digester Supernatant,
W77-07059 5D

SEWAGE SLUDGE
Laboratory Studies on the Effect of Metals on Oxygen Uptake by Sewage Sludge in Brackish Water,
W77-06788 5C

Acid Solubilization of Sewage Sludge and Ash Constituents for Possible Recovery,
W77-07017 5E

Forms of Sulfur in Sewage Sludge,
W77-07044 5A

Application of Municipal Refuse and Liquid Sewage Sludge to Agricultural Land: II. Lysimeter Study,
W77-07080 5D

Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

SEWAGE TREATMENT
Sewage Aeration Impeller-With Automatic De-Icing and Anti-Clogging System,
W77-07001 5D

Method of Waste Treatment and Algae Recovery,
W77-07003 5D

Treatment of Sewage by Electrons and Gammas,
W77-07012 5D

Fast-Tracking Cuts Costs 16% on Advanced Waste Water Plant.
W77-07016 5D

Study on Sewage Flow Dynamics Through Dorr Type Clarifier on Stream, (Synopsis),
W77-07048 5D

Phosphates in Soils Treated with Sewage Water: I. General Information on Sewage Farm, Soil, and Treatment Results,
W77-07052 5G

SEWARD PENINSULA (ALAS)
Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

SEWERAGE
Anaerobic Digestion and Membrane Separation for the Treatment of Domestic Sewage,
W77-06631 5D

Sewerage for a Rural Resort Area,
W77-06987 5D

Cincinnati's Preventive Maintenance Sewer Program.
W77-06989 5G

Preventive Sewer Maintenance Helps Preserve Historic Annapolis.
W77-06990 8G

Copper Sulfate Fights Root Growth in Sewer Systems,
W77-06991 8G

Contract Services Stretch Sewer Maintenance Budget,
W77-06994 8G

The Plight and Promise of On-Site Waste Water Treatment,
W77-07010 5D

New Visibility for On-Site Waste Treatment Systems,
W77-07013 5D

SEWERS
The Growth Shapers: The Land Use Impacts of Infrastructure Investments.
W77-06601 6D

Control Sewer Corrosion with H2O2,
W77-06993 8G

The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

SHADES CREEK BASIN
Urbanization and Flooding in Shades Creek Basin, Jefferson County, Alabama,
W77-06977 4C

SHEET FLOW
Hydraulics of Sheet Flow in Wetlands,
W77-06929 8B

SHELLFISH
Adsorption of Polychlorinated Biphenyl (Aroclor 1254) on Shrimp,
W77-06758 5C

Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
W77-06847 6G

SHORE BIRDS
Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

SHORE PROTECTION
Sand Stabilization on the Dunes, Beach and Shoreface of a Historically Eroding Barrier Island. Wassaw Island Erosion Study, Part III,
W77-06940 8G

SHOREBIRDS
Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

SHRIMP
Adsorption of Polychlorinated Biphenyl (Aroclor 1254) on Shrimp,
W77-06758 5C

SHRINK-SWELL POTENTIAL
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

SILICA
Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

SILICIC ACID UPTAKE
Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

SILVER
Respiratory Response of Cunners to Silver,
W77-06789 5C

SIMULATION ANALYSIS
Mathematical Models in Hydrology.
W77-06708 2A

On Large-Scale Simulation of Groundwater Flow Systems,
W77-06713 4B

Optimal Operations of Reservoirs in the Harz Mountains,
W77-06715 4A

Mathematical Model of Water Resources Utilization in a River Basin,
W77-06719 4A

Optimal Design and Operation of Reservoir Systems,
W77-06721 4A

Construction and Adjustment of a Two-Layer Mathematical Model of the Llobregat Delta,
W77-06722 4A

Modele Mathematique de Simulation du Systeme des Ressources Hydrauliques Superficielles du Llobregat,
W77-06727 4A

Hybrid Computer Analysis of a Combined Surface Water--Groundwater System,
W77-06729 4B

The Multi-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06734 4A

The Out-of-Kilter Algorithm as a Single-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06735 4A

Further Development and Testing of a Stream-Aquifer System Model,
W77-06762 2F

Surface Water Network Design by Regression Analysis Simulation,
W77-06963 2E

SIPHONS
Lake Restoration by Bottom Water Siphoning (In German),
W77-06689 5G

SKAHA LAKE (BRITISH COLUMBIA)
Presenting Trends in Lake Eutrophication,
W77-06693 5C

SKYLAB
A Study of the Utilization of EREP Data from the Wabash River Basin,
W77-06670 7B

SLUDGE
Forms of Sulfur in Sewage Sludge,
W77-07044 5A

LIBRARY U. OF I. URBANA-CHAMPAIGN

SLUDGE

Application of Municipal Refuse and Liquid Sewage Sludge to Agricultural Land: II. Lysimeter Study,
W77-07080 5D

SLUDGE DIGESTION
Acid Solubilization of Sewage Sludge and Ash Constituents for Possible Recovery,
W77-07017 5E

Conditioning and Land Application of Aerobically Digested Sludge,
W77-07058 5D

Elimination of Anaerobic Digester Supernatant,
W77-07059 5D

SLUDGE DISPOSAL
Subsurface Injection-How Much Does It Cost,
W77-07011 5E

Acid Solubilization of Sewage Sludge and Ash Constituents for Possible Recovery,
W77-07017 5E

Fluosolids Incinerator Commissioned at Esher,
W77-07018 5E

Persistence of Poliovirus 1 in Soil and on Vegetables Grown in Soil Previously Flooded with Inoculated Sewage Sludge or Effluent,
W77-07050 5C

Agricultural Disposal of Aerobic Wastewater Sludges in an Urban County,
W77-07057 5D

Conditioning and Land Application of Aerobically Digested Sludge,
W77-07058 5D

Trends in Sludge Treatment and Disposal Practices in the United States,
W77-07083 5D

Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

SLUDGE SEPARATORS
Sludge Separator.
W77-06998 5D

SLUDGE TREATMENT
Electron-Beam Irradiation of Waste Products--e.g., For Sterilization of Sewage Sludge and Waste Industrial Products.
W77-06997 5D

Sludge Separator.
W77-06998 5D

Sludge Incineration at Esher.
W77-07020 5E

Screenings Dewatering Press.
W77-07029 5D

The Use of Polymers for Improving Chemical Sludge Dewatering on Sand Beds,
W77-07033 5D

Trends in Sludge Treatment and Disposal Practices in the United States,
W77-07083 5D

Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

Effect of Water Work's Sludge on Waste Water Treatment,
W77-07085 5D

Sludge Dewatering Pilot Plant Design. Part 2,
W77-07088 5D

Factors Influencing the Dewatering Characteristics of Sludge,
W77-07097 5D

Recycling of Aluminum Used for Phosphate Removal in Domestic Waste Water Treatment,
W77-07099 5D

SNAILS
Temperature Relations of Puget Sound Thaids in Reference to Their Intertidal Distribution,
W77-06767 5C

Dispersal and Dispersion of Pond Snails in an Experimental Environment Varying to Three Factors, Singly and in Combination,
W77-06773 5C

A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

SNAKE RIVER
Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

SNOW SURVEYS
River Basin Snow Mapping at the National Environmental Satellite Service,
W77-06915 2C

SOCIAL ASPECTS
Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
W77-06957 6G

SOCIAL IMPACT
A New Reservoir and Recreational Behavior,
W77-06956 6B

SOCIAL PARTICIPATION
Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

SOCKEYE SALMON
Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
W77-06924 5C

SOIL CHEMICAL PROPERTIES
Indicator Values of Vascular Plants in Central Europe, (In German),
W77-06803 2I

SOIL CONSERVATION
Current Methods Used in the Soil Conservation Service to Estimate Sediment Yield,
W77-06657 4D

SOIL CONTAMINATION
Accumulation of Heavy Metals in Soils from Extended Waste Water Irrigation,
W77-07049 5B

SOIL DISPOSAL FIELD S
Fate of Nitrogen and Phosphorus in Soils Under Septic Tank Waste Disposal Fields,
W77-06914 5B

SOIL EROSION
Sediment Discharge from an Area of Highway Construction, Applemans Run Basin, Columbia County, Pennsylvania,
W77-06969 4C

SOIL MECHANICS
A Laboratory Study of Fluid and Soil Mechanics Processes During Hydraulic Dredging (Hydraulische und Bodentechnische Vorgange beim Grundsaugen),
W77-06883 8D

SOIL MOISTURE
Land Forming Systems to Improve Water Use Efficiency,
W77-06761 3F

Smoothing Data with Cubic Splines,
W77-06831 7C

The Significance of Regulating the Water Regime of Agricultural Lands, (In Russian),
W77-06837 3F

A Method of Evaluating a Field Water Capacity Using PF-3, (In French),
W77-06844 2G

SOIL PROFILES
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

SOIL PROPERTIES
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

SOIL SURVEYS
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

SOIL TEXTURE
Depth and Seasonal Fluctuations in the Condition of the Groundwater of the Area Around the City of Ghent (Belgium), (In Dutch),
W77-06681 2G

SOIL TYPES
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

Nutrient Removal and Sludge Disposal Within Septic Systems-Phase III,
W77-06686 5D

A Laboratory Study of Fluid and Soil Mechanics Processes During Hydraulic Dredging (Hydraulische und Bodentechnische Vorgange beim Grundsaugen),
W77-06883 8D

SOIL WATER MOVEMENT
Suprapermafrost Water,
W77-06630 2C

SOILS
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

Phosphates in Soils Treated with Sewage Water: I. General Information on Sewage Farm, Soil, and Treatment Results,
W77-07052 5G

Solubility and Plant Uptake of Cadmium in Soils Amended with Cadmium and Sewage Sludge,
W77-07055 5B

SOLID WASTES
Drying Potato Wastes for Animal Feed as an Alternative Disposal Method.
W77-06947 5D

Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

SOLIDS CONTACT PROCESSES
Advanced Waste Treatment Seminar, Session III, Removal of Solids and Organics, Held at San Francisco, on October 28-29, 1970.
W77-07074 5D

SOLUBILITY
The Solubility of Nitrogen, Oxygen and Argon in Water and Seawater,
W77-06923 5C

Solubility and Plant Uptake of Cadmium in Soils Amended with Cadmium and Sewage Sludge,
W77-07055 5B

SOLUBILITY EQUATIONS
The Solubility of Nitrogen, Oxygen and Argon in Water and Seawater,
W77-06923 5C

SOUND WAVES
Method of Applying Ozone and Sonic Energy to Sterilize and Oxidize Waste Water,
W77-07007 5D

SOUTH CAROLINA
Algal Supplement Enhancement of Static and Recirculating System,
W77-06933 5C

SOUTH PLATTE RIVER BASIN (COLO)
Water Quality Investigations in the South Platte River Basin, Colorado, 1971-72.
W77-07076 5A

SPATIAL DISTRIBUTION
Influence of Gradient on the Distribution of Fishes in Conowingo Creek, Maryland and Pennsylvania,
W77-06635 2I

Mississippi Sound Temporal and Spatial Distribution of Nutrients,
W77-06932 5B

SPAWNING
Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
W77-06828 6G

SPECIES COMPOSITION
Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06620 5A

SPECIFIC GRAVITY
Device for Sucking the Upper Layer of a Polluted Water Surface,
W77-07089 5G

SPILLWAYS
Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

SPORES
Effect of Salinity on Spore Germination of Terrestrial and Marine Fungi,
W77-06772 5C

ST. LAWRENCE RIVER
Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

STABILITY
Profiles and Evaporation,
W77-06898 2D

STABILIZATION
Sand Stabilization on the Dunes, Beach and Shoreface of a Historically Eroding Barrier Island. Wassaw Island Erosion Study, Part III,
W77-06940 8G

STATISTICAL METHODS
Smoothing Data with Cubic Splines,
W77-06831 7C

STATISTICS
Smoothing Data with Cubic Splines,
W77-06831 7C

STEAM
Guidelines for the Preparation of Environmental Reports for Fossil-Fueled Steam Electric Generating Stations,
W77-06918 6G

STEAM GENERATING STATIONS
First Reported Incidence of Gas-Bubble Disease in the Heated Effluent of a Steam Generating Station,
W77-06922 5C

STEELHEAD TROUT
Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

STEMFLOW
Investigation of Precipitation Within Forest Ecosystems, (In Hungarian),
W77-06797 2B

STERILANTS
Method of Applying Ozone and Sonic Energy to Sterilize and Oxidize Waste Water,
W77-07007 5D

LIBRARY U. OF I. URBANA-CHAMP

STERILANTS

STOCHASTIC PROGRAMMING
Optimal Complex Use of Controlled Water Resources of a Basin,
W77-06718 4A

STORAGE
Lake St. Clair Hydrologic Transfer Factors.
W77-06879 2H

STORM RUNOFF
Sediment Discharge from an Area of Highway Construction, Applemans Run Basin, Columbia County, Pennsylvania,
W77-06969 4C

London's Stormwater Problem,
W77-06983 5D

Sediments and Water Quality of Urban Storm Water,
W77-06984 5B

Short Course Proceedings: Applications of Stormwater Management Models,
W77-07066 5B

Introduction to Urban Storm Water Runoff Models,
W77-07071 5B

Simplified Methods of Computing the Quantity of Urban Runoff,
W77-07072 5B

The WRE Storm Model,
W77-07073 5B

On-Line Adaptive Control for Combined Sewer Systems,
W77-07100 5D

STORM WATER
An Executive Summary of Three EPA Demonstration Programs in Erosion and Sediment Control,
W77-06671 5G

London's Stormwater Problem,
W77-06983 5D

Time-Distribution of Storm Rainfall in Pennsylvania,
W77-07022 2B

Treatment of Combined Sewer Overflows Via Thin Film Chemistry,
W77-07034 5D

Short Course Proceedings: Applications of Stormwater Management Models,
W77-07066 5B

Integrated Approach to Urban Waste Water Management,
W77-07095 5D

On-Line Adaptive Control for Combined Sewer Systems,
W77-07100 5D

STORMS
Time-Distribution of Storm Rainfall in Pennsylvania,
W77-07022 2B

STRAIT OF JUAN DE FUCA
A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

STRATIGRAPHY
Nile Cone: Late Quaternary Stratigraphy and Sediment Dispersal,
W77-06650 2L

STREAM-AQUIFER MODELS
Further Development and Testing of a Stream-Aquifer System Model,
W77-06762 2F

STREAMFLOW
Streamflow Regulation by Artificial Recharge Fed from Upstream Surface Storage: Derivation of Control Rules,
W77-06725 4A

Surface Water Network Design by Regression Analysis Simulation,
W77-06963 2E

STREAMS
Influence of Gradient on the Distribution of Fishes in Conowingo Creek, Maryland and Pennsylvania,
W77-06635 2I

Water Quality Simulation of Tahoe-Truckee System, Nevada-California-Volume I,
W77-07075 5B

Water Quality Investigations in the South Platte River Basin, Colorado, 1971-72.
W77-07076 5A

STRENGTH
Laboratory Study of the Flexural Strength and Elastic Modulus of Freshwater and Saline Ice,
W77-06661 2C

SUB-LETHAL EFFECTS
Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

SUBLETHAL EFFECTS
Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

SUBMERGED OFFSHORE DIFFUSER
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

SUBMERSIBLE PUMPS
Pumping Systems: The Simpler, The Better,
W77-06856 8C

Submersible Pump Design: Dependent on Well Diameter and Depth.
W77-06867 8C

SUBSURFACE FLOW
Comparison of Iterative Methods of Solving Two-Dimensional Groundwater Flow Equations,
W77-06965 2F

SUBSURFACE INJECTION
Subsurface Injection-How Much Does It Cost,
W77-07011 5E

SUBSURFACE INVESTIGATIONS
On Large-Scale Simulation of Groundwater Flow Systems,
W77-06713 4B

SUBTROPIC
Stratification of Kinetic Origin and its Biological Consequences in a Neotropical Man-Made Lake,
W77-06683 2H

SUGARCANE
Particle Characteristics and Dispersal Patterns of Sugar Cane Wastes in Selected Rivers and Estuaries of Puerto Rico,
W77-06632 5B

SULFATES
Biogenic Elements and Sulfate Reduction in Water Oil Carbonate Layer, (In Russian),
W77-07040 5B

SULFIDES
The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

SULFUR COMPOUNDS
The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

Forms of Sulfur in Sewage Sludge,
W77-07044 5A

SUPERSATURATION
A Preliminary Evaluation of the Effects of Gas Bubble Disease on Fish Populations in the Kootenai River Below Libby Dam,
W77-06919 5C

Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
W77-06924 5C

Dissolved Nitrogen, Dissolved Oxygen and Related Water Temperatures in the Columbia and Lower Snake Rivers, 1965-1969,
W77-06925 5C

Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

SUPRAPERMAFROST WATER
Suprapermafrost Water,
W77-06630 2C

SURFACE MINING
Debris Basins for Control of Surface Mine Sedimentation,
W77-06672 5G

SURFACE RESISTANCE
Evaporation and Advection II: Evaporation Downwind of a Boundary Separating Regions Having Different Surface Resistances and Available Energies,
W77-06897 2D

SURFACE WATERS
Modele Mathematique de Simulation du Systeme des Ressources Hydrauliques Superficielles du Llobregat,
W77-06727 4A

Conjunctive Use of the Tajo-Segura Aqueduct Surface System and the Aquifers of the La Mancha Area,
W77-06728 4B

Hybrid Computer Analysis of a Combined Surface Water--Groundwater System,
W77-06729 4B

Reconnaissance of the Water Resources of the Clinton Quadrangle, West-Central Oklahoma,
W77-06959 7C

Surface Water Network Design by Regression Analysis Simulation,
W77-06963 2E

SURFACES
Evaporation and Advection II: Evaporation Downwind of a Boundary Separating Regions Having Different Surface Resistances and Available Energies,
W77-06897 2D

SURFACTANTS
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

SURVEYS
Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

Effects of Engineering Activities on the Ecology of Pismo Clams,
W77-06886 5C

Hydrologic Interpretation of Geophysical Data from the Southeastern Hueco Bolson, El Paso and Hudspeth Counties, Texas,
W77-06970 4B

Review and Analysis of Hydrogeologic Conditions Near the Site of a Potential Nuclear-Waste Repository, Eddy and Lea Counties, New Mexico,
W77-06974 5B

SUSPENDED SOLIDS
Foam and Film of Fresh Waters as an Ecological Niche of Aquatic Hyphomycetes, (In Russian),
W77-06787 2I

Design and Control of Secondary Settlement Tanks,
W77-07015 5D

SWINE-WASTE LAGOONS
Pollutant Movement to Shallow Ground Water Tables from Swine Waste Lagoons,
W77-06742 5B

SYRDARYA RIVER (MIDDLE ASIA)
Mathematical Model of Water Resources Utilization in a River Basin,
W77-06719 4A

SYSTEM SCIENCE
La Science des Systemes dans la Planification des Ressources en Eau,
W77-06736 6A

SYSTEMS ANALYSIS
La Science des Systemes dans la Planification des Ressources en Eau,
W77-06736 6A

TAHOE-TRUCKEE WATER SYSTEM (NEV AND CALIF)
Water Quality Simulation of Tahoe-Truckee System, Nevada-California-Volume I,
W77-07075 5B

TASTE
Identity, Origin and Development of Off-Flavors in Great Lakes Anadromous Fish,
W77-06931 5A

TECHNOLOGY
A Pneumatic Grab for Obtaining Large, Undisturbed Mud Samples: Its Construction and Some Applications for Measuring the Growth of Larvae and Emergence of Adult Chironomidae,
W77-06613 5A

TECHNOLOGY TRANSFER
Proceedings Technology Transfer Seminar on Waste Handling, Disposal and Recovery in the Metal Finishing Industry, November 12-13, 1975, Toronto, Ontario.
W77-06950 5D

TELEOSTS
Effects of Various Ecological Factors on Radiostrontium Uptake in Two Euryhaline Teleosts: Mugil Auratus Risso and Pleuronectes Platessal, (Influence de Divers Facteurs Ecologiques Sur L'Accumulation du Radiostrontium Chez Deux Teleosteens Euryhalins: Mugil Auratus Risso et Pleuronectes Platessa L.),
W77-06777 5C

TEMPERATURE
Effects of Pressure, Temperature and Oxygen on the Oxygen-Consumption Rate of the Mid-water Copepod Gaussia Princeps,
W77-06642 5C

A Note on Temperature and Humidity Profile Measurement Over Forests Using Diodes,
W77-06653 7B

Exchange Through a Barrier Island Inlet: Additional Evidence of Upwelling Off the Northeast Coast of North Carolina,
W77-06654 2L

The Measurement of Temperature Tolerance: Verification of an Index,
W77-06764 5C

Seasonal changes in the Respiration of Pumpkinseed, Lepomis Gibbosus, Correlated with Temperature, Day Length, and Stage of Reproductive Development,
W77-06768 5C

The Algal Flora in the Thermal Baths of Montegrotto Terme (Padua). Its Distribution Over One-Year Period,
W77-06770 5C

Effect of Salinity on Spore Germination of Terrestrial and Marine Fungi,
W77-06772 5C

Effects of Various Ecological Factors on Radiostrontium Uptake in Two Euryhaline Teleosts: Mugil Auratus Risso and Pleuronectes Platessal, (Influence de Divers Facteurs Ecologiques Sur L'Accumulation du Radiostrontium Chez Deux Teleosteens Euryhalins: Mugil Auratus Risso et Pleuronectes Platessa L.),
W77-06777 5C

Reproductive Cycle of Trout and Tench: Effect of Experimental Variations of the Temperature, (Etude Sur le Cycle Reproducteur do la Truite Arc-En-Ciel et de la Tanche: Effet de Variations Experimentales de la Temperature),
W77-06779 5C

Plant Data Analysis of Temperature Significance in the Activated Sludge Process,
W77-07046 5D

TEMPERATURE LIMITATION
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

TEMPERATURE PROFILES
A Single Field of View Method for Retrieving Tropospheric Temperature Profiles from Cloud-Contaminated Radiance Data,
W77-06887 2B

TEMPORAL DISTRIBUTION
Mississippi Sound Temporal and Spatial Distribution of Nutrients,
W77-06932 5B

TENCH
Reproductive Cycle of Trout and Tench: Effect of Experimental Variations of the Temperature, (Etude Sur le Cycle Reproducteur do la Truite Arc-En-Ciel et de la Tanche: Effet de Variations Experimentales de la Temperature),
W77-06779 5C

TERRACING
Land Forming Systems to Improve Water Use Efficiency,
W77-06761 3F

TERTIARY TREATMENT
Expansion Comes Quickly to AWT Plant,
W77-07009 5D

Fast-Tracking Cuts Costs 16% on Advanced Waste Water Plant.
W77-07016 5D

Plug-In Concept for Pilot Sewage Treatment Plant,
W77-07026 5D

Fail-Safe Waste Treatment System,
W77-07027 5D

LIBRARY U. OF I. URBANA-CHAMPAIGN

TEXAS
Hydrologic Interpretation of Geophysical Data from the Southeastern Hueco Bolson, El Paso and Hudspeth Counties, Texas,
W77-06970 4B

Control Sewer Corrosion with H2O2,
W77-06993 8G

THANITE
Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

THAWING SOILS
Suprapermafrost Water,
W77-06630 2C

THEIS EQUATION
Performance of a Recharge and Recovery System in an Aquifer with Uniform Flow,
W77-06905 2F

THERMAL POLLUTION
Lake Currents and Temperatures Near the Western Shore of Lake Michigan,
W77-06687 2H

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin I. Quantitative Relations and Qualitative Composition of the Bottom Fauna of the Konin Lakes Complex, (In Polish),
W77-06749 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin II. Changes in Time of Bottom Fauna, (In Polish),
W77-06750 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin III. An Effort to Explain the Causes and Results of Changes in the Bottom Fauna of Lakes as Influenced by the Inflow of Heated Waters, (In Polish),
W77-06751 5C

Primary and Secondary Production of Plankton in Heated Lakes, (In Polish),
W77-06752 5C

The Influence of Heated Effluent Waters on the Water Chemism of Konin Lakes, (In Polish),
W77-06753 5C

Occurrence and Growth of Dreissena Polymorpha Pall. in Lakes Included in a Cooling System, (In Polish),
W77-06754 5C

Long-Term Changes of the Pelagic Primary Production in Heated Lakes, (In Polish),
W77-06755 5C

The Influence of Heated Effluent Waters on the Thermal-Oxygen Relations and Water Transparency in the Konin Lakes Complex, (In Polish),
W77-06756 5C

Growth and Movement of Fish in the Vicinity of a Thermal Discharge,
W77-06766 5C

First Reported Incidence of Gas-Bubble Disease in the Heated Effluent of a Steam Generating Station,
W77-06922 5C

THERMAL POWER
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

THERMAL POWER PLANTS
Guidelines for the Preparation of Environmental Reports for Fossil-Fueled Steam Electric Generating Stations,
W77-06918 6G

THERMAL SPRINGS
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

The Algal Flora in the Thermal Baths of Montegrotto Terme (Padua). Its Distribution Over One-Year Period,
W77-06770 5C

THERMAL STRATIFICATION
Stratification of Kinetic Origin and its Biological Consequences in a Neotropical Man-Made Lake,
W77-06683 2H

THERMAL TUNNELING
Cost Comparison Between Subterrene and Current Tunneling Methods,
W77-06662 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix A--Baseline Cost Analyses,
W77-06663 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix B--Subterrene Cost Analyses,
W77-06664 8A

THERMOCLINE
Stratification of Kinetic Origin and its Biological Consequences in a Neotropical Man-Made Lake,
W77-06683 2H

THIN FILM CHEMISTRY
Treatment of Combined Sewer Overflows Via Thin Film Chemistry,
W77-07034 5D

THREE-DIMENSIONAL MODELS
Numerical Models of Wind-Driven Circulation in Lakes,
W77-06958 2H

TIDAL WATERS
Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

TIME
Time-Distribution of Storm Rainfall in Pennsylvania,
W77-07022 2B

TOXICANTS
The Effects of Methoxychlor on Riffle Invertebrate Populations and Communities,
W77-06614 5C

Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

TOXICITY
An Electronic System to Monitor the Effects of Changes in Water Quality on Fish Opercular Rhythms,
W77-06610 5C

Effect of Malachite Green and Formalin on the Survival of Largemouth Bass Eggs and Fry,
W77-06612 5C

Response of Natural Marine Bacterial Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06622 5A

Effects of Four Oils on Marine Bacterial Populations: Controlled Ecosystem Pollution Experiment,
W77-06623 5A

Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

Toxicity of Fluoride to Brown Trout Fry (Salmo trutta),
W77-06628 5C

The Toxic Effects of Selected Heavy Metals on Unadapted Populations of Vorticella Convallaria Var Similis,
W77-06636 5C

The Influence of Acrolein and Hydrocryle on the Development Dynamics of Aquatic Bacteria,
W77-06690 5C

Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

Median Tolerance Limits of Some Chemicals to the Fresh Water Fish Cyprinus-Carpio,
W77-06780 5C

TOXINS
The Toxic Effects of Selected Heavy Metals on Unadapted Populations of Vorticella Convallaria Var Similis,
W77-06636 5C

UNOX System for Waste Water Treatment,
W77-07014 5D

TRACE ELEMENTS
An Estimate of the Input of Atmospheric Trace Elements into the North Sea and the Clyde Sea (1972-3),
W77-06668 5B

Concentration and Determination of Trace Organic Pollutants in Water,
W77-07098 5A

TRACERS
The Accumulation of Organic Mercury from Sea Water by the Plaice, Pleuronectes platessa L.,
W77-06607 5C

Investigation of Flushing Time in the Lafayette River, Norfolk, Virginia,
W77-06881 2L

TRACKING TECHNIQUES
Application of Digital Modelling to the Prediction of Radioisotope Migration in Groundwater
W77-06981 5B

TRANSFER FACTORS (HYDROLOGIC)
Lake St. Clair Hydrologic Transfer Factors.
W77-06879 2H

TREATMENT FACILITIES
Canwel Can Do,
W77-06985 5D

Sewerage for a Rural Resort Area,
W77-06987 5D

Sludge Separator.
W77-06998 5D

Expansion Comes Quickly to AWT Plant,
W77-07009 5D

New Visibility for On-Site Waste Treatment Systems,
W77-07013 5D

Fast-Tracking Cuts Costs 16% on Advanced Waste Water Plant.
W77-07016 5D

Fluosolids Incinerator Commissioned at Esher,
W77-07018 5E

Sludge Incineration at Esher.
W77-07020 5E

Waste Water Treatment Plant Built in Wet Hole,
W77-07021 5D

The Operations Section of Lincoln Sewage Division,
W77-07023 5D

Energy Conservation and Heat Recovery in Waste Water Treatment Plants,
W77-07024 5D

Municipal Waste Water Treatment as an Industrial Operation,
W77-07025 5D

Plug-In Concept for Pilot Sewage Treatment Plant,
W77-07026 5D

Fail-Safe Waste Treatment System,
W77-07027 5D

The Fabric-Lined Purification Basin.
W77-07035 5D

Upgrading Biological Sewage Treatment Plants Today,
W77-07062 5D

TREES
Irrigation of the Nebit-Dag Plantings by Mineralized Ground Water, (In Russian),
W77-06691 3C

TRICKLING FILTER
Renovated Water from Municipal Sewage Treatment Plants,
W77-07086 5D

TRITIUM
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

TROPHIC LEVEL
Dynamics of Phytoplankton Biomass in Two Lakes of Different Limnological Character,
W77-06685 5C

The Historic and Present Relationships Between Phytoplankton, Limiting Nutrients, and Sediment-Water Geochemical Processes in Selected Maine Lakes,
W77-06741 5C

TROPHIC LEVELS
Ecosystem Dynamics Birds and Marine Mammals. Part I: Preliminary Estimates of Pinniped - Finfish Relationships in the Bering Sea,
W77-06806 6G

TROUT
Reproductive Cycle of Trout and Tench: Effect of Experimental Variations of the Temperature, (Etude Sur le Cycle Reproducteur do la Truite Arc-En-Ciel et de la Tanche: Effet de Variations Experimentales de la Temperature),
W77-06779 5C

A Preliminary Evaluation of the Effects of Gas Bubble Disease on Fish Populations in the Kootenai River Below Libby Dam,
W77-06919 5C

TULALIP INDIAN RESERVATION (WASH)
Preliminary Assessment of the Water Resources of the Tulalip Indian Reservation, Washingtor
W77-06971 4A

TUNNEL BORING
Conference on Research in Tunneling and Excavation Technology,
W77-06885 8E

TUNNEL CONSTRUCTION
Slipform Paver, Steel Forms Speed Lining of 25,000-Foot Sewer Tunnel,
W77-06992 8F

TUNNEL LININGS
Slipform Paver, Steel Forms Speed Lining of 25,000-Foot Sewer Tunnel,
W77-06992 8F

TUNNELING
Cost Comparison Between Subterrene and Current Tunneling Methods,
W77-06662 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix A--Baseline Cost Analyses,
W77-06663 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix B--Subterrene Cost Analyses,
W77-06664 8A

Conference on Research in Tunneling and Excavation Technology,
W77-06885 8E

TUNNELING MACHINES
Cost Comparison Between Subterrene and Current Tunneling Methods,
W77-06662 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix A--Baseline Cost Analyses,
W77-06663 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix B--Subterrene Cost Analyses,
W77-06664 8A

TURBULENCE
Investigation of the Effects of Nonhomogeneous (or Nonstationary) Behavior on the Spectra of Atmospheric Turbulence,
W77-06678 2B

Evidence for Strong Currents and Turbulence in a Deep Coral Reef Groove,
W77-06904 2L

TURKEY
The Effect of Different Methods on Growth, Development and Yield of Cotton, (In German),
W77-06962 3F

UMATILLA RIVER BASIN (OR)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

UNDERFLOW
Underflow from Sludge-Irrigated Cropland,
W77-07056 5B

UNDERGROUND WASTE DISPOSAL
Review and Analysis of Hydrogeologic Conditions Near the Site of a Potential Nuclear-Waste Repository, Eddy and Lea Counties, New Mexico,
W77-06974 5B

UNIT HYDROGRAPHS
Simplified Methods of Computing the Quantity of Urban Runoff,
W77-07072 5B

UNIVERSAL SOIL LOSS EQUATION
Current Methods Used in the Soil Conservation Service to Estimate Sediment Yield,
W77-06657 4D

UPWELLING
Exchange Through a Barrier Island Inlet: Additional Evidence of Upwelling Off the Northeast Coast of North Carolina,
W77-06654 2L

Circulation and Hydrographic Structure Over the Ghana Continental Shelf During the 1974 Upwelling,
W77-06893 2L

URAL RIVER BASIN (USSR)
Causes of the Drying up of Forests in the Flood Plain of the Lower Reaches of the Ural River, (In Russian),
W77-06801 4D

URBAN DRAINAGE
Integrated Approach to Urban Waste Water Management,
W77-07095 5D

URBAN HYDROLOGY
Open Space and Urban Water Management - Phase II: Case Studies and Findings,
W77-06917 6B

URBAN RUNOFF
Sediments and Water Quality of Urban Storm Water,
W77-06984 5B

Introduction to Urban Storm Water Runoff Models,
W77-07071 5B

Simplified Methods of Computing the Quantity of Urban Runoff,
W77-07072 5B

The WRE Storm Model,
W77-07073 5B

URBAN WATER MANAGEMENT
Open Space and Urban Water Management - Phase II: Case Studies and Findings,
W77-06917 6B

LIBRARY U. OF I. URBANA-CHAMPAIGN

URBANIZATION
Urbanization and Flooding in Shades Creek Basin, Jefferson County, Alabama,
W77-06977 4C

URIDINE
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

USSR
Weather Modification in the Soviet Union--1976,
W77-06644 3B

USSR (KAZAN)
Hygienic Effectiveness of Measures for Decontaminating Effluents at Petrochemical Plants, (In Russian),
W77-07069 5D

USSR (POLAZNENSKY DEPOSIT)
Biogenic Elements and Sulfate Reduction in Water Oil Carbonate Layer, (In Russian),
W77-07040 5B

UTAH
Improvement of Planning for Post-Development Water Resource Management: A Study of the Weber Basin Project,
W77-06739 6B

VANCOUVER ISLAND
The Influence of Wind on the Surface Layer of a Stratified Inlet: Part I. Observations,
W77-06894 2L

The Influence of Wind on the Surface Layer of a Stratified Inlet: Part II. Analysis,
W77-06895 2L

VAPOR PRESSURE
An Approximating Polynomial for the Computation of Saturation Vapor Pressure,
W77-06652 2B

A Note on Temperature and Humidity Profile Measurement Over Forests Using Diodes,
W77-06653 7B

VAPOR PRESSURE GRADIENTS
A Note on Temperature and Humidity Profile Measurement Over Forests Using Diodes,
W77-06653 7B

VARIABILITY
Zooplankton Sampling Variability: Controlled Ecosystem Pollution Experiment,
W77-06615 5A

Measurements of Planktonic Biomass in a Reservoir,
W77-06679 5A

VARVES
Iron-Rich Rhythmically Laminated Sediments in Lake of the Clouds, Northeastern Minnesota,
W77-06901 2J

VASCULAR PLANTS
Indicator Values of Vascular Plants in Central Europe, (In German),
W77-06803 2I

VEGETABLE CROPS
Persistence of Poliovirus 1 in Soil and on Vegetables Grown in Soil Previously Flooded with Inoculated Sewage Sludge or Effluent,
W77-07050 5C

VEGETATION
Ecological Data on Continental Aquatic Vegetation, (In Spanish),
W77-06784 2I

Persistence of Poliovirus 1 in Soil and on Vegetables Grown in Soil Previously Flooded with Inoculated Sewage Sludge or Effluent,
W77-07050 5C

VEGETATION EFFECTS
Place and Role of Plant Cover in Optimization of the Donbas Natural Environment, (In Ukranian),
W77-06858 4C

VERMICULITE
Bonding of Calcium and Potassium by Vermiculite and Kaolinite Clays as Affected by H-Clay Addition,
W77-06872 2G

VERTICAL MIGRATION
Effects of Pressure, Temperature and Oxygen on the Oxygen-Consumption Rate of the Midwater Copepod Gaussia Princeps,
W77-06642 5C

VIBRIO PARAHAEMOLYTICUS
Environmental Factors Affecting Survival and Growth of Vibrio Parahaemolyticus. A Review,
W77-06765 5C

VIRGINIA
Pollutant Movement to Shallow Ground Water Tables from Swine Waste Lagoons,
W77-06742 5B

Investigation of Flushing Time in the Lafayette River, Norfolk, Virginia,
W77-06881 2L

VIRUSES
Persistence of Poliovirus 1 in Soil and on Vegetables Grown in Soil Previously Flooded with Inoculated Sewage Sludge or Effluent,
W77-07050 5C

Quantitative Analysis of Enteroviruses in Water with Various Degrees of Pollution, (In Russian),
W77-07070 5A

VISTULA RIVER (POLAND)
General Description of the Vistula River Project and Basic Planning Data,
W77-06733 4A

The Multi-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06734 4A

The Out-of-Kilter Algorithm as a Single-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06735 4A

VORTICELLA CONVALLARIA VAR SIMILIS
The Toxic Effects of Selected Heavy Metals on Unadapted Populations of Vorticella Convallaria Var Similis,
W77-06636 5C

WABASH RIVER BASIN (IND)
A Study of the Utilization of EREP Data from the Wabash River Basin,
W77-06670 7B

WALNUT CREEK BASIN (KAN)
Further Development and Testing of a Stream-Aquifer System Model,
W77-06762 2F

WALTHAM (MA)
New Programs Improve Sensitive Areas of Water and Sewer Systems,
W77-06995 8G

WARM SPRINGS DAM (ARIZ)
Environmental Impact Statements in Water Resources Planning and Decision Making,
W77-06738 6E

WARNING SYSTEMS
Forecasting Floods in Hawaii (Excluding Hawaii Island),
W77-06873 4A

WASHINGTON
Temperature Relations of Puget Sound Thaids in Reference to Their Intertidal Distribution,
W77-06767 5C

Potassium in an Arid Loessial Soil: Changes in Availability as Related to Cropping and Fertilization,
W77-06870 3F

A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

Preliminary Assessment of the Water Resources of the Tulalip Indian Reservation, Washington,
W77-06971 4A

Water in the Palouse River Basin, Washington,
W77-06978 4B

WASTE DILUTION
Dispersion of Liquid Waste from a Moving Barge,
W77-06913 5B

WASTE DISPOSAL
Dispersion of Liquid Waste from a Moving Barge,
W77-06913 5B

Burning Waste Chlorinated Hydrocarbons in a Cement Kiln,
W77-06946 5E

Proceedings Technology Transfer Seminar on Waste Handling, Disposal and Recovery in the Metal Finishing Industry, November 12-13, 1975, Toronto, Ontario.
W77-06950 5D

Apparatus for Disposal of Effluents.
W77-07002 5E

Expansion Comes Quickly to AWT Plant,
W77-07009 5D

Application of Municipal Refuse and Liquid Sewage Sludge to Agricultural Land: II. Lysimeter Study,
W77-07080 5D

WASTE DISPOSAL FIELDS
Fate of Nitrogen and Phosphorus in Soils Under Septic Tank Waste Disposal Fields,
W77-06914 5B

WASTE OIL DISPOSAL
Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

WASTE TREATMENT
Adjustment Costs and Optimal Waste Treatment,
W77-06699 5D

Burning Waste Chlorinated Hydrocarbons in a Cement Kiln,
W77-06946 5E

Hydrocarbon Products Manufacture--By Carbonisation of Coal, Scrap Rubber or Plastic or Domestic Sewage Under Reduced Pressure.
W77-07000 5D

Expansion Comes Quickly to AWT Plant,
W77-07009 5D

New Visibility for On-Site Waste Treatment Systems,
W77-07013 5D

Fluosolids Incinerator Commissioned at Esher,
W77-07018 5E

Sludge Incineration at Esher.
W77-07020 5E

WASTE WATER DISPOSAL
Chemical Quality of Effluents and Their Influence on Water Quality in a Shallow Aquifer,
W77-06658 5B

Waste Injection into Stratified Ground Water Bodies,
W77-06855 5B

WASTE WATER (POLLUTION)
Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

WASTE WATER TREATMENT
Anaerobic Digestion and Membrane Separation for the Treatment of Domestic Sewage,
W77-06631 5D

Adjustment Costs and Optimal Waste Treatment,
W77-06699 5D

The Removal of Organic Matter from Water Supplies by Ion Exchange,
W77-06760 5F

Water Decontamination in Northern Regions by Impulse Electric Charges, (In Russian),
W77-06791 5D

Septic Tank Study is Off and Running.
W77-06859 5D

Annotated Bibliography on Northern Environmental Engineering 1974-75,
W77-06948 5D

State-of-the-Art Review of Processes for Treatment and Reuse of Potato Wastes,
W77-06949 5D

Proceedings Technology Transfer Seminar on Waste Handling, Disposal and Recovery in the Metal Finishing Industry, November 12-13, 1975, Toronto, Ontario.
W77-06950 5D

Literature Review of Wastewater Characteristics and Abatement Technology in the Wood and Timber Processing Industry.
W77-06951 5D

Canwel Can Do,
W77-06985 5D

Sewerage for a Rural Resort Area,
W77-06987 5D

The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

Electron-Beam Irradiation of Waste Products--e.g., For Sterilization of Sewage Sludge and Waste Industrial Products.
W77-06997 5D

Sludge Separator.
W77-06998 5D

Oxidation and Ozonation Chamber,
W77-06999 5D

Sewage Aeration Impeller-With Automatic De-Icing and Anti-Clogging System,
W77-07001 5D

Method of Waste Treatment and Algae Recovery,
W77-07003 5D

Renovation of Waste Water,
W77-07004 5D

Waste Treatment Apparatus,
W77-07005 5D

Process for the Treatment of Waste Water by Heterogeneous Photosensitized Oxidation,
W77-07006 5D

Method of Applying Ozone and Sonic Energy to Sterilize and Oxidize Waste Water,
W77-07007 5D

Apparatus and Process for Removing Ammonia Nitrogen from Waste Water,
W77-07008 5D

Expansion Comes Quickly to AWT Plant,
W77-07009 5D

The Plight and Promise of On-Site Waste Water Treatment,
W77-07010 5D

Treatment of Sewage by Electrons and Gammas,
W77-07012 5D

New Visibility for On-Site Waste Treatment Systems,
W77-07013 5D

UNOX System for Waste Water Treatment,
W77-07014 5D

Design and Control of Secondary Settlement Tanks,
W77-07015 5D

Fast-Tracking Cuts Costs 16% on Advanced Waste Water Plant.
W77-07016 5D

Waste Water System Uses Microwaves,
W77-07019 5D

Municipal Waste Water Treatment as an Industrial Operation,
W77-07025 5D

Plug-In Concept for Pilot Sewage Treatment Plant,
W77-07026 5D

Fail-Safe Waste Treatment System,
W77-07027 5D

Plastic Spheres for Waste Water Treatment.
W77-07028 5D

Screenings Dewatering Press.
W77-07029 5D

Sludge Dewatering on Alaska's North Slope,
W77-07030 5D

Single P/C Unit Removal of Nutrients from Combined Sewer Overflows,
W77-07031 5D

Influence of Phosphorus Removal on Solids Budget,
W77-07032 5D

The Use of Polymers for Improving Chemical Sludge Dewatering on Sand Beds,
W77-07033 5D

Treatment of Combined Sewer Overflows Via Thin Film Chemistry,
W77-07034 5D

The Fabric-Lined Purification Basin.
W77-07035 5D

Nutrient Removal by Water Hyacinths,
W77-07036 5G

Backwashing of Granular Filters,
W77-07037 5D

Evaluation of In-Line and Side-Line Flow Equalization Systems,
W77-07041 5D

Some Factors Affecting Floc Formation by Zoogloea Ramigera, Strain I-16-M,
W77-07042 5D

The Effect of High Purity Oxygen on the Activated Sludge Process,
W77-07043 5D

Plant Data Analysis of Temperature Significance in the Activated Sludge Process,
W77-07046 5D

Study on Sewage Flow Dynamics Through Dorr Type Clarifier on Stream, (Synopsis),
W77-07048 5D

Phosphates in Soils Treated with Sewage Water: I. General Information on Sewage Farm, Soil, and Treatment Results,
W77-07052 5G

Elimination of Anaerobic Digester Supernatant,
W77-07059 5D

Design Criteria for Waste Water Aerator Drives,
W77-07060 5D

Purifying Water,
W77-07061 5D

Upgrading Biological Sewage Treatment Plants Today,
W77-07062 5D

Stabilisation Lagoons Including Experience in Brazil. Part 1,
W77-07063 5D

The Current Role of Wastewater Disinfection,
W77-07064 5D

Fuel Gas and Electricity from Municipal Sewage,
W77-07065 5D

Experience in Treating Waste Waters from the Donetsk Mines, (In Russion),
W77-07068 5D

Hygienic Effectiveness of Measures for Decontaminating Effluents at Petrochemical Plants, (In Russian),
W77-07069 5D

LIBRARY U. OF I. URBANA-CHAMPAIGN

WASTE WATER TREATMENT

Advanced Waste Treatment Seminar, Session III, Removal of Solids and Organics, Held at San Francisco, on October 28-29, 1970.
W77-07074 5D

Adsorption, Coagulation and Filtration Make a Useful Treatment Combination-Part 2,
W77-07077 5D

Anaerobic Filter Treats Waste Activated Sludge,
W77-07078 5D

Land Application of Sewage Sludge: IV. Wheat Growth, N Content, N Fertilizer Value, and N Use Efficiency as Influenced by Sewage Sludge and Wood Waste Mixtures,
W77-07079 5D

Application of Municipal Refuse and Liquid Sewage Sludge to Agricultural Land: II. Lysimeter Study,
W77-07080 5D

The Electrolytic Respirometer-II. Use in Water Pollution Control Plant Laboratories,
W77-07081 5D

Process Technological Background Regarding New Protective Regulations of Water Bodies-Results of Nitrification and Phosphorus Elimination Experiments in Zurich and Bern. III. Filtration by Flocculation for the Elimination of Phosphorus from Communal Waste Water (Verfahrenstechnische Unterlagen im Hinblick auf die neuen Gewaesserschutzanforderungen-Ergebnisse der Versuche ueber die Nitrifikation und Phosphorelimination in Zuerich und Bern. III. Flockungsfiltration zur Elimination von Phosphor aus Kommunalem Abwasser),
W77-07082 5D

Trends in Sludge Treatment and Disposal Practices in the United States,
W77-07083 5D

Effect of Water Work's Sludge on Waste Water Treatment,
W77-07085 5D

Renovated Water from Municipal Sewage Treatment Plants,
W77-07086 5D

Waste Water Reuse Practice in the United States,
W77-07087 5D

Sludge Dewatering Pilot Plant Design. Part 2,
W77-07088 5D

Method of Treating Waste Water with Jet Nozzles,
W77-07090 5D

Waste Treatment Process,
W77-07091 5D

Clarifier with Overflow Scum Removal,
W77-07092 5D

Process for the Purification of Waste Waters with Activated Carbon,
W77-07093 5D

Ozone Oxidation of Waste Water,
W77-07094 5D

Factors Influencing the Dewatering Characteristics of Sludge,
W77-07097 5D

Concentration and Determination of Trace Organic Pollutants in Water,
W77-07098 5A

Recycling of Aluminum Used for Phosphate Removal in Domestic Waste Water Treatment,
W77-07099 5D

WASTEWATER TREATMENT

Activated Sludge Treatment of High Strength NSSC Mill Effluent,
W77-06945 5D

WATER ALLOCATION (POLICY)

The Out-of-Kilter Algorithm as a Single-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06735 4A

WATER ANALYSIS

Interstitial Water Chemistry of Anoxic Long Island Sound Sediments. 1. Dissolved Gases,
W77-06900 5B

Quantitative Analysis of Enteroviruses in Water with Various Degrees of Pollution, (In Russian),
W77-07070 5A

WATER BALANCE

Investigation of Precipitation Within Forest Ecosystems, (In Hungarian),
W77-06797 2B

The Significance of Regulating the Water Regime of Agricultural Lands, (In Russian),
W77-06837 3F

A Model for the Water Regime of a Deciduous Forest with Special Consideration of the Functional Interrelationships Among Meteorological Factors, Soil Water Content and Evapotranspiration, (In German),
W77-06864 2A

WATER BIRDS

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W77-06810 6G

Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

WATER CHEMISTRY

Water Chemistry and Water Quality,
W77-06778 5A

Interstitial Water Chemistry of Anoxic Long Island Sound Sediments. 1. Dissolved Gases,
W77-06900 5B

Hydrochemistry of the Lake Magadi Basin, Kenya,
W77-06967 2K

WATER CIRCULATION

Numerical Models of Wind-Driven Circulation in Lakes,
W77-06958 2H

Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

WATER CONSERVATION

Waste Water Reuse Practice in the United States,
W77-07087 5D

WATER COOLING

An Annular Flow Ice-Water Model Heat Sink,
W77-06889 2C

WATER DEFICIENCY

Indices of Water Restriction and Water Deficiency Tolerance,
W77-06711 6A

WATER DEMAND

Indices of Water Restriction and Water Deficiency Tolerance,
W77-06711 6A

Optimization of a Three-Reservoir System by Dynamic Programming,
W77-06720 4A

Water in the Palouse River Basin, Washington,
W77-06978 4B

Waste Water Reuse Practice in the United States,
W77-07087 5D

WATER DISTRIBUTION (APPLIED)

The Methods of Distribution of Water Resources in River Development Systems,
W77-06726 4A

WATER DISTRICTS

Cincinnati's Preventive Maintenance Sewer Program.
W77-06989 5D

The Operations Section of Lincoln Sewage Division,
W77-07023 5D

WATER HYACINTH

Nutrient Removal by Water Hyacinths,
W77-07036 5D

WATER LEVEL FLUCTUATIONS

Depth and Seasonal Fluctuations in the Condition of the Groundwater of the Area Around the City of Ghent (Belgium), (In Dutch),
W77-06681 2F

WATER LEVELS

Lake Ontario Atlas: Surface Waves,
W77-06884 2H

WATER MANAGEMENT (APPLIED)

Mathematical Model of Water Resource Utilization in a River Basin,
W77-06719 4A

Construction and Adjustment of a Two-Layer Mathematical Model of the Llobregat Delta,
W77-06722 4A

A Dynamic Multisector Programming Approach to Regional Water Resource Management,
W77-06737 6B

Short Course Proceedings: Applications of Stormwater Management Models,
W77-07066 5G

Integrated Approach to Urban Waste Water Management,
W77-07095 5D

WATER POLICY

Two-Goal Regional Environmental Policy: Case of the Santa Ana River Basin,
W77-06707 6B

Mathematical Models in Hydrology.
W77-06708 2A

Collective Utility: A Systems Approach to Water Pricing Policy,
W77-06712 6C

WATER POLLUTION
Monitoring Groundwater Quality: Illustrative Examples.
W77-06673 5A

Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska.
W77-06810 6G

Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

A Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment and Baseline Study Guidelines.
W77-06850 5A

Pollution Prevention, Not Control Called Key to a Clean Environment.
W77-06861 5G

Loss of 2,4-D in Runoff from Plots Receiving Simulated Rainfall and from a Small Agricultural Watershed,
W77-06908 5B

Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
W77-06957 6G

WATER POLLUTION CONTROL
Means for Protecting the Drinking Water Quality of Lake George, New York,
W77-06682 5G

Polluters' Profits and Political Response: Direct Control Versus Taxes: Comments and Reply,
W77-06700 5G

Effluent Charges and Pollution Control: A Case Study,
W77-06701 5G

Two-Goal Regional Environmental Policy: The Case of the Santa Ana River Basin,
W77-06707 5G

The Legal Responsibility of Water Well Drillers,
W77-06862 5G

What's New in Landfill Liners.
W77-07051 5G

WATER POLLUTION EFFECTS
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06620 5A

Response of Natural Marine Bacterial Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06622 5A

Effects of Four Oils on Marine Bacterial Populations: Controlled Ecosystem Pollution Experiment,
W77-06623 5A

Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

Effects of Copper on the Dominance and the Diversity of Algae: Controlled Ecosystem Pollution Experiment,
W77-06625 5A

Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
W77-06639 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin I. Quantitative Relations and Qualitative Composition of the Bottom Fauna of the Konin Lakes Complex, (In Polish),
W77-06749 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin II. Changes in Time of Bottom Fauna, (In Polish),
W77-06750 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin III. An Effort to Explain the Causes and Results of Changes in the Bottom Fauna of Lakes as Influenced by the Inflow of Heated Waters, (In Polish),
W77-06751 5C

Primary and Secondary Production of Plankton in Heated Lakes, (In Polish),
W77-06752 5C

The Influence of Heated Effluent Waters on the Water Chemism of Konin Lakes, (In Polish),
W77-06753 5C

The Influence of Heated Effluent Waters on the Thermal-Oxygen Relations and Water Transparency in the Konin Lakes Complex, (In Polish),
W77-06756 5C

Health Effects of Multipurpose Use of Water,
W77-06775 5C

Median Tolerance Limits of Some Chemicals to the Fresh Water Fish Cyprinus-Carpio,
W77-06780 5C

Heavy Metal Concentrations in Water, Sediments, and Fish from Mediterranean Coastal Area, Israel,
W77-06782 5C

Correlation Coefficients and Concentration Factors of Copper and Lead in Seawater and Benthic Algae,
W77-06783 5C

A Preliminary Survey of Mercury in Fish from Bombay and Thana Environment,
W77-06785 5C

Avifaunal Utilization of the Offshore Island Area Near Prudhoe Bay, Alaska,
W77-06812 6G

Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
W77-06828 6G

A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

Impact of Oil Spillage from World War II Tanker Sinkings,
W77-06877 5C

WATER POLLUTION SOURCES
The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

Chlorine Reactions with Seawater Constituents and the Inhibition of Photosynthesis of Natural Marine Phytoplankton,
W77-06637 5C

The Fauna of the Polluted River Tees Estuary,
W77-06638 5C

Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

An Estimate of the Input of Atmospheric Trace Elements into the North Sea and the Clyde Sea (1972-3),
W77-06668 5B

Study of Leachate at Landfill Sites 1975, Volume 1.
W77-06851 5B

Microbial Methane Consumption Reactions and Their Effect on Methane Distributions in Freshwater and Marine Environments,
W77-06899 5C

Phosphate Prediction Model for Streams by Means of Discriminant Analysis,
W77-06906 5B

The Impact of Fertilizer Use and Crop Management on Nitrogen Content of Subsurface Water Draining from Upland Agricultural Watersheds,
W77-06909 5B

Fate of Nitrogen and Phosphorus in Soils Under Septic Tank Waste Disposal Fields,
W77-06914 5B

Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W77-06975 5B

Sediments and Water Quality of Urban Storm Water,
W77-06984 5B

Chicago Drives Large Bores to Control Combined Sewage Flow.
W77-06988 8E

Drugs and Drug Metabolites as Environmental Contaminants: Chlorophenoxyisobutyrate and Salicylic Acid in Sewage Water Effluent,
W77-07045 5A

The WRE Storm Model,
W77-07073 5B

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

WATER POLLUTION TREATMENT
The Removal of Organic Matter from Water Supplies by Ion Exchange,
W77-06760 5F

WATER PURIFICATION
Renovation of Waste Water,
W77-07004 5D

The Fabric-Lined Purification Basin.
W77-07035 5D

Purifying Water,
W77-07061 5D

Waste Water Reuse Practice in the United States,
W77-07087 5D

WATER QUALITY
An Electronic System to Monitor the Effects of Changes in Water Quality on Fish Opercular Rhythms,
W77-06610 5C

Chemical Quality of Effluents and Their Influence on Water Quality in a Shallow Aquifer,
W77-06658 5B

Application of Landsat to the Surveillance and Control of Eutrophication in Saginaw Bay,
W77-06665 5A

Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

Mineral Content of Selected Geothermal Waters,
W77-06667 3E

Monitoring Groundwater Quality: Illustrative Examples.
W77-06673 5A

Water Chemistry and Water Quality,
W77-06778 5A

Interstitial Water Chemistry of Anoxic Long Island Sound Sediments. 1. Dissolved Gases,
W77-06900 5B

Dissolved Nitrogen, Dissolved Oxygen and Related Water Temperatures in the Columbia and Lower Snake Rivers, 1965-1969,
W77-06925 5C

Mississippi Sound Temporal and Spatial Distribution of Nutrients,
W77-06932 5B

Algal Supplement Enhancement of Static and Recirculating System,
W77-06933 5C

Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

Reconnaissance of the Water Resources of the Clinton Quadrangle, West-Central Oklahoma,
W77-06959 7C

Preliminary Assessment of the Water Resources of the Tulalip Indian Reservation, Washington,
W77-06971 4A

Canwel Can Do,
W77-06985 5D

Purifying Water,
W77-07061 5D

Water Quality Investigations in the South Platte River Basin, Colorado, 1971-72.
W77-07076 5A

WATER QUALITY CONTROL
Means for Protecting the Drinking Water Quality of Lake George, New York,
W77-06682 5G

The New York Bight Project - 1975; Stony Brook, Long Island, New York.
W77-06876 5G

Review and Analysis of Hydrogeologic Conditions Near the Site of a Potential Nuclear-Waste Repository, Eddy and Lea Counties, New Mexico,
W77-06974 5B

Water Quality Management and the Distribution of Emission Rights by Sealed Tender Markets,
W77-06976 5E

Water Quality Simulation of Tahoe-Truckee System, Nevada-California-Volume I,
W77-07075 5B

Integrated Approach to Urban Waste Water Management,
W77-07095 5D

WATER REQUIREMENTS
The Significance of Regulating the Water Regime of Agricultural Lands, (In Russian),
W77-06837 3F

WATER RESOURCES
Methods for Control of the Regimes for Water Resources Systems,
W77-06717 4A

Optimal Complex Use of Controlled Water Resources of a Basin,
W77-06718 4A

Mathematical Model of Water Resources Utilization in a River Basin,
W77-06719 4A

Construction and Adjustment of a Two-Layer Mathematical Model of the Llobregat Delta,
W77-06722 4A

La Science des Systemes dans la Planification des Ressources en Eau,
W77-06736 6A

A Dynamic Multisector Programming Approach to Regional Water Resource Management,
W77-06737 6A

Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

Reconnaissance of the Water Resources of the Clinton Quadrangle, West-Central Oklahoma,
W77-06959 7C

Preliminary Assessment of the Water Resources of the Tulalip Indian Reservation, Washington,
W77-06971 4A

Water in the Palouse River Basin, Washington,
W77-06978 4B

A Nonlinear Multilevel Transportation Model for Water Resource-Water Quality Management,
W77-07096 5B

WATER RESOURCES DEVELOPMENT
Mathematical Models in Hydrology.
W77-06708 2A

Indices of Water Restriction and Water Deficiency Tolerance,
W77-06711 6A

The Methods of Distribution of Water Resources in River Development Systems,
W77-06726 4A

WATER RESTRICTION INDICES
Indices of Water Restriction and Water Deficiency Tolerance,
W77-06711 6A

WATER REUSE
State-of-the-Art Review of Processes for Treatment and Reuse of Potato Wastes,
W77-06949 5D

Purifying Water,
W77-07061 5D

Application of Municipal Refuse and Liquid Sewage Sludge to Agricultural Land: II. Lysimeter Study,
W77-07080 5D

Waste Water Reuse Practice in the United States,
W77-07087 5D

WATER SOFTENING
Septic Tank Study is Off and Running.
W77-06859 5D

WATER STORAGE
Optimal Complex Use of Controlled Water Resources of a Basin,
W77-06718 4A

Streamflow Regulation by Artificial Recharge Fed from Upstream Surface Storage: Derivation of Control Rules,
W77-06725 4A

WATER SUPPLY
Optimal Seasonal and Short-Term Operation of a Reservoir Used for Flood Control and Water Supply,
W77-06724 4A

Water in the Palouse River Basin, Washington,
W77-06978 4B

WATER SUPPLY DEVELOPMENT
Performance of a Recharge and Recovery System in an Aquifer with Uniform Flow,
W77-06905 2

WATER SYSTEMS
Methods for Control of the Regimes for Water Resources Systems,
W77-06717 4A

WATER TABLE
Depth and Seasonal Fluctuations in the Condition of the Groundwater of the Area Around the City of Ghent (Belgium), (In Dutch),
W77-06681 2

WATER TEMPERATURE
Rotary-Flow Technique for Testing Fitness of Fish,
W77-06608 5

Temperature, Salinity and Light Penetration Structures: Controlled Ecosystem Pollution Experiment,
W77-06626 5

Mixing in Upper Layer of a Lake During Heating Cycle,
W77-06649 2H

Lake Currents and Temperatures Near the Western Shore of Lake Michigan,
W77-06687 2H

Fish Diseases and Parasites in Relation to the Environment,
W77-06744 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin II. Changes in Time of Bottom Fauna, (In Polish),
W77-06750 5C

The Influence of Heated Effluent Waters on the Water Chemism of Konin Lakes, (In Polish),
W77-06753 5C

Occurrence and Growth of Dreissena Polymorpha Pall. in Lakes Included in a Cooling System, (In Polish),
W77-06754 5C

Long-Term Changes of the Pelagic Primary Production in Heated Lakes, (In Polish),
W77-06755 5C

The Influence of Heated Effluent Waters on the Thermal-Oxygen Relations and Water Transparency in the Konin Lakes Complex, (In Polish),
W77-06756 5C

Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

Dissolved Nitrogen, Dissolved Oxygen and Related Water Temperatures in the Columbia and Lower Snake Rivers, 1965-1969,
W77-06925 5C

Measurement in a Marine Environment Using Low Cost Sensors of Temperature and Dissolved Oxygen,
W77-06960 7B

WATER TREATMENT
The Removal of Organic Matter from Water Supplies by Ion Exchange,
W77-06760 5F

WATER UTILIZATION
Land Forming Systems to Improve Water Use Efficiency,
W77-06761 3F

WATER WELL FIELD
Hydraulics and Economics of Well Field Layout.
W77-06863 8B

WATER WELLS
New Design Gives Denver District Iron-Free Well,
W77-06868 8A

WATER YIELD IMPROVEMENT
Place and Role of Plant Cover in Optimization of the Donbas Natural Environment, (In Ukranian),
W77-06858 4C

WATERFOWL
Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

WATERSHED MANAGEMENT
Open Space and Urban Water Management - Phase II: Case Studies and Findings,
W77-06917 6B

Water in the Palouse River Basin, Washington,
W77-06978 4B

WATERTON LAKES (ALBERTA)
Limnological and Planktonic Studies in the Waterton Lakes, Alberta,
W77-06680 5C

WAVES (WATER)
A Study to Forecast the Waves at Digha,
W77-06648 2L

Observations of Wind-Generated Waves on Variable Current,
W77-06896 2L

WEATHER DATA
Forecasting Floods in Hawaii (Excluding Hawaii Island),
W77-06873 4A

WEATHER MODIFICATION
Weather Modification in the Soviet Union--1976,
W77-06644 3B

On the Status of Hail Suppression,
W77-06645 3B

Compressed Air for Supercooled Fog Dispersal,
W77-06674 3B

WEBER BASIN PROJECT (UTAH)
Improvement of Planning for Post-Development Water Resource Management: A Study of the Weber Basin Project,
W77-06739 6B

WELL CASINGS
Bits and Pieces,
W77-06866 8G

WELL CONSTRUCTION
The Legal Responsibility of Water Well Drillers,
W77-06862 5G

WELL CONTRACTOR LIABILITY
The Legal Responsibility of Water Well Drillers,
W77-06862 5G

WELL DESIGN
Submersible Pump Design: Dependent on Well Diameter and Depth.
W77-06867 8C

WELL REGULATIONS
The Legal Responsibility of Water Well Drillers,
W77-06862 5G

WELLS
Performance of a Recharge and Recovery System in an Aquifer with Uniform Flow,
W77-06905 2F

WESTERN UNITED STATES
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

WETLANDS
Hydraulics of Sheet Flow in Wetlands,
W77-06929 8B

WHEAT
Dependence of Water Absorption by the Cell Walls of Plant Leaves on the Volume of the Free Space, (In Russian),
W77-06827 2I

Land Application of Sewage Sludge: IV. Wheat Growth, N Content, N Fertilizer Value, and N Use Efficiency as Influenced by Sewage Sludge and Wood Waste Mixtures,
W77-07079 5D

WILDLIFE
The Mammalian and Fish Fauna of the Nature Preserve of Martely, (In Hungarian),
W77-06838 6G

WIND EROSION
Computing Eolian Sand Transport from Routine Weather Data,
W77-06669 2L

WIND-GENERATED WAVES
Observations of Wind-Generated Waves on Variable Current,
W77-06896 2L

WINDS
A Study to Forecast the Waves at Digha,
W77-06648 2L

The Use of Remote Sensing to Detect How Wind Influences Planktonic Blue-Green Algal Distribution,
W77-06697 5C

Observations of Wind-Generated Waves on Variable Current,
W77-06896 2L

Numerical Models of Wind-Driven Circulation in Lakes,
W77-06958 2H

WINNIPEG (CANADA)
The Chemical Characteristics of the City of Winnipeg Waste Water,
W77-07047 5A

WINTER
The Observed Winter Circulation of Lake Ontario,
W77-06655 2H

WINTER CIRCULATION
The Observed Winter Circulation of Lake Ontario,
W77-06655 2H

WIRE ROPE
Make Wire Rope Last-Treat it Like a Machine,
W77-06857 8G

WISCONSIN
A Device for Measuring Seepage Flux in Lakes and Estuaries,
W77-06903 7B

Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W77-06975 5B

LIBRARY U. OF I. URBANA-CHAMPAIGN

WITHDRAWAL
Economic Analysis of Alternative Groundwater Withdrawal Rates in Conjunction with Surface Water Irrigation,
W77-06740 4B

WOOD WASTES
Land Application of Sewage Sludge: IV. Wheat Growth, N Content, N Fertilizer Value, and N Use Efficiency as Influenced by Sewage Sludge and Wood Waste Mixtures,
W77-07079 5D

WORKABILITY
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

YUGOSLAVIA (DERDAP RESERVOIR)
Changes in the Structure of Phytoplankton During the First Years of Existence of the Derdap Storage Reservoir, (In Serbo-Croatian),
W77-06786 2H

ZINC
The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

The Toxic Effects of Selected Heavy Metals on Unadapted Populations of Vorticella Convallaria Var Similis,
W77-06636 5C

ZOOGLOEA RAMIGERA
Some Factors Affecting Floc Formation by Zoogloea Ramigera, Strain I-16-M,
W77-07042 5D

ZOOPLANKTON
Zooplankton Sampling Variability: Controlled Ecosystem Pollution Experiment,
W77-06615 5A

Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

Experimental Observations on the Effects of Copper on Copepods and Other Zooplankton: Controlled Ecosystem Pollution Experiment,
W77-06619 5A

Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06620 5A

Limnological and Planktonic Studies in the Waterton Lakes, Alberta,
W77-06680 5C

A Study on the Role of Herbivorous Zooplankton Community as Primary Consumers of Phytoplankton in Dutch Lakes,
W77-06695 5C

Primary and Secondary Production of Plankton in Heated Lakes, (In Polish),
W77-06752 5C

Initial Zooplankton Investigations in Lower Cook Inlet,
W77-06835 6G

AUTHOR INDEX

ADAR, Z.
Uncertainty and the Choice of Pollution Control Instruments,
W77-06704 6G

AGBIM, N. N.
Land Application of Sewage Sludge: IV. Wheat Growth, N Content, N Fertilizer Value, and N Use Efficiency as Influenced by Sewage Sludge and Wood Waste Mixtures,
W77-07079 5D

ALEKSEEV, A. M.
Dependence of Water Absorption by the Cell Walls of Plant Leaves on the Volume of the Free Space, (In Russian),
W77-06827 2I

ALLEN, J. S.
Continental Shelf Waves and Alongshore Variations in Bottom Topography and Coastline,
W77-06891 2L

ALVARES DA SILVA, M. O. S.
Stabilisation Lagoons Including Experience in Brazil. Part 1,
W77-07063 5D

AMIARD, J. C.
Effects of Various Ecological Factors on Radiostrontium Uptake in Two Euryhaline Teleosts: Mugil Auratus Risso and Pleuronectes Platessal, (Influence de Divers Facteurs Ecologiques Sur L'Accumulation du Radiostrontium Chez Deux Teleosteens Euryhalins: Mugil Auratus Risso et Pleuronectes Platessa L.),
W77-06777 5C

ANDERSON, C.
The Removal of Organic Matter from Water Supplies by Ion Exchange,
W77-06760 5F

ANDERSON, D. C.
Contract Services Stretch Sewer Maintenance Budget,
W77-06994 8G

ANDERSON, D. W.
Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

ANDERSON, R. S.
Limnological and Planktonic Studies in the Waterton Lakes, Alberta,
W77-06680 5C

ANDREOLI, C.
The Algal Flora in the Thermal Baths of Montegrotto Terme (Padua). Its Distribution Over One-Year Period,
W77-06770 5C

ANDREW, R. C.
Underflow from Sludge-Irrigated Cropland,
W77-07056 5B

ANDREWS, W. H.
Improvement of Planning for Post-Development Water Resource Management: A Study of the Weber Basin Project,
W77-06739 6B

ANDRONIKOV, V. B.
Heat Resistance of Gametes of Marine Invertebrates in Relation to Temperature Conditions Under Which the Species Exist,
W77-06771 5C

ANTHONY, R. S.
Iron-Rich Rhythmically Laminated Sediments in Lake of the Clouds, Northeastern Minnesota,
W77-06901 2J

ARBOLEDA, J.
Backwashing of Granular Filters,
W77-07037 5D

ARKHANGUELSKY, YU. A.
Mathematical Model of Water Resources Utilization in a River Basin,
W77-06719 4A

ARNESON, P. D.
Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska,
W77-06804 6G

ARONOVICH, T. M.
Egg Incubation and Larval Rearing of Navaga (Eleginus Navaga Pall.), Polar Cod (Boreogadus Saida Lepechin) and Arctic Flounder (Liopsetta Glacialis Pall.) in the Laboratory,
W77-06792 8I

ARRHENIUS, E.
Health Effects of Multipurpose Use of Water,
W77-06775 5C

ASKEW, A. J.
Optimal Design and Operation of Reservoir Systems,
W77-06721 4A

ASMUSSEN, L. E.
Loss of 2,4-D in Runoff from Plots Receiving Simulated Rainfall and from a Small Agricultural Watershed,
W77-06908 5B

ATAEV, N. A.
Irrigation of the Nebit-Dag Plantings by Mineralized Ground Water, (In Russian),
W77-06691 3C

ATANASIU, N.
The Effect of Different Methods on Growth, Development and Yield of Cotton, (In German),
W77-06962 3F

ATTANASI, E. D.
Water Quality Management and the Distribution of Emission Rights by Sealed Tender Markets,
W77-06976 5E

AULENBACH, D. B.
Means for Protecting the Drinking Water Quality of Lake George, New York,
W77-06682 5G

AZAM, F.
Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

Effects of Four Oils on Marine Bacterial Populations: Controlled Ecosystem Pollution Experiment,
W77-06623 5A

Response of Natural Marine Bacterial Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06622 5A

AZARNOFF, D. L.
Drugs and Drug Metabolites as Environmental Contaminants: Chlorophenoxyisobutyrate and Salicylic Acid in Sewage Water Effluent,
W77-07045 5A

BABCZYNSKI, S.
Study on Sewage Flow Dynamics Through Dorr Type Clarifier on Stream, (Synopsis),
W77-07048 5D

BAILLOD, C. R.
Influence of Phosphorus Removal on Solids Budget,
W77-07032 5D

BAKER, D. G.
Coastal Meteorological Networks to Determine Effects of Nuclear Plant Cooling Systems,
W77-06643 2B

BALDINA, A. L.
Biogenic Elements and Sulfate Reduction in Water Oil Carbonate Layer, (In Russian),
W77-07040 5B

BALL, J.
Dispersion of Liquid Waste from a Moving Barge,
W77-06913 5B

BARGMAN, R. D.
Fuel Gas and Electricity from Municipal Sewage,
W77-07065 5D

BARGUR, J.
A Dynamic Multisector Programming Approach to Regional Water Resource Management,
W77-06737 6A

BARTLETT, S. F.
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

BARTOLOME, J. C.
Modele Mathematique de Simulation du Systeme des Ressources Hydrauliques Superficielles du Llobregat,
W77-06727 4A

BARTON, L. H.
Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
W77-06828 6G

BARTONEK, J. C.
Feeding Ecology and Trophic Relationships of Alaskan Marine Bird, and Population Dynamics of Marine Birds,
W77-06819 6G

Migration of Birds in Alaska Coastal and Marine Habitats Subject to Influence by OCS Development,
W77-06818 6G

Preliminary Catalog of Seabird Colonies and Photographic Mapping of Seabird Colonies,
W77-06816 6G

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BARTONEK, J. C.

Review and Analysis of Literature and Unpublished Data on Marine Birds,
W77-06817 6G

Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

BATEMAN, R. L.
Water Quality Simulation of Tahoe-Truckee System, Nevada-California-Volume I,
W77-07075 5B

BATTAN, L. J.
Weather Modification in the Soviet Union--1976,
W77-06644 3B

BAUMANN, E. R.
The Electrolytic Respirometer-II. Use in Water Pollution Control Plant Laboratories,
W77-07081 5D

BAWEJA, A. S.
Bonding of Calcium and Potassium by Vermiculite and Kaolinite Clays as Affected by H-Clay Addition,
W77-06872 2G

BEARD, L. R.
Hydrological Evaluation of Changes in Runoff Characteristics,
W77-06732 4A

BEAUPRE, R. T.
Influence of Phosphorus Removal on Solids Budget,
W77-07032 5D

BECK, J.
Phosphates in Soils Treated with Sewage Water: II. Fractionation of Accumulated Phosphates,
W77-07053 5B

BECKER, B. C.
An Executive Summary of Three EPA Demonstration Programs in Erosion and Sediment Control,
W77-06671 5G

BEDFORD, W. K.
Activated Sludge Treatment of High Strength NSSC Mill Effluent,
W77-06945 5D

BEEK, J.
Phosphates in Soils Treated with Sewage Water: I. General Information on Sewage Farm, Soil, and Treatment Results,
W77-07052 5G

Phosphates in Soils Treated with Sewage Water: III. Kinetic Studies on the Reaction of Phosphates with Aluminum Compounds,
W77-07054 5B

BEERS, J. R.
Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

BEININGEN, K. T.
Dissolved Nitrogen, Dissolved Oxygen and Related Water Temperatures in the Columbia and Lower Snake Rivers, 1965-1969,
W77-06925 5C

BELL, L. J.
Notes on the Nesting Success and Fecundity of the Anemonefish Amphiprion Clarkii at Miyake-Jima, Japan,
W77-06763 5C

BENDA, R. S.
Growth and Movement of Fish in the Vicinity of a Thermal Discharge,
W77-06766 5C

BENDOCK, T. M.
Beaufort Sea Estuarine Fishery Study,
W77-06840 6G

BENEFIELD, L. D.
The Effect of High Purity Oxygen on the Activated Sludge Process,
W77-07043 5D

BEREGOVAYA, V. I.
Foam and Film of Fresh Waters as an Ecological Niche of Aquatic Hyphomycetes, (In Russian),
W77-06787 2I

BERGER, A. R.
Preliminary Bibliography on Groundwater in Developing Countries,
W77-06852 2F

BERGMAN, D. L.
Reconnaissance of the Water Resources of the Clinton Quadrangle, West-Central Oklahoma,
W77-06959 7C

BERNDT, H. D.
Sediment Yield Prediction Based on Watershed Hydrology,
W77-06656 4D

BERNER, R. A.
Interstitial Water Chemistry of Anoxic Long Island Sound Sediments. 1. Dissolved Gases,
W77-06900 5B

BERTNESS, M. D.
Temperature Relations of Puget Sound Thaids in Reference to Their Intertidal Distribution,
W77-06767 5C

BESCH, W. K.
A Biological Monitoring System Employing Rheotaxis of Fish,
W77-06609 5C

BESIK, F.
Renovation of Waste Water,
W77-07004 5D

BETZ, J. M.
Fuel Gas and Electricity from Municipal Sewage,
W77-07065 5D

BEUCHAT, L. R.
Environmental Factors Affecting Survival and Growth of Vibrio Parahaemolyticus. A Review,
W77-06765 5C

BIERNACKI, T.
Optimization Model of a System of Two Open-Channel Hydroplants,
W77-06716 4A

BILLARD, R.
Reproductive Cycle of Trout and Tench: Effect of Experimental Variations of the Temperature, (Etude Sur le Cycle Reproducteur do la Truite Arc-En-Ciel et de la Tanche: Effet de Variations Experimentales de la Temperature),
W77-06779 5C

BILLS, T. D.
Changes in the Blood Chemistry of Coho Salmon Exposed to Malachite Green,
W77-06746 5C

Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

BLACKBURN, J. E.
Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
W77-06847 6G

Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
W77-06829 6G

BLAIR, C. H.
Investigation of Flushing Time in the Lafayette River, Norfolk, Virginia,
W77-06881 2L

BLEDSOE, J. D.
Cost Comparison Between Subterrene and Current Tunneling Methods,
W77-06662 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix A--Baseline Cost Analyses,
W77-06663 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix B--Subterrene Cost Analyses,
W77-06664 8A

BLOOMFIELD, J. A.
A General Model of Microbial Growth and Decomposition in Aquatic Ecosystems,
W77-06684 5C

BLOUGH, D.
Evaluation of In-Line and Side-Line Flow Equalization Systems,
W77-07041 5D

BOISSEAU, D.
Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

BOLLER, M.
Process Technological Background Regarding New Protective Regulations of Water Bodies-Results of Nitrification and Phosphorus Elimination Experiments in Zurich and Bern. III. Filtration by Flocculation for the Elimination of Phosphorus from Communal Waste Water (Verfahrenstechnische Unterlagen im Hinblick auf die neuen Gewaesserschutzanforderungen-Ergebnisse der Versuche ueber die Nitrifikation und Phosphorelimination in Zuerich und Bern. III. Flockungsfiltration zur Elimination von Phosphor aus Kommunalem Abwasser),
W77-07082 5D

BOON, A. G.
The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

BOUCHE, G.
Effect of Two Rearing Conditions on Growth and Body Composition in Carp (Cyprinus Carpio L), (Influence de Deux Modes d'Elevage sur la Croissance et la Composition Corporelle de la Carpe Commune),
W77-06769 5C

BOUCK, G. R.
Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
W77-06924 5C

BOVBJERG, R. V.
Dispersal and Dispersion of Pond Snails in an Experimental Environment Varying to Three Factors, Singly and in Combination,
W77-06773 5C

BOWEN, J. H.
Oxidation and Ozonation Chamber,
W77-06999 5D

BRADBURY, K. M.
Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

BRADLEY, B. P.
The Measurement of Temperature Tolerance: Verification of an Index,
W77-06764 5C

BRADLEY, M. D.
Environmental Impact Statements in Water Resources Planning and Decision Making,
W77-06738 6E

BRADLEY, R. M.
Stabilisation Lagoons Including Experience in Brazil. Part I,
W77-07063 5D

BRAHAM, H. W.
Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska,
W77-06795 6G

Baseline Characterization of Marine Mammals in the Bering Sea,
W77-06794 6G

Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
W77-06796 6G

BRAUNSCHEIDEL, D. E.
UNOX System for Waste Water Treatment,
W77-07014 5D

BRETON, B.
Reproductive Cycle of Trout and Tench: Effect of Experimental Variations of the Temperature, (Etude Sur le Cycle Reproducteur do la Truite Arc-En-Ciel et de la Tanche: Effet de Variations Experimentales de la Temperature),
W77-06779 5C

BRINKMEIER, R.
Distribution and Indicatory Value of the Submerged Macrophytes in the Flowing Waters of the Friedberger Au, (In German),
W77-06802 5C

BROAD, A. C.
Reconnaissance Characterization of Littoral Biota, Beaufort and Chukchi Seas,
W77-06843 6G

BROWN, D. W.
A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

BROWN, J. L.
An Annular Flow Ice-Water Model Heat Sink,
W77-06889 2C

BRULAND, K. W.
Monitoring the Marine Environment Through Sedimentation,
W77-06651 2L

BRUNNER, C. A.
Waste Water Reuse Practice in the United States,
W77-07087 5D

BUCHANAN, J. M.
Polluters' Profits and Political Response: Direct Control Versus Taxes: Comments and Reply,
W77-06700 5G

BUCHHOLZ, J. R.
Chemical Quality of Effluents and Their Influence on Water Quality in a Shallow Aquifer,
W77-06658 5B

BUDHRAJA, V.
The Conjunctive Use of a Multi-Reservoir System and a Dual-Purpose Desalting Plant,
W77-06714 4B

BUHLER, D. R.
Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
W77-06639 5C

BURAS, N.
Integration of Aquifers in Flood Control Projects,
W77-06723 4A

BURNS, D. E.
Backwashing of Granular Filters,
W77-07037 5D

BURNS, J. J.
An Aerial Census of Spotted Seals, Phoca Vitulina Largha,
W77-06800 6G

The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
W77-06799 6G

BURNS, J. R.
Seasonal changes in the Respiration of Pumpkinseed, Lepomis Gibbosus, Correlated with Temperature, Day Length, and Stage of Reproductive Development,
W77-06768 5C

BURRESS, R. M.
Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

BUTCHER, W. R.
Economic Analysis of Alternative Groundwater Withdrawal Rates in Conjunction with Surface Water Irrigation,
W77-06740 4B

BYKOV, V. N.
Biogenic Elements and Sulfate Reduction in Water Oil Carbonate Layer, (In Russian),
W77-07040 5B

BYRNE, P.
Effect of Salinity on Spore Germination of Terrestrial and Marine Fungi,
W77-06772 5C

CACHTER, R.
Lake Restoration by Bottom Water Siphoning (In German),
W77-06689 5G

CALDWELL, R. S.
Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
W77-06639 5C

CAMBRAY, R. S.
An Estimate of the Input of Atmospheric Trace Elements into the North Sea and the Clyde Sea (1972-3),
W77-06668 5B

CAMERON, J. J.
Annotated Bibliography on Northern Environmental Engineering 1974-75,
W77-06948 5D

CAMP, B. J.
Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

CAMPBELL, B.
Impact of Oil Spillage from World War II Tanker Sinkings,
W77-06877 5C

CAREY, J. H.
Acid Solubilization of Sewage Sludge and Ash Constituents for Possible Recovery,
W77-07017 5E

CARR, J. E.
Reconnaissance of the Water Resources of the Clinton Quadrangle, West-Central Oklahoma,
W77-06959 7C

CARROLL, W. D.
The Chemical Characteristics of the City of Winnipeg Waste Water,
W77-07047 5A

CATHCART, N. L.
Automated Method for the Determination of the Phosphorus Content of Detergents,
W77-06944 5A

CEBULA, J.
Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

CHANG, R. C-Y.
Concentration and Determination of Trace Organic Pollutants in Water,
W77-07098 5A

CHANG, W. Y. B.
Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

CHANGNON, S. A. JR.
On the Status of Hail Suppression,
W77-06645 3B

CHAPMAN, G. A.
Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
W77-06924 5C

CHARLES, W. N.
A Pneumatic Grab for Obtaining Large, Undisturbed Mud Samples: Its Construction

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CHARLES, W. N.

and Some Applications for Measuring the Growth of Larvae and Emergence of Adult Chironomidae,
W77-06613 5A

CHASTAN-BAGNIS, L.
Device for Sucking the Upper Layer of a Polluted Water Surface,
W77-07089 5G

CHENG, R. T.
Numerical Models of Wind-Driven Circulation in Lakes,
W77-06958 2H

CHEREMISINOFF, P. M.
Sludge Dewatering Pilot Plant Design. Part 2,
W77-07088 5D

CHIAN, E. S. K.
Characterization of Soluble Organic Matter in Leachate,
W77-07039 5A

CHIANG, W. L.
Further Development and Testing of a Stream-Aquifer System Model,
W77-06762 2F

CHICHESTER, F. W.
The Impact of Fertilizer Use and Crop Management on Nitrogen Content of Subsurface Water Draining from Upland Agricultural Watersheds,
W77-06909 5B

CHILDRESS, J. J.
Effects of Pressure, Temperature and Oxygen on the Oxygen-Consumption Rate of the Midwater Copepod Gaussia Princeps,
W77-06642 5C

CHMIELEWSKI, A. G.
Study on Sewage Flow Dynamics Through Dorr Type Clarifier on Stream, (Synopsis),
W77-07048 5D

CHRISTENSEN, B. A.
Hydraulics of Sheet Flow in Wetlands,
W77-06929 8B

Incipient Sediment Motion in Entrances with Shell Beds,
W77-06930 2L

CIAMBRONE, D. F.
Ozone Oxidation of Waste Water,
W77-07094 5D

CICCONE, V. J.
Adsorption, Coagulation and Filtration Make a Useful Treatment Combination-Part 2,
W77-07077 5D

CIRAVOLO, T. G.
Pollutant Movement to Shallow Ground Water Tables from Swine Waste Lagoons,
W77-06742 5B

CLARK, A. B.
Agricultural Disposal of Aerobic Wastewater Sludges in an Urban County,
W77-07057 5D

CLEASBY, J. L.
Backwashing of Granular Filters,
W77-07037 5D

CLESCERI, L. S.
A General Model of Microbial Growth and Decomposition in Aquatic Ecosystems,
W77-06684 5C

CLESCERI, N. L.
Means for Protecting the Drinking Water Quality of Lake George, New York,
W77-06682 5G

Nutrient Removal and Sludge Disposal Within Septic Systems-Phase III,
W77-06686 5D

COLE, J. A.
Optimal Seasonal and Short-Term Operation of a Reservoir Used for Flood Control and Water Supply,
W77-06724 4A

COLLIER, R. S.
Respiratory Response of Cunners to Silver,
W77-06789 5C

COLLINS, E. R. JR.
Pollutant Movement to Shallow Ground Water Tables from Swine Waste Lagoons,
W77-06742 5B

CONNORS, P. G.
Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

COON, R. F.
Cost Comparison Between Subterrene and Current Tunneling Methods,
W77-06662 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix A--Baseline Cost Analyses,
W77-06663 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix B--Subterrene Cost Analyses,
W77-06664 8A

CORDES, E. H.
Analog-Model Simulations for Secondary Canal Controls and Forward Pumping Water-Management Schemes in Southeast Florida,
W77-06968 4B

COREY, R. B.
Fate of Nitrogen and Phosphorus in Soils Under Septic Tank Waste Disposal Fields,
W77-06914 5B

CORNWELL, D. A.
Nutrient Removal by Water Hyacinths,
W77-07036 5G

Recycling of Aluminum Used for Phosphate Removal in Domestic Waste Water Treatment,
W77-07099 5D

CORY, R. L.
Measurement in a Marine Environment Using Low Cost Sensors of Temperature and Dissolved Oxygen,
W77-06960 7B

COUGHTREY, P. J.
The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

COX, J. H.
Investigation of Flushing Time in the Lafayette River, Norfolk, Virginia,
W77-06881 2L

CRESSEY, G. M.
Influence of Phosphorus Removal on Solids Budget,
W77-07032 5D

CRILL, P. A.
Monitoring the Marine Environment Through Sedimentation,
W77-06651 2L

CROPPER, M. L.
Regulating Activities with Catastrophic Environmental Effects,
W77-06703 6G

CUENA, J.
Construction and Adjustment of a Two-Layer Mathematical Model of the Llobregat Delta,
W77-06722 4A

CUMMING, K. B.
Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

CUSTODIO, E.
Construction and Adjustment of a Two-Layer Mathematical Model of the Llobregat Delta,
W77-06722 4A

DAMKAER, D. M.
Initial Zooplankton Investigations in Lower Cook Inlet,
W77-06835 6G

DANCETTE, C.
A Method of Evaluating a Field Water Capacity Using PF-3, (In French),
W77-06844 2G

DARCY, K.
Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

DARR, R. E.
New Design Gives Denver District Iron-Free Well,
W77-06868 8A

DAS KAVIRAJ, S. K.
A Study to Forecast the Waves at Digha,
W77-06648 2L

DAUTOV, F. F.
Hygienic Effectiveness of Measures for Decontaminating Effluents at Petrochemical Plants, (In Russian),
W77-07069 5D

DAVIES, J. M.
Loch Ewe Bag Experiment, 1974,
W77-06627 5A

DAVIS, R. B.
The Historic and Present Relationships Between Phytoplankton, Limiting Nutrients, and Sediment-Water Geochemical Processes in Selected Maine Lakes,
W77-06741 5C

DE HAAN, F. A. M.
Phosphates in Soils Treated with Sewage Water: I. General Information on Sewage Farm, Soil, and Treatment Results,
W77-07052 5G

Phosphates in Soils Treated with Sewage Water: II. Fractionation of Accumulated Phosphates,
W77-07053 5B

DECKER, T. L.
New Design Gives Denver District Iron-Free Well,
W77-06868 8A

DELANEY, E. F.
New Programs Improve Sensitive Areas of Water and Sewer Systems,
W77-06995 8G

DEMONT, D. J.
First Reported Incidence of Gas-Bubble Disease in the Heated Effluent of a Steam Generating Station,
W77-06922 5C

DEWALLE, F. B.
Characterization of Soluble Organic Matter in Leachate,
W77-07039 5A

DILLON, T. M.
Numerical Models of Wind-Driven Circulation in Lakes,
W77-06958 2H

DIVOKY, G. J.
Identification, Documentation, and Delineation of Coastal Migratory Bird Habitat in Alaska, and the Distribution, Abundance and Feeding Ecology of Birds Associated with Pack Ice,
W77-06805 6G

DOMOKOS, M.
Indices of Water Restriction and Water Deficiency Tolerance,
W77-06711 6A

DOROSHEV, S. I.
Egg Incubation and Larval Rearing of Navaga (Eleginus Navaga Pall.), Polar Cod (Boreogadus Saida Lepechin) and Arctic Flounder (Liopsetta Glacialis Pall.) in the Laboratory,
W77-06792 8I

DOUNIN-BARKOVSKY, L. V.
Mathematical Model of Water Resources Utilization in a River Basin,
W77-06719 4A

DROST, B. W.
Preliminary Assessment of the Water Resources of the Tulalip Indian Reservation, Washington,
W77-06971 4A

DRURY, W. H.
Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

Studies of Populations, Community Structure and Colony of Marine Birds at King Island, Bering Strait Region, Alaska,
W77-06821 6G

DUCKSTEIN, L.
Collective Utility: A Systems Approach to Water Pricing Policy,
W77-06712 6C

DUDKA, I. A.
Foam and Film of Fresh Waters as an Ecological Niche of Aquatic Hyphomycetes, (In Russian),
W77-06787 2I

DUFFRIN, E.
Monitoring the Marine Environment Through Sedimentation,
W77-06651 2L

DYCK, S.
On the Application of Optimization Techniques to Conceptual Catchment Models,
W77-06709 2A

EBEL, W. J.
Dissolved Nitrogen, Dissolved Oxygen and Related Water Temperatures in the Columbia and Lower Snake Rivers, 1965-1969,
W77-06925 5C

Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

ECCLES, L. A.
USGS Scientists Bring California Water Supply into Compliance with Federal Regulations,
W77-06853 5G

ECKHARDT, D. A. V.
Sediment Discharge from an Area of Highway Construction, Applemans Run Basin, Columbia County, Pennsylvania,
W77-06969 4C

EDWARDS, P.
Correlation Coefficients and Concentration Factors of Copper and Lead in Seawater and Benthic Algae,
W77-06783 5C

EIHE, E. P.
The Significance of Regulating the Water Regime of Agricultural Lands, (In Russian),
W77-06837 3F

EISELE, P. J.
The Effects of Methoxychlor on Riffle Invertebrate Populations and Communities,
W77-06614 5C

EJSMONT-KARABINOWA, J.
Primary and Secondary Production of Plankton in Heated Lakes, (In Polish),
W77-06752 5C

ELEUTERIUS, C. K.
Mississippi Sound Temporal and Spatial Distribution of Nutrients,
W77-06932 5B

ELEY, T. J.
The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
W77-06799 6G

ELFERS, K.
Open Space and Urban Water Management - Phase II: Case Studies and Findings,
W77-06917 6B

ELLENBERG, H.
Indicator Values of Vascular Plants in Central Europe, (In German),
W77-06803 2I

ELLIS, J. B.
Sediments and Water Quality of Urban Storm Water,
W77-06984 5B

ENGEL, P.
A Universal Calibration Equation for Price Meters and Similar Instruments,
W77-06943 7B

ENGLISH, T. S.
Plankton of the Gulf of Alaska - Ichthyoplankton,
W77-06834 6G

EPITANIO, C.
Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

EPPLEY, R. W.
Chlorine Reactions with Seawater Constituents and the Inhibition of Photosynthesis of Natural Marine Phytoplankton,
W77-06637 5C

ERIKSSON, E.
Water Chemistry and Water Quality,
W77-06778 5A

EUGSTER, H. P.
Hydrochemistry of the Lake Magadi Basin, Kenya,
W77-06967 2K

EVERITT, R. D.
Baseline Characterization of Marine Mammals in the Bering Sea,
W77-06794 6G

Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
W77-06796 6G

FAN, E.
Single P/C Unit Removal of Nutrients from Combined Sewer Overflows,
W77-07031 5D

FARMER, D. M.
The Influence of Wind on the Surface Layer of a Stratified Inlet: Part I. Observations,
W77-06894 2L

The Influence of Wind on the Surface Layer of a Stratified Inlet: Part II. Analysis,
W77-06895 2L

FARR, W. E.
Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

FARRELL, J. B.
Trends in Sludge Treatment and Disposal Practices in the United States,
W77-07083 5D

FAVORITE, F.
Ecosystem Dynamics Birds and Marine Mammals. Part III: A Dynamic Numerical Marine Ecosystem Model for Evaluation of Marine Resources in Eastern Bering Sea,
W77-06808 6G

Ichthyoplankton of the Eastern Bering Sea,
W77-06845 6G

FEDER, H. M.
The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

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FEDER, H. M.

The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
W77-06826 6G

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

FELDMAN, M.
Economic Analysis of Alternative Groundwater Withdrawal Rates in Conjunction with Surface Water Irrigation,
W77-06740 4B

FIELD, R.
Single P/C Unit Removal of Nutrients from Combined Sewer Overflows,
W77-07031 5D

FILIMOWSKI, J.
The Out-of-Kilter Algorithm as a Single-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06735 4A

FILIPKOWSKI, A.
The Multi-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06734 4A

FISCHER, R. W.
Investigation of the Effects of Nonhomogeneous (or Nonstationary) Behavior on the Spectra of Atmospheric Turbulence,
W77-06678 2B

FISCUS, C. H.
Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska,
W77-06795 6G

Baseline Characterization of Marine Mammals in the Bering Sea,
W77-06794 6G

Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
W77-06796 6G

FLIEGEL, F. C.
Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

FOESS, G. W.
Evaluation of In-Line and Side-Line Flow Equalization Systems,
W77-07041 5D

FOLGER, D. W.
Delaware River: Evidence for Its Former Extension to Wilmington Submarine Canyon,
W77-06966 2E

FORSTER, C. F.
The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

FORSUND, F. R.
The Generation of Residual Flows in Norway: An Input-Output Approach,
W77-06698 5G

FOSTIER, A.
Reproductive Cycle of Trout and Tench: Effect of Experimental Variations of the Temperature, (Etude Sur le Cycle Reproducteur do la Truite Arc-En-Ciel et de la Tanche: Effet de Variations Experimentales de la Temperature),
W77-06779 5C

FREY, D. G.
Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

FURMAN, T. DES.
Nutrient Removal by Water Hyacinths,
W77-07036 5G

GAMBLE, J. C.
Experimental Observations on the Effects of Copper on Copepods and Other Zooplankton: Controlled Ecosystem Pollution Experiment,
W77-06619 5A

Loch Ewe Bag Experiment, 1974,
W77-06627 5A

GAPPA, G.
Process for the Purification of Waste Waters with Activated Carbon,
W77-07093 5D

GARCIA, L. L.
Optimization of a Three-Reservoir System by Dynamic Programming,
W77-06720 4A

GARDNER, R. A.
Analog-Model Simulations for Secondary Canal Controls and Forward Pumping Water-Management Schemes in Southeast Florida,
W77-06968 4B

GASS, T. E.
Electric Logging,
W77-06865 8G

GATES, J. S.
Hydrologic Interpretation of Geophysical Data from the Southeastern Hueco Bolson, El Paso and Hudspeth Counties, Texas,
W77-06970 4B

GIBSON, V. R.
Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06620 5A

GILDERHUS, P. A.
Field Tests of Isobornyl Thiocyanoacetate (Thanite) for Live Collection of Fishes,
W77-06747 5C

GLEASON, W. T.
Single P/C Unit Removal of Nutrients from Combined Sewer Overflows,
W77-07031 5D

GLIBERT, P. M.
Blank and Salinity Corrections for Automated Nutrient Analysis of Estuarine and Sea Waters,
W77-06938 5A

GLIWICZ, Z. M.
Stratification of Kinetic Origin and its Biological Consequences in a Neotropical Man-Made Lake,
W77-06683 2H

GODSHALL, F. A.
Measurement in a Marine Environment Using Low Cost Sensors of Temperature and Dissolved Oxygen,
W77-06960 7B

GOERING, J. J.
Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

GRAHAM, M. J.
Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

GRAY, J. S.
The Fauna of the Polluted River Tees Estuary,
W77-06638 5C

GREEN, R. B.
Limnological and Planktonic Studies in the Waterton Lakes, Alberta,
W77-06680 5C

GRETHLEIN, H. E.
Anaerobic Digestion and Membrane Separation for the Treatment of Domestic Sewage,
W77-06631 5D

GRICE, G. D.
Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06620 5A

Zooplankton Sampling Variability: Controlled Ecosystem Pollution Experiment,
W77-06615 5A

GRIFFIN, J. M.
Uncertainty and the Choice of Pollution Control Instruments,
W77-06704 6G

GRIGOR'EV, YU. S.
Some Significant Regularities in Plant Hydroadaptation, (In Russian),
W77-06774 3B

GRIN', N. V.
Experience in Treating Waste Waters from the Donetsk Mines, (In Russion),
W77-07068 5D

GROVE, K.
Particle Characteristics and Dispersal Patterns of Sugar Cane Wastes in Selected Rivers and Estuaries of Puerto Rico,
W77-06632 5B

GRUNEWALD, U.
On the Application of Optimization Techniques to Conceptual Catchment Models,
W77-06709 2A

GRUVER, G. W.
Optimal Investment in Pollution Control Capital in a Neoclassical Growth Context,
W77-06705 6G

GUGGINO, E.
La Science des Systemes dans la Planification des Ressources en Eau,
W77-06736 6A

GULATI, R. D.
A Study on the Role of Herbivorous Zooplankton Community as Primary Consumers of Phytoplankton in Dutch Lakes,
W77-06695 5C

GUNN, G. A.
Fail-Safe Waste Treatment System,
W77-07027 5D

GUO, P. H. M.
Activated Sludge Treatment of High Strength NSSC Mill Effluent,
W77-06945 5D

State-of-the-Art Review of Processes for Treatment and Reuse of Potato Wastes,
W77-06949 5D

GUTHRIE, D. L.
Municipal Waste Water Treatment as an Industrial Operation,
W77-07025 5D

GUY, H. P.
Diminution Ratios for Planning Construction-Area Sediment Controls,
W77-06980 4D

GUYMON, G. L.
Suprapermafrost Water,
W77-06630 2C

GUZMAN, J.
Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, When Over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska During the Northern Summer,
W77-06814 6G

GYGER, R. G.
UNOX System for Waste Water Treatment,
W77-07014 5D

HACKETT, J. E.
Design Study of Environmental and Human Cultural Information System Needs in Urban Water Resource Development,
W77-06634 6B

HAKONSON, T. E.
Chemical Quality of Effluents and Their Influence on Water Quality in a Shallow Aquifer,
W77-06658 5B

HALDAR, B. C.
A Preliminary Survey of Mercury in Fish from Bombay and Thana Environment,
W77-06785 5C

HALL, A. J.
Mixing in Upper Layer of a Lake During Heating Cycle,
W77-06649 2H

HALL, W. A.
Optimal Design and Operation of Reservoir Systems,
W77-06721 4A

HALLOCK, D. L.
Pollutant Movement to Shallow Ground Water Tables from Swine Waste Lagoons,
W77-06742 5B

HAMPSON, B. L.
Ammonia Concentration in Relation to Ammonia Toxicity During a Rainbow Trout Rearing Experiment in a Closed Freshwater-Seawater System,
W77-06743 5C

HANCOCK, N.
Slipform Paver, Steel Forms Speed Lining of 25,000-Foot Sewer Tunnel,
W77-06992 8F

HARAGUCHI, P.
Forecasting Floods in Hawaii (Excluding Hawaii Island),
W77-06873 4A

HARBO, S. J. JR.
An Aerial Census of Spotted Seals, Phoca Vitulina Largha,
W77-06800 6G

HARDING, JAMES L.
Sand Stabilization on the Dunes, Beach and Shoreface of a Historically Eroding Barrier Island. Wassaw Island Erosion Study, Part III,
W77-06940 8G

HARDT, W. F.
USGS Scientists Bring California Water Supply into Compliance with Federal Regulations,
W77-06853 5G

HARRIS, C. K.
Assessment of Pelagic and Nearshore Fish in Three Bays on Southeast Kodiak Island,
W77-06846 6G

HARTFORD, J. D.
Adjustment Costs and Optimal Waste Treatment,
W77-06699 5D

HARTMANN, R.
Depth and Seasonal Fluctuations in the Condition of the Groundwater of the Area Around the City of Ghent (Belgium), (In Dutch),
W77-06681 2G

HARTT, A. C.
Assessment of Pelagic and Nearshore Fish in Three Bays on Southeast Kodiak Island,
W77-06846 6G

HARTUNG, R.
The Effects of Methoxychlor on Riffle Invertebrate Populations and Communities,
W77-06614 5C

HASAN, S. M.
Integrated Approach to Urban Waste Water Management,
W77-07095 5D

HATTORI, A.
Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

HAUG, R. T.
Anaerobic Filter Treats Waste Activated Sludge,
W77-07078 5D

HAUSER, E. W.
Loss of 2,4-D in Runoff from Plots Receiving Simulated Rainfall and from a Small Agricultural Watershed,
W77-06908 5B

HECOCK, R. D.
A New Reservoir and Recreational Behavior,
W77-06956 6B

HEESEN, T. C.
An Offshore Biomonitoring System for Chlorinated Hydrocarbons,
W77-06641 5A

HEGGIE, D. T.
Microbial Methane Consumption Reactions and Their Effect on Methane Distributions in Freshwater and Marine Environments,
W77-06899 5C

HEINKE, G. W.
Plant Data Analysis of Temperature Significance in the Activated Sludge Process,
W77-07046 5D

HEISS, H. W.
The Legal Responsibility of Water Well Drillers,
W77-06862 5G

HEJTMANCIK, E.
Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

HENDERSON, A. D.
Method of Applying Ozone and Sonic Energy to Sterilize and Oxidize Waste Water,
W77-07007 5D

HERNDON, J.
Testing and Grouting Leaking Joints,
W77-06986 8G

HERRMANN, R.
Phosphate Prediction Model for Streams by Means of Discriminant Analysis,
W77-06906 5B

HERSHAFT, A.
The Plight and Promise of On-Site Waste Water Treatment,
W77-07010 5D

HERSHMAN, S.
Presenting Trends in Lake Eutrophication,
W77-06693 5C

HESS, K.
Method of Treating Waste Water with Jet Nozzles,
W77-07090 5D

HEUTMAKER, D. L.
Waste Injection into Stratified Ground Water Bodies,
W77-06855 5B

HICKS, J. R.
Compressed Air for Supercooled Fog Dispersal,
W77-06674 3B

HIGNITE, C.
Drugs and Drug Metabolites as Environmental Contaminants: Chlorophenoxyisobutyrate and Salicylic Acid in Sewage Water Effluent,
W77-07045 5A

HILL, D. W.
Induction of Hepatic Microsomal Enzymes by Aroclor 1254 in Ictalurus punctatus (Channel Catfish),
W77-06759 5C

HILL, J. E.
Cost Comparison Between Subterrene and Current Tunneling Methods,
W77-06662 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix A--Baseline Cost Analyses,
W77-06663 8A

Cost Comparison Between Subterrene and Current Tunneling Methods, Appendix B--Subterrene Cost Analyses,
W77-06664 8A

HILLBRICHT-ILKOWSKA, A.
Primary and Secondary Production of Plankton in Heated Lakes, (In Polish),
W77-06752 5C

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HOCHMAN, E.
Two-Goal Regional Environmental Policy: The Case of the Santa Ana River Basin,
W77-06707 5G

HOCUTT, C. H.
Influence of Gradient on the Distribution of Fishes in Conowingo Creek, Maryland and Pennsylvania,
W77-06635 2I

HODGES, D. B.
A Single Field of View Method for Retrieving Tropospheric Temperature Profiles from Cloud-Contaminated Radiance Data,
W77-06887 2B

HODSON, R.
Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

HODSON, R. E.
Effects of Four Oils on Marine Bacterial Populations: Controlled Ecosystem Pollution Experiment,
W77-06623 5A

Response of Natural Marine Bacterial Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06622 5A

HOFFMAN, G. L.
Fish Diseases and Parasites in Relation to the Environment,
W77-06744 5C

HOLLYDAY, E. F.
Improving Estimates of Streamflow Characteristics Using LANDSAT-1 (ERTS-1) Imagery,
W77-06972 4A

HOLM-HANSEN, O.
Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

HOOK, J. E.
Accumulation of Heavy Metals in Soils from Extended Waste Water Irrigation,
W77-07049 5B

HOPTON, F. J.
Burning Waste Chlorinated Hydrocarbons in a Cement Kiln,
W77-06946 5E

HORN, D.
Impact of Oil Spillage from World War II Tanker Sinkings,
W77-06877 5C

HORNE, A. J.
The Use of Remote Sensing to Detect How Wind Influences Planktonic Blue-Green Algal Distribution,
W77-06697 5C

HORNER, R. W.
London's Stormwater Problem,
W77-06983 5D

HORNUNG, H.
Heavy Metal Concentrations in Water, Sediments, and Fish from Mediterranean Coastal Area, Israel,
W77-06782 5C

HOSKINS, K. D.
Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

HOUCK, C. P.
Subsurface Injection-How Much Does It Cost,
W77-07011 5E

HOUGHTON, R. W.
Circulation and Hydrographic Structure Over the Ghana Continental Shelf During the 1974 Upwelling,
W77-06893 2L

HRYCYK, O.
Single P/C Unit Removal of Nutrients from Combined Sewer Overflows,
W77-07031 5D

HSU, S. A.
Computing Eolian Sand Transport from Routine Weather Data,
W77-06669 2L

HUANG, N. E.
Observations of Wind-Generated Waves on Variable Current,
W77-06896 2L

HUFSCHMIDT, M. M.
Open Space and Urban Water Management - Phase II: Case Studies and Findings,
W77-06917 6B

HUNN, J. B.
Changes in the Blood Chemistry of Coho Salmon Exposed to Malachite Green,
W77-06746 5C

HUNT, G. L. JR.
Reproductive Ecology of Pribilof Island Seabirds,
W77-06809 6G

HUNTER, A. H.
Potassium in an Arid Loessial Soil: Changes in Availability as Related to Cropping and Fertilization,
W77-06870 3F

IKEDA, T.
Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

IONSON, A.
Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

ITEM, H.
A Model for the Water Regime of a Deciduous Forest with Special Consideration of the Functional Interrelationships Among Meteorological Factors, Soil Water Content and Evapotranspiration, (In German),
W77-06864 2A

JACOBY, S. L. S.
Optimal Planning of Flows in Multi-Reservoir Hydro-Power Systems,
W77-06730 4A

JALABERT, B.
Reproductive Cycle of Trout and Tench: Effect of Experimental Variations of the Temperature, (Etude Sur le Cycle Reproducteur do la Truite Arc-En-Ciel et de la Tanche: Effet de Variations Experimentales de la Temperature),
W77-06779 5C

JAMES, D. W.
Potassium in an Arid Loessial Soil: Changes in Availability as Related to Cropping and Fertilization,
W77-06870 3F

JANK, B. E.
Activated Sludge Treatment of High Strength NSSC Mill Effluent,
W77-06945 5D

JEDRYSIK, M.
General Description of the Vistula River Project and Basic Planning Data,
W77-06733 4A

JEFFERIES, D. F.
An Estimate of the Input of Atmospheric Trace Elements into the North Sea and the Clyde Sea (1972-3),
W77-06668 5B

JEFFERS, A.
NASA Develops Water Monitoring System,
W77-06912 5A

JENKINS, R. G.
A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

JERIS, J. S.
Apparatus and Process for Removing Ammonia Nitrogen from Waste Water,
W77-07008 5D

Waste Treatment Apparatus,
W77-07005 5D

Waste Treatment Process,
W77-07091 5D

JEWSON, D. H.
Some Effects on Integral Photosynthesis of Artificial Circulation of Phytoplankton Through Light Gradients,
W77-06696 5C

JOBSON, H. E.
Comprehensive Monitoring of Meteorology, Hydraulics, and Thermal Regime of the San Diego Aqueduct, California,
W77-06973 2D

JONES, B. F.
Hydrochemistry of the Lake Magadi Basin, Kenya,
W77-06967 2K

JONES, E. B. G.
Effect of Salinity on Spore Germination of Terrestrial and Marine Fungi,
W77-06772 5C

JONES, J. G.
The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

JONES, R. D. JR.
Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
W77-06824 6G

JUNTGEN, H.
Process for the Purification of Waste Waters with Activated Carbon,
W77-07093 5D

JUST, R. E.
Two-Goal Regional Environmental Policy: The Case of the Santa Ana River Basin,
W77-06707 5G

KACZMAREK, Z.
The Multi-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06734 4A

KADDAH, M. T.
Salinity Effects on Rice After the Boot Stage,
W77-06871 3C

KAISER, R. J.
Razor Clam (Siliqua Patula, Dixon) Distribution and Population Assessment Study,
W77-06830 6G

KANIAS, G. D.
Stable Elements of Radioecological Importance in Certain Echinoderm Species,
W77-06640 5A

KARABIN, A.
Primary and Secondary Production of Plankton in Heated Lakes, (In Polish),
W77-06752 5C

KARDOS, L. T.
Accumulation of Heavy Metals in Soils from Extended Waste Water Irrigation,
W77-07049 5B

KARLINGER, M. R.
Surface Water Network Design by Regression Analysis Simulation,
W77-06963 2E

KARR, P. R. III.
Factors Influencing the Dewatering Characteristics of Sludge,
W77-07097 5D

KECK, R.
Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

KEMBALL, A.
A Biological Monitoring System Employing Rheotaxis of Fish,
W77-06609 5C

KERN, E.
Impact of Oil Spillage from World War II Tanker Sinkings,
W77-06877 5C

KERR, R. L.
Time-Distribution of Storm Rainfall in Pennsylvania,
W77-07022 2B

KHAN, M. A.
Adsorption of Polychlorinated Biphenyl (Aroclor 1254) on Shrimp,
W77-06758 5C

KIM, J. I.
Nutrient Removal by Water Hyacinths,
W77-07036 5G

KIMBALL, B. A.
Smoothing Data with Cubic Splines,
W77-06831 7C

KIMBALL, L. R.
Debris Basins for Control of Surface Mine Sedimentation,
W77-06672 5G

KINDLER, J.
The Multi-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06734 4A

The Out-of-Kilter Algorithm as a Single-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06735 4A

KING, I. P.
The Out-of-Kilter Algorithm as a Single-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06735 4A

KING, L. D.
Application of Municipal Refuse and Liquid Sewage Sludge to Agricultural Land: II. Lysimeter Study,
W77-07080 5D

KING, P. H.
The Effect of High Purity Oxygen on the Activated Sludge Process,
W77-07043 5D

KISIEL, C. C.
Collective Utility: A Systems Approach to Water Pricing Policy,
W77-06712 6C

KIVLIN, J. E.
Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

KLEIN, J. M.
USGS Scientists Bring California Water Supply into Compliance with Federal Regulations,
W77-06853 5G

KLING, S. A.
Monitoring the Marine Environment Through Sedimentation,
W77-06651 2L

KNEBEL, H. J.
Delaware River: Evidence for Its Former Extension to Wilmington Submarine Canyon,
W77-06966 2E

KNIGHT, A. L.
Urbanization and Flooding in Shades Creek Basin, Jefferson County, Alabama,
W77-06977 4C

KNOWLES, C. E.
Exchange Through a Barrier Island Inlet: Additional Evidence of Upwelling Off the Northeast Coast of North Carolina,
W77-06654 2L

KOELLER, P.
The Growth of Young Salmonids (Onchorhynchus Keta): Controlled Ecosystem Pollution Experiment,
W77-06618 5A

KOELLIKER, J. K.
Land Forming Systems to Improve Water Use Efficiency,
W77-06761 3F

KOERNER, R. M.
Devon Island Ice Cap: Core Stratigraphy and Paleoclimate,
W77-06890 2C

KOHLER, A.
Distribution and Indicatory Value of the Submerged Macrophytes in the Flowing Waters of the Friedberger Au, (In German),
W77-06802 5C

KONIGSBERG, D.
Razor Clam (Siliqua Patula, Dixon) Distribution and Population Assessment Study,
W77-06830 6G

KORNATOWSKI, T.
The Multi-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06734 4A

KORNEGAY, E. T.
Pollutant Movement to Shallow Ground Water Tables from Swine Waste Lagoons,
W77-06742 5B

KORNGOLD, U.
Use of a Parametric Model as a Tool for Hydrometric Network Planning,
W77-06710 2A

KOROBOVA, D. N.
The Methods of Distribution of Water Resources in River Development Systems,
W77-06726 4A

KORYCKA, A.
The Influence of Heated Effluent Waters on the Thermal-Oxygen Relations and Water Transparency in the Konin Lakes Complex, (In Polish),
W77-06756 5C

The Influence of Heated Effluent Waters on the Water Chemism of Konin Lakes, (In Polish),
W77-06753 5C

KOSOGOROVA, T. A.
Biogenic Elements and Sulfate Reduction in Water Oil Carbonate Layer, (In Russian),
W77-07040 5B

KOWAL, A. L.
Renovated Water from Municipal Sewage Treatment Plants,
W77-07086 5D

KOWALIK, J. S.
Optimal Planning of Flows in Multi-Reservoir Hydro-Power Systems,
W77-06730 4A

KRABACH, M. H.
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

KRAJEWSKI, K.
The Multi-Step Method for Simulation and Optimization of Vistula River Planning Alternatives,
W77-06734 4A

KROGMAN, B. D.
Distribution and Abundance of Bowhead and Belukha Whales in the Bering and Chukchi Seas,
W77-06796 6G

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Some Factors Affecting Floc Formation by Zoogloea Ramigera, Strain I-16-M,
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An Analysis of Inertial Oscillations Observed Near Oregon Coast,
W77-06892 2L

KUO, C. Y.
Investigation of Flushing Time in the Lafayette River, Norfolk, Virginia,
W77-06881 2L

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Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

LAEVASTU, T.
Ecosystem Dynamics Birds and Marine Mammals. Part III: A Dynamic Numerical Marine Ecosystem Model for Evaluation of Marine Resources in Eastern Bering Sea,
W77-06808 6G

LAIST, D.
Coastal Zone Management, Annotated Bibliography,
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LAL, D.
Particulate Transport of Radionuclides 14C and 55Fe to Deep Waters in the Pacific Ocean,
W77-06902 5B

LANGFORD, M.
The Use of Polymers for Improving Chemical Sludge Dewatering on Sand Beds,
W77-07033 5D

LARKIN, E. P.
Persistence of Poliovirus 1 in Soil and on Vegetables Grown in Soil Previously Flooded with Inoculated Sewage Sludge or Effluent,
W77-07050 5C

LARRANCE, J. D.
Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

LARSON, S. P.
Comparison of Iterative Methods of Solving Two-Dimensional Groundwater Flow Equations,
W77-06965 2F

LASKI, A.
General Description of the Vistula River Project and Basic Planning Data,
W77-06733 4A

LAWSON, T. J.
Zooplankton Sampling Variability: Controlled Ecosystem Pollution Experiment,
W77-06615 5A

LEE, B. H.
Time-Distribution of Storm Rainfall in Pennsylvania,
W77-07022 2B

LEE, D. R.
A Device for Measuring Seepage Flux in Lakes and Estuaries,
W77-06903 7B

LEE, P. C.
The Chemical Characteristics of the City of Winnipeg Waste Water,
W77-07047 5A

LEE, R. F.
Effects of Four Oils on Marine Bacterial Populations: Controlled Ecosystem Pollution Experiment,
W77-06623 5A

LEENHEER, J. A.
Determination of Free Formic and Acetic Acids by Gas Chromatography Using the Flame Ionization Detector,
W77-06961 5A

LEHMAN, W. F.
Salinity Effects on Rice After the Boot Stage,
W77-06871 3C

LEICH, H. H.
Canwel Can Do,
W77-06985 5D

LENSINK, C. J.
Characterization of Coastal Habitat for Migratory Birds: Northern Bering Sea,
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Feeding Ecology and Trophic Relationships of Alaskan Marine Bird, and Population Dynamics of Marine Birds,
W77-06819 6G

Migration of Birds in Alaska Coastal and Marine Habitats Subject to Influence by OCS Development,
W77-06818 6G

Preliminary Catalog of Seabird Colonies and Photographic Mapping of Seabird Colonies,
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Review and Analysis of Literature and Unpublished Data on Marine Birds,
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Seasonal Distribution and Abundance of Marine Birds,
W77-06815 6G

LEPORE, G.
Effluent Charges and Pollution Control: A Case Study,
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LESHT, B.
A Self-Contained Facility for Analyzing Near-Bottom Flow and Associated Sediment Transport,
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LESZCZYNSKI, L.
The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin I. Quantitative Relations and Qualitative Composition of the Bottom Fauna of the Konin Lakes Complex, (In Polish),
W77-06749 5C

The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin II. Changes in Time of Bottom Fauna, (In Polish),
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The Influence of Effluent Heated Waters on the Bottom Fauna of Lakes in the Vicinity of Konin III. An Effort to Explain the Causes and Results of Changes in the Bottom Fauna of Lakes as Influenced by the Inflow of Heated Waters, (In Polish),
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LEVINE, M. D.
Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
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High Seas Oil Pollution: Particulate Petroleum Residues in the North Atlantic,
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LEYSHON, A. J.
Application of Municipal Refuse and Liquid Sewage Sludge to Agricultural Land: II. Lysimeter Study,
W77-07080 5D

LIKHOVOZ, L. K.
Optic Device for Observations of Small Organisms Under Water, (In Russian),
W77-06926 7B

LIN, K-C.
Plant Data Analysis of Temperature Significance in the Activated Sludge Process,
W77-07046 5D

LINDAHL, P. E.
Rotary-Flow Technique for Testing Fitness of Fish,
W77-06608 5C

LINDSAY, M. G.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

LINDSAY, R. C.
Identity, Origin and Development of Off-Flavors in Great Lakes Anadromous Fish,
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LINDSAY, W. L.
Solubility and Plant Uptake of Cadmium in Soils Amended with Cadmium and Sewage Sludge,
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LIPNOWSKI, I. F.
An Input-Output Analysis of Environmental Preservation,
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LLOYD, B. J.
The Toxic Effects of Selected Heavy Metals on Unadapted Populations of Vorticella Convallaria Var Similis,
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LOCKWARD, G. M.
Expansion Comes Quickly to AWT Plant,
W77-07009 5D

LODER, T. C.
Blank and Salinity Corrections for Automated Nutrient Analysis of Estuarine and Sea Waters,
W77-06938 5A

LONG, I. F.
Profiles and Evaporation,
W77-06898 2D

LONG, S. R.
Observations of Wind-Generated Waves on Variable Current,
W77-06896 2L

LOVELL, B. B.
Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

LOWE, P. R.
An Approximating Polynomial for the Computation of Saturation Vapor Pressure,
W77-06652 2B

MACDONALD, L. P.
Burning Waste Chlorinated Hydrocarbons in a Cement Kiln,
W77-06946 5E

MACLEOD, W. D.
A Pilot Study on the Design of a Petroleum Hydrocarbon Baseline Investigation for Northern Puget Sound and Strait of Juan de Fuca,
W77-06875 5C

MADDOX, M. B.
Algal Supplement Enhancement of Static and Recirculating System,
W77-06933 5C

MADSEN, G. E.
Improvement of Planning for Post-Development Water Resource Management: A Study of the Weber Basin Project,
W77-06739 6B

MAERTENS, C.
A Method of Evaluating a Field Water Capacity Using PF-3, (In French),
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MAIBORODA, I. I.
Experience in Treating Waste Waters from the Donetsk Mines, (In Russion),
W77-07068 5D

MAIER, J.
The Removal of Organic Matter from Water Supplies by Ion Exchange,
W77-06760 5F

MAKHOTIN, V. M.
Egg Incubation and Larval Rearing of Navaga (Eleginus Navaga Pall.), Polar Cod (Boreogadus Saida Lepechin) and Arctic Flounder (Liopsetta Glacialis Pall.) in the Laboratory,
W77-06792 8I

MALDONADO, A.
Nile Cone: Late Quaternary Stratigraphy and Sediment Dispersal,
W77-06650 2L

MALO, B. A.
Partial Extraction of Metals from Aquatic Sediments,
W77-06781 5A

MALOUF, R.
Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

MANIAK, U.
Optimal Operations of Reservoirs in the Harz Mountains,
W77-06715 4A

MANNER, H. W.
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

MANZI, J. J.
Algal Supplement Enhancement of Static and Recirculating System,
W77-06933 5C

MARCELLO, R. A. JR.
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

MARK, W. D.
Investigation of the Effects of Nonhomogeneous (or Nonstationary) Behavior on the Spectra of Atmospheric Turbulence,
W77-06678 2B

MARKING, L. L.
Toxicity of Rotenone to Fish in Standardized Laboratory Tests,
W77-06748 5C

MARKSTORM, D. C.
Land Application of Sewage Sludge: IV. Wheat Growth, N Content, N Fertilizer Value, and N Use Efficiency as Influenced by Sewage Sludge and Wood Waste Mixtures,
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MARTENS, C. S.
Interstitial Water Chemistry of Anoxic Long Island Sound Sediments. 1. Dissolved Gases,
W77-06900 5B

MARTENS, D. C.
Pollutant Movement to Shallow Ground Water Tables from Swine Waste Lagoons,
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MARTIN, M. H.
The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

MATTHEWS, D. G.
Control Sewer Corrosion with H2O2,
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MAURER, D.
Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

MAWER, P. A.
Streamflow Regulation by Artificial Recharge Fed from Upstream Surface Storage: Derivation of Control Rules,
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MAY, B.
A Preliminary Evaluation of the Effects of Gas Bubble Disease on Fish Populations in the Kootenai River Below Libby Dam,
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MCALISTER, W. B.
Ecosystem Dynamics Birds and Marine Mammals. Part I: Preliminary Estimates of Pinniped - Finfish Relationships in the Bering Sea,
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Ecosystem Dynamics Birds and Marine Mammals. Part III: A Dynamic Numerical Marine Ecosystem Model for Evaluation of Marine Resources in Eastern Bering Sea,
W77-06808 6G

MCCAUGHEY, J. H.
A Note on Temperature and Humidity Profile Measurement Over Forests Using Diodes,
W77-06653 7B

MCCULLOUGH, J. D.
Electrically Powered Sampler for Benthic Macroinvertebrates,
W77-06757 7B

MCDANNALD, R. B.
Bits and Pieces,
W77-06866 8G

Pumping Systems: The Simpler, The Better,
W77-06856 8C

MCDERMOTT, D. J.
An Offshore Biomonitoring System for Chlorinated Hydrocarbons,
W77-06641 5A

MCKEON, J. B.
Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

MCKIM, H. L.
Use of Remote Sensing to Quantify Construction Material and to Define Geologic Lineations; Dickey-Lincoln School Lakes Project, Maine,
W77-06888 8D

MCLEAN, E. O.
Bonding of Calcium and Potassium by Vermiculite and Kaolinite Clays as Affected by H-Clay Addition,
W77-06872 2G

MCMILLAN, M. C.
River Basin Snow Mapping at the National Environmental Satellite Service,
W77-06915 2C

MCNAUGHTON, K. G.
Evaporation and Advection II: Evaporation Downwind of a Boundary Separating Regions Having Different Surface Resistances and Available Energies,
W77-06897 2D

MEDWIN, H.
In Situ Acoustic Measurements of Microbubbles at Sea,
W77-06916 2L

MEEK, B. D.
Salinity Effects on Rice After the Boot Stage,
W77-06871 3C

MEENAHAN, J. G.
Evaluation of In-Line and Side-Line Flow Equalization Systems,
W77-07041 5D

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Incipient Sediment Motion in Entrances with Shell Beds,
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Review and Analysis of Hydrogeologic Conditions Near the Site of a Potential Nuclear-Waste Repository, Eddy and Lea Counties, New Mexico,
W77-06974 5B

MERCER, R. W.
Abundance and Seasonal Distribution of Marine Mammals in the Gulf of Alaska,
W77-06795 6G

MERRELL, T. R. JR.
Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

MERRY, C. J.
Use of Remote Sensing to Quantify Construction Material and to Define Geologic Lineations; Dickey-Lincoln School Lakes Project, Maine,
W77-06888 8D

MEYER-WAARDEN, K.
A Biological Monitoring System Employing Rheotaxis of Fish,
W77-06609 5C

MIGNONE, N. A.
Elimination of Anaerobic Digester Supernatant,
W77-07059 5D

MILES, M. J.
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

MILLER, R. L.
A Self-Contained Facility for Analyzing Near-Bottom Flow and Associated Sediment Transport,
W77-06874 2L

MILLER, R. W.
First Reported Incidence of Gas-Bubble Disease in the Heated Effluent of a Steam Generating Station,
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MILOVANOVIC, D.
Changes in the Structure of Phytoplankton During the First Years of Existence of the Derdap Storage Reservoir, (In Serbo-Croatian),
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MIRZOEV, G. G.
Escherichia Coli as a Sanitary-Indicator Microorganism, (In Russian),
W77-07067 5A

MOBASHERI, F.
The Conjunctive Use of a Multi-Reservoir System and a Dual-Purpose Desalting Plant,
W77-06714 4B

MONAN, G. E.
Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
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MORAITOPOULOU-KASSIMATI, E.
Stable Elements of Radioecological Importance in Certain Echinoderm Species,
W77-06640 5A

MORELOCK, D. J.
Particle Characteristics and Dispersal Patterns of Sugar Cane Wastes in Selected Rivers and Estuaries of Puerto Rico,
W77-06632 5B

MORGAN, N. W.
Hybrid Computer Analysis of a Combined Surface Water--Groundwater System,
W77-06729 4B

MORGAN, W. S. G.
An Electronic System to Monitor the Effects of Changes in Water Quality on Fish Opercular Rhythms,
W77-06610 5C

MORRIS, W. J.
Hybrid Computer Analysis of a Combined Surface Water--Groundwater System,
W77-06729 4B

MORTIMER, C. H.
Lake Currents and Temperatures Near the Western Shore of Lake Michigan,
W77-06687 2H

MOSES, H.
Coastal Meteorological Networks to Determine Effects of Nuclear Plant Cooling Systems,
W77-06643 2B

MOSS, M. E.
Surface Water Network Design by Regression Analysis Simulation,
W77-06963 2E

MUEHLEMAN, C.
LAS Inhibition of Diffusion and Uptake of Tritiated Uridine During Teleost Embryogenesis,
W77-06611 5C

MURPHY, C. B. JR.
Single P/C Unit Removal of Nutrients from Combined Sewer Overflows,
W77-07031 5D

MURPHY, K. L.
The Current Role of Wastewater Disinfection,
W77-07064 5D

MURRAY, S. P.
Evidence for Strong Currents and Turbulence in a Deep Coral Reef Groove,
W77-06904 2L

MURRAY, T. D.
A Pneumatic Grab for Obtaining Large, Undisturbed Mud Samples: Its Construction and Some Applications for Measuring the Growth of Larvae and Emergence of Adult Chironomidae,
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MYER, G. E.
Lake Ontario Atlas: Surface Waves,
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MYSHLYAEVA, L. A.
Quantitative Analysis of Enteroviruses in Water with Various Degrees of Pollution, (In Russian),
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NAGEL, O.
Method of Treating Waste Water with Jet Nozzles,
W77-07090 5D

NASSAR, E. G.
Water in the Palouse River Basin, Washington,
W77-06978 4B

NAWROCKI, M. A.
An Executive Summary of Three EPA Demonstration Programs in Erosion and Sediment Control,
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Floods in Louisiana, Magnitude and Frequency, Third Edition,
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NELSON, D. W.
Forms of Sulfur in Sewage Sludge,
W77-07044 5A

NELSON, M. O.
Resources of Non-Salmonid Pelagic Fish of the Eastern Bering Sea and the Gulf of Alaska,
W77-06832 6G

NEWCOMBE, S.
The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

NHARITONOVA, N. N.
Experiment with a Multipoint System for Judging Carp Fattening Ponds, (In Russian),
W77-06798 2H

NICHOLAS, E. C.
Current Methods Used in the Soil Conservation Service to Estimate Sediment Yield,
W77-06657 4D

NINTIN, S. A.
Causes of the Drying up of Forests in the Flood Plain of the Lower Reaches of the Ural River (In Russian),
W77-06801 4D

NORGREN, J. A.
Oregon's Long Range Requirements for Water: General Soil Map Report with Irrigable Areas: Malheur River Drainage Basin,
W77-06605 2C

Oregon's Long-Range Requirements for Water: General Soil Map Report with Irrigable Areas: Owyhee Drainage Basin,
W77-06606 2C

Oregon's Long-Range Requirements for Water: General Soil Map Report with Irrigable Areas: Umatilla Drainage Basin,
W77-06602 2C

NORTON, S. A.
The Historic and Present Relationship Between Phytoplankton, Limiting Nutrients and Sediment-Water Geochemical Processes in Selected Maine Lakes,
W77-06741 5C

NOVAK, A. F.
Adsorption of Polychlorinated Biphenyl (Aroclor 1254) on Shrimp,
W77-06758 5C

NOVAK, J. T.
The Use of Polymers for Improving Chemical Sludge Dewatering on Sand Beds,
W77-07033 5E

NYBAKKEN, J.
Effects of Engineering Activities on the Ecology of Pismo Clams,
W77-06886 5C

OERTEL, G. F.
Characteristics of Water Flow at the North End of the Wassaw Barrier Island Complex. Wassaw Island Erosion Study, Part II,
W77-06939 2J

OERTEL, GEORGE F.
Sand Stabilization on the Dunes, Beach and Shoreface of a Historically Eroding Barrier Island. Wassaw Island Erosion Study, Part III,
W77-06940 8G

OEZCUERUEMEZ, N.
The Effect of Different Methods on Growth, Development and Yield of Cotton, (In German),
W77-06962 3F

OLIVER, B. G.
Acid Solubilization of Sewage Sludge and Ash Constituents for Possible Recovery,
W77-07017 5E

OLOFSSON, S.
Rotary-Flow Technique for Testing Fitness of Fish,
W77-06608 5C

ORR, B. R.
Review and Analysis of Hydrogeologic Conditions Near the Site of a Potential Nuclear-Waste Repository, Eddy and Lea Counties, New Mexico,
W77-06974 5B

OSBORN, T. R.
The Influence of Wind on the Surface Layer of a Stratified Inlet: Part I. Observations,
W77-06894 2L

OSWALD, W. J.
Method of Waste Treatment and Algae Recovery,
W77-07003 5D

PALLIO, F. S.
Energy Conservation and Heat Recovery in Waste Water Treatment Plants,
W77-07024 5D

PAPADOPOULOU, C.
Stable Elements of Radioecological Importance in Certain Echinoderm Species,
W77-06640 5A

PARENT, J. P.
Effect of Two Rearing Conditions on Growth and Body Composition in Carp (Cyprinus Carpio L), (Influence de Deux Modes d'Elevage sur la Croissance et la Composition Corporelle de la Carpe Commune),
W77-06769 5C

PARK, R. A.
A General Model of Microbial Growth and Decomposition in Aquatic Ecosystems,
W77-06684 5C

PARSONS, T. R.
The Growth of Young Salmonids (Onchorhynchus Keta): Controlled Ecosystem Pollution Experiment,
W77-06618 5A

PATEL, J.
Adenosine Triphosphate (ATP) Levels in Microbial Cultures and a Review of the ATP Biomass Estimation Technique,
W77-06942 5A

PATRINELY, C. D.
Nutrient Removal by Water Hyacinths,
W77-07036 5G

PELOQUIN, A. E.
Treatment of Combined Sewer Overflows Via Thin Film Chemistry,
W77-07034 5D

PENMAN, H. L.
Profiles and Evaporation,
W77-06898 2D

PENTREATH, R. J.
The Accumulation of Organic Mercury from Sea Water by the Plaice, Pleuronectes platessa L.,
W77-06607 5C

PEREYRA, W. T.
Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chukchi Sea,
W77-06839 6G

Resources of Non-Salmonid Pelagic Fish of the Eastern Bering Sea and the Gulf of Alaska,
W77-06832 6G

PEREZ, M. A.
Ecosystem Dynamics Birds and Marine Mammals. Part I: Preliminary Estimates of Pinniped - Finfish Relationships in the Bering Sea,
W77-06806 6G

PERIALE, J. M.
Method of Applying Ozone and Sonic Energy to Sterilize and Oxidize Waste Water,
W77-07007 5D

PETERSON, F. L.
Waste Injection into Stratified Ground Water Bodies,
W77-06855 5B

PEYTON, L. J.
Avian Community Ecology of the Akulik - Inglutalik River Delta, Norton Bay, Alaska,
W77-06822 6G

PHINNEY, D. E.
Measurement in a Marine Environment Using Low Cost Sensors of Temperature and Dissolved Oxygen,
W77-06960 7B

PICKETT, R. L.
The Observed Winter Circulation of Lake Ontario,
W77-06655 2H

PINCHUK, N. A.
Antierosion Role of Forest Plantings in the Steppe Zone of the Moldavian SSR, (In Russian),
W77-06745 4C

PIWECKI, T.
Optimization Model of a System of Two Open-Channel Hydroplants,
W77-06716 4A

PLUMMER, K. H.
Time-Distribution of Storm Rainfall in Pennsylvania,
W77-07022 2B

POGGE, E. C.
Further Development and Testing of a Stream-Aquifer System Model,
W77-06762 2F

POOLE, S. E.
Treatment of Combined Sewer Overflows Via Thin Film Chemistry,
W77-07034 5D

POWELL, T. M.
Numerical Models of Wind-Driven Circulation in Lakes,
W77-06958 2H

PRASAD, S. B. S. K.
Median Tolerance Limits of Some Chemicals to the Fresh Water Fish Cyprinus-Carpio,
W77-06780 5C

PRATISHTHANANDA, S.
A Nonlinear Multilevel Transportation Model for Water Resource-Water Quality Management,
W77-07096 5B

PRENDIVILLE, P. W.
Backwashing of Granular Filters,
W77-07037 5D

PULLEN, K. G.
The Operations Section of Lincoln Sewage Division,
W77-07023 5D

PULLIN, J.
Plug-In Concept for Pilot Sewage Treatment Plant,
W77-07026 5D

PURTYMUN, W. D.
Chemical Quality of Effluents and Their Influence on Water Quality in a Shallow Aquifer,
W77-06658 5B

QUINN, F. H.
Lake St. Clair Hydrologic Transfer Factors.
W77-06879 2H

QUINN, W. F.
An Annular Flow Ice-Water Model Heat Sink,
W77-06889 2C

QURESHI, A. A.
Adenosine Triphosphate (ATP) Levels in Microbial Cultures and a Review of the ATP Biomass Estimation Technique,
W77-06942 5A

QURESHI, A. S.
Use of a Parametric Model as a Tool for Hydrometric Network Planning,
W77-06710 2A

RACHFORD, T. M.
Time-Distribution of Storm Rainfall in Pennsylvania,
W77-07022 2B

RAKSIT, S. K.
Anaerobic Filter Treats Waste Activated Sludge,
W77-07078 5D

RANDALL, C. W.
The Effect of High Purity Oxygen on the Activated Sludge Process,
W77-07043 5D

RAO, M. S.
Median Tolerance Limits of Some Chemicals to the Fresh Water Fish Cyprinus-Carpio,
W77-06780 5C

RAO, R. M.
Adsorption of Polychlorinated Biphenyl (Aroclor 1254) on Shrimp,
W77-06758 5C

RAO, T. S.
Median Tolerance Limits of Some Chemicals to the Fresh Water Fish Cyprinus-Carpio,
W77-06780 5C

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RASCIO, N.
The Algal Flora in the Thermal Baths of Montegrotto Terme (Padua). Its Distribution Over One-Year Period,
W77-06770 5C

RAYMOND, H. L.
Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

REDDY, S. J.
Simple Formulae for the Estimation of Wet Bulb Temperature and Precipitable Water,
W77-06646 2B

REEBURGH, W. S.
Microbial Methane Consumption Reactions and Their Effect on Methane Distributions in Freshwater and Marine Environments,
W77-06899 5C

REED, L. E.
Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

REEVE, M. R.
Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

Experimental Observations on the Effects of Copper on Copepods and Other Zooplankton: Controlled Ecosystem Pollution Experiment,
W77-06619 5A

REICH, B. M.
Time-Distribution of Storm Rainfall in Pennsylvania,
W77-07022 2B

REICHENBERGER, J.
Process for the Purification of Waste Waters with Activated Carbon,
W77-07093 5D

RENGER, E. H.
Chlorine Reactions with Seawater Constituents and the Inhibition of Photosynthesis of Natural Marine Phytoplankton,
W77-06637 5C

RETTIG, S. L.
Hydrochemistry of the Lake Magadi Basin, Kenya,
W77-06967 2K

REYNOLDS, T. D.
Dispersion of Liquid Waste from a Moving Barge,
W77-06913 5B

REZNIKOVSKY, A. SH.
Methods for Control of the Regimes for Water Resources Systems,
W77-06717 4A

RISEBROUGH, R. W.
Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

RIVAS-MARTINEZ, S.
Ecological Data on Continental Aquatic Vegetation, (In Spanish),
W77-06784 2I

ROBERTS, H. H.
Evidence for Strong Currents and Turbulence in a Deep Coral Reef Groove,
W77-06904 2L

Methane-Derived Carbonate Cements in Barrier and Beach Sands of a Subtropical Delta Complex,
W77-06677 2L

ROBERTS, S.
Potassium in an Arid Loessial Soil: Changes in Availability as Related to Cropping and Fertilization,
W77-06870 3F

ROBERTSON, J. B.
Application of Digital Modelling to the Prediction of Radioisotope Migration in Groundwater,
W77-06981 5B

ROBINSON, F. E.
Salinity Effects on Rice After the Boot Stage,
W77-06871 3C

RODOSHKEVICH, E. A.
Experience in Treating Waste Waters from the Donetsk Mines, (In Russion),
W77-07068 5D

ROGERS, P.
A Sector Model for Regional and National Water Resources Planning,
W77-06731 6A

ROGERS, R. H.
Application of Landsat to the Surveillance and Control of Eutrophication in Saginaw Bay,
W77-06665 5A

Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

ROSENEAU, D. G.
A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

ROSS, R. G.
Adsorption, Coagulation and Filtration Make a Useful Treatment Combination-Part 2,
W77-07077 5D

ROTH, I.
Heavy Metal Concentrations in Water, Sediments, and Fish from Mediterranean Coastal Area, Israel,
W77-06782 5C

ROZANOVA, E. P.
Biogenic Elements and Sulfate Reduction in Water Oil Carbonate Layer, (In Russian),
W77-07040 5B

RUCKER, R. R.
Gas Bubble Disease of Salmonids: A Critical Review,
W77-06920 5

RUHE, R. V.
Monroe Reservoir, Indiana, Part I: Hydrologic Circulation, Sedimentation, and Water Chemistry Part II: Nutrient Relations,
W77-06982 5C

RUSSELL, S. O.
Presenting Trends in Lake Eutrophication,
W77-06693 5C

RYZNAR, E.
Coastal Meteorological Networks to Determine Effects of Nuclear Plant Cooling Systems,
W77-06643 2B

SABEY, B. R.
Land Application of Sewage Sludge: IV. Wheat Growth, N Content, N Fertilizer Value, and N Use Efficiency as Influenced by Sewage Sludge and Wood Waste Mixtures,
W77-07079 5D

Solubility and Plant Uptake of Cadmium in Soils Amended with Cadmium and Sewage Sludge,
W77-07055 5B

SAHUQUILLO, A.
Conjunctive Use of the Tajo-Segura Aqueduct Surface System and the Aquifers of the La Mancha Area,
W77-06728 4B

SALZMANN, H.
A Laboratory Study of Fluid and Soil Mechanics Processes During Hydraulic Dredging (Hydraulische und Bodentechnische Vorgange beim Grundsaugen),
W77-06883 8D

SANDERS, J. W.
Mineral Content of Selected Geothermal Waters,
W77-06667 3E

SANGER, G. A.
Ecosystem Dynamics Birds and Marine Mammals. Part II: Food Web Structure and Trophic Relations of Bering Sea Avifauna (Preliminary Report),
W77-06807 6G

SARIN, R. K.
Optimal Oil Tanker Size with Regard to Environmental Impact of Oil Spills,
W77-06702 5G

SARKAR, S. K.
A Study to Forecast the Waves at Digha,
W77-06648 2L

SARTORY, D. P.
The Toxic Effects of Selected Heavy Metals on Unadapted Populations of Vorticella Convallaria Var Similis,
W77-06636 5C

SATO, G. K.
Lake Currents and Temperatures Near the Western Shore of Lake Michigan,
W77-06687 2H

SAVAGE, E. S.
Backwashing of Granular Filters,
W77-07037 5D

SCHAMEL, D.
Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

Avifaunal Utilization of the Offshore Island Area Near Prudhoe Bay, Alaska,
W77-06812 6G

SCHARF, B.
A Biological Monitoring System Employing Rheotaxis of Fish,
W77-06609 5C

SCHAUFFLER, F. K.
Treatment of Combined Sewer Overflows Via Thin Film Chemistry,
W77-07034 5D

SCHECTER, R. N.
Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

SCHERER, C. R.
Optimal Oil Tanker Size with Regard to Environmental Impact of Oil Spills,
W77-06702 5G

SCHMIDT, N. F.
Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

SCHNEIDER, D. E.
Temperature Relations of Puget Sound Thaids in Reference to Their Intertidal Distribution,
W77-06767 5C

SCHNEIDER, P. W. JR
Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
W77-06924 5C

SCHNEIDER, S. R.
River Basin Snow Mapping at the National Environmental Satellite Service,
W77-06915 2C

SCHULZ-BALDES, M.
Long-Term Lead Accumulation in Abalone (Haliotis Spp.) Fed on Lead-Treated Brown Algae (Egregia Laevigata),
W77-06776 5C

SCHWANBOM, E.
Rotary-Flow Technique for Testing Fitness of Fish,
W77-06608 5C

SEELIGER, U.
Correlation Coefficients and Concentration Factors of Copper and Lead in Seawater and Benthic Algae,
W77-06783 5C

SEIBERT, D. L. R.
Effects of Copper on the Dominance and the Diversity of Algae: Controlled Ecosystem Pollution Experiment,
W77-06625 5A

SEIDEL, K.
On the Self-Purification of Natural Waters, (In German),
W77-07038 5G

SELECKI, A.
Study on Sewage Flow Dynamics Through Dorr Type Clarifier on Stream, (Synopsis),
W77-07048 5D

SERFATY, A.
Effect of Two Rearing Conditions on Growth and Body Composition in Carp (Cyprinus Carpio L), (Influence de Deux Modes d'Elevage sur la Croissance et la Composition Corporelle de la Carpe Commune),
W77-06769 5C

SHARAF EL DIN, S. H.
Effect of the Nile Flood on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-06907 2L

SHARMA, N. C.
Environmental Pollution: Is There Enough Public Concern to Lead to Action,
W77-06955 6G

SHARP, J. V. A.
Water Quality Simulation of Tahoe-Truckee System, Nevada-California-Volume I,
W77-07075 5B

SHERRILL, M. G.
Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite,
W77-06975 5B

SHIELDS, G. F.
Avian Community Ecology of the Akulik - Inglutalik River Delta, Norton Bay, Alaska,
W77-06822 6G

SHISHKINA, L. A.
Dependence of Water Absorption by the Cell Walls of Plant Leaves on the Volume of the Free Space, (In Russian),
W77-06827 2I

SHPET, G. I.
Experiment with a Multipoint System for Judging Carp Fattening Ponds, (In Russian),
W77-06798 2H

SHUBINSKI, R. F.
Introduction to Urban Storm Water Runoff Models,
W77-07071 5B

SHUBINSKI, R. P.
Simplified Methods of Computing the Quantity of Urban Runoff,
W77-07072 5B

The WRE Storm Model,
W77-07073 5B

SIDLE, R. C.
Accumulation of Heavy Metals in Soils from Extended Waste Water Irrigation,
W77-07049 5B

SIEBERT, D. L. R.
Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

SIKORA, L. J.
Fate of Nitrogen and Phosphorus in Soils Under Septic Tank Waste Disposal Fields,
W77-06914 5B

SILVA, L. F.
A Study of the Utilization of EREP Data from the Wabash River Basin,
W77-06670 7B

SIMONSON, G. H.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

Oregon's Long Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur River Drainage Basin,
W77-06605 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Owyhee Drainage Basin,
W77-06606 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Powder Drainage Basin,
W77-06604 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umatilla Drainage Basin,
W77-06602 2G

SINGER, J. J.
Exchange Through a Barrier Island Inlet: Additional Evidence of Upwelling Off the Northeast Coast of North Carolina,
W77-06654 2L

SINN, R.
Method of Treating Waste Water with Jet Nozzles,
W77-07090 5D

SITEK, G. M.
An Executive Summary of Three EPA Demonstration Programs in Erosion and Sediment Control,
W77-06671 5G

SKELLETT, C. F.
The Use of Oxygen to Treat Sewage in a Rising Main,
W77-06996 5D

SKIDMORE, J.
Preliminary Bibliography on Groundwater in Developing Countries,
W77-06852 2F

SKINNER, D. J.
Burning Waste Chlorinated Hydrocarbons in a Cement Kiln,
W77-06946 5E

SMITH, D. W.
Annotated Bibliography on Northern Environmental Engineering 1974-75,
W77-06948 5D

SMITH, G. W.
Clarifier with Overflow Scum Removal,
W77-07092 5D

SMITH, J. L.
Subsurface Injection-How Much Does It Cost,
W77-07011 5E

SMITH, R. L.
Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W77-06842 6G

SMYSER, S.
New Visibility for On-Site Waste Treatment Systems,
W77-07013 5D

SOLOMON, S. I.
Use of a Parametric Model as a Tool for Hydrometric Network Planning,
W77-06710 2A

SOLOV'EV, V. I.
Experience in Treating Waste Waters from the Donetsk Mines, (In Russion),
W77-07068 5D

LIBRARY U. OF I. URBANA-CHAMPAIGN

SOMAYAJULU, B. L. K.
Particulate Transport of Radionuclides 14C and 55Fe to Deep Waters in the Pacific Ocean,
W77-06902 5B

SOMMERS, L. E.
Forms of Sulfur in Sewage Sludge,
W77-07044 5A

SOSZKA, G. J.
Ecological Relations Between Invertebrates and Submerged Macrophytes in the Lake Littoral,
W77-06694 5C

SOUTAR, A.
Monitoring the Marine Environment Through Sedimentation,
W77-06651 2L

SPECTOROVA, L. V.
Egg Incubation and Larval Rearing of Navaga (Eleginus Navaga Pall.), Polar Cod (Boreogadus Saida Lepechin) and Arctic Flounder (Liopsetta Glacialis Pall.) in the Laboratory,
W77-06792 8I

SPRINGER, A. M.
A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska,
W77-06823 6G

STANCZYKOWSKA, A.
Occurrence and Growth of Dreissena Polymorpha Pall. in Lakes Included in a Cooling System, (In Polish),
W77-06754 5C

STANLEY, D. J.
Nile Cone: Late Quaternary Stratigraphy and Sediment Dispersal,
W77-06650 2L

STANLEY, W. D.
Hydrologic Interpretation of Geophysical Data from the Southeastern Hueco Bolson, El Paso and Hudspeth Counties, Texas,
W77-06970 4B

STARZECKA, A.
The Influence of Acrolein and Hydrocryle on the Development Dynamics of Aquatic Bacteria,
W77-06690 5C

STAUFFER, J. R.
Influence of Gradient on the Distribution of Fishes in Conowingo Creek, Maryland and Pennsylvania,
W77-06635 2I

STEELE, J. H.
Loch Ewe Bag Experiment, 1974,
W77-06627 5A

STEELE, R. V.
Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
W77-06957 6G

STEPHENSON, J. P.
State-of-the-Art Review of Processes for Treatment and Reuse of Potato Wastes,
W77-06949 5D

STEPHENSON, M.
Effects of Engineering Activities on the Ecology of Pismo Clams,
W77-06886 5C

STERBETZ, I.
The Mammalian and Fish Fauna of the Nature Preserve of Martely, (In Hungarian),
W77-06838 6G

STEVENS, D. L.
Observations on Gas Bubble Disease in Adult Columbia River Sockeye Salmon (Oncorhynchus Nerka),
W77-06924 5C

STEWART, G. L.
Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

STEWART, J.
Long-Term Lead Accumulation in Abalone (Haliotis Spp.) Fed on Lead-Treated Brown Algae (Egregia Laevigata),
W77-06776 5C

STICKEL, R.
Method of Treating Waste Water with Jet Nozzles,
W77-07090 5D

STOKES, R. M.
Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
W77-06639 5C

STOW, D. A. V.
Preliminary Bibliography on Groundwater in Developing Countries,
W77-06852 2F

STREET, J. J.
Solubility and Plant Uptake of Cadmium in Soils Amended with Cadmium and Sewage Sludge,
W77-07055 5B

STROM, S.
The Generation of Residual Flows in Norway: An Input-Output Approach,
W77-06698 5G

STURROCK, A. M. JR.
Comprehensive Monitoring of Meteorology, Hydraulics, and Thermal Regime of the San Diego Aqueduct, California,
W77-06973 2D

SUHAYDA, J. N.
Evidence for Strong Currents and Turbulence in a Deep Coral Reef Groove,
W77-06904 2L

SULLIVAN, J. A.
Sewerage for a Rural Resort Area,
W77-06987 5D

SULLIVAN, R.
Persistence of Poliovirus 1 in Soil and on Vegetables Grown in Soil Previously Flooded with Inoculated Sewage Sludge or Effluent,
W77-07050 5C

SVENSON, G.
Waste Water Treatment Plant Built in Wet Hole,
W77-07021 5D

SYLVESTER, A. J.
Laboratory Studies on the Effect of Metals on Oxygen Uptake by Sewage Sludge in Brackish Water,
W77-06788 5C

SYMADER, W.
Phosphate Prediction Model for Streams by Means of Discriminant Analysis,
W77-06906 5B

SZABO, M.
Investigation of Precipitation Within Forest Ecosystems, (In Hungarian),
W77-06797 2B

TABATABAI, M. A.
Forms of Sulfur in Sewage Sludge,
W77-07044 5A

TAKAHASHI, M.
Temperature, Salinity and Light Penetration Structures: Controlled Ecosystem Pollution Experiment,
W77-06626 5A

TANACREDI, J. T.
Petroleum Hydrocarbons from Effluents: Detection in Marine Environment,
W77-06660 5A

TATINCLAUX, J. C.
Laboratory Study of the Flexural Strength and Elastic Modulus of Freshwater and Saline Ice,
W77-06661 2C

TAYLOR, R. E.
NASA Develops Water Monitoring System,
W77-06912 5A

TEJAM, B. M.
A Preliminary Survey of Mercury in Fish from Bombay and Thana Environment,
W77-06785 5C

TENNANT, D. A.
Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska,
W77-06836 6G

TERJUNG, W. H.
Climatology for Geographers,
W77-06659 2B

THERRIAULT, J.-C.
Nutrients, Chlorophyll, and Internal Tides in the St. Lawrence Estuary,
W77-06910 5B

THOMAS, G. H.
Burning Waste Chlorinated Hydrocarbons in a Cement Kiln,
W77-06946 5E

THOMAS, W. H.
Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

THOMAS, W. N.
Effects of Copper on the Dominance and the Diversity of Algae: Controlled Ecosystem Pollution Experiment,
W77-06625 5A

THORN, D. G.
Streamflow Regulation by Artificial Recharg Fed from Upstream Surface Storage: Derivation of Control Rules,
W77-06725 4A

THORPE, S. A.
Mixing in Upper Layer of a Lake During Heating Cycle,
W77-06649 2E

THURBERG, F. P.
Respiratory Response of Cunners to Silver,
W77-06789 5C

TIEMER, K.
On Large-Scale Simulation of Groundwater Flow Systems,
W77-06713 4B

TIERNEY, J. T.
Persistence of Poliovirus 1 in Soil and on Vegetables Grown in Soil Previously Flooded with Inoculated Sewage Sludge or Effluent,
W77-07050 5C

TKACHENKO, V. S.
Place and Role of Plant Cover in Optimization of the Donbas Natural Environment, (In Ukranian),
W77-06858 4C

TOETZ, D. W.
Measurements of Planktonic Biomass in a Reservoir,
W77-06679 5A

TOFAUTE, K.
Sewage Aeration Impeller-With Automatic De-Icing and Anti-Clogging System,
W77-07001 5D

TONONAKA, G. K.
Effect of Atmospheric Gas Supersaturation Caused by Dams on Salmon and Steelhead Trout of the Snake and Columbia Rivers (A Review of the Problem and the Progress Toward a Solution, 1974),
W77-06927 5C

TOPPING, G.
An Estimate of the Input of Atmospheric Trace Elements into the North Sea and the Clyde Sea (1972-3),
W77-06668 5B

TORREST, R. S.
Mixing and Circulation of Lakes and Reservoirs with Air Plumes,
W77-06633 5G

TRACY, D.
Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

TRAU, W.
Optimal Operations of Reservoirs in the Harz Mountains,
W77-06715 4A

TRESCOTT, P. C.
Comparison of Iterative Methods of Solving Two-Dimensional Groundwater Flow Equations,
W77-06965 2F

TRIPATHI, N.
Area-Depth Relations for Frequency Values of Rainfall,
W77-06647 2B

TROEMPER, A. P.
Underflow from Sludge-Irrigated Cropland,
W77-07056 5B

TROTTA, P. D.
On-Line Adaptive Control for Combined Sewer Systems,
W77-07100 5D

TULLOCK, G.
Polluters' Profits and Political Response: Direct Control Versus Taxes: Comments and Reply,
W77-06700 5G

TURNBULL, J. W.
Loss of 2,4-D in Runoff from Plots Receiving Simulated Rainfall and from a Small Agricultural Watershed,
W77-06908 5B

TUWINER, S. B.
Copper Sulfate Fights Root Growth in Sewer Systems,
W77-06991 8G

TWICHELL, D. C.
Delaware River: Evidence for Its Former Extension to Wilmington Submarine Canyon,
W77-06966 2E

URBAN, E.
The Mining Fauna in Four Macrophyte Species in Mikolajskie Lake,
W77-06688 5C

VACCARO, R. F.
Response of Natural Marine Bacterial Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06622 5A

VAN DEN AKKER, C.
Performance of a Recharge and Recovery System in an Aquifer with Uniform Flow,
W77-06905 2F

VAN DEN BROEK, W. L. F.
Heavy Metals in Macroinvertebrates and Fish from the Lower Medway Estuary, Kent,
W77-06790 5C

VAN GELDER, P.
Design Criteria for Waste Water Aerator Drives,
W77-07060 5D

VAN RIEMSDIJK, W. H.
Phosphates in Soils Treated with Sewage Water: I. General Information on Sewage Farm, Soil, and Treatment Results,
W77-07052 5G

Phosphates in Soils Treated with Sewage Water: II. Fractionation of Accumulated Phosphates,
W77-07053 5B

Phosphates in Soils Treated with Sewage Water: III. Kinetic Studies on the Reaction of Phosphates with Aluminum Compounds,
W77-07054 5B

VANCE, H. M.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Area, Grande Ronde Drainage Basin,
W77-06603 2G

VANDENBERG, A.
Tables and Type Curves for Analysis of Pump Tests in Leaky Parallel-Channel Aquifers,
W77-06941 4B

VELIKANOV, A. L.
The Methods of Distribution of Water Resources in River Development Systems,
W77-06726 4A

VERKHOVSKII, B. S.
Optimal Complex Use of Controlled Water Resources of a Basin,
W77-06718 4A

VERMEER, P. A.
Performance of a Recharge and Recovery System in an Aquifer with Uniform Flow,
W77-06905 2F

VOLLRATH, H.
Distribution and Indicatory Value of the Submerged Macrophytes in the Flowing Waters of the Friedberger Au, (In German),
W77-06802 5C

WALDRON, K. D.
Ichthyoplankton of the Eastern Bering Sea,
W77-06845 6G

WALKER, J. I.
A Note on Temperature and Humidity Profile Measurement Over Forests Using Diodes,
W77-06653 7B

WALTER, M. A.
Evaluation of Potential Indicators of Sub-Lethal Toxic Stress on Marine Zooplankton (Feeding, Fecundity, Respiration and Excretion): Controlled Ecosystem Pollution Experiment,
W77-06617 5A

Experimental Observations on the Effects of Copper on Copepods and Other Zooplankton: Controlled Ecosystem Pollution Experiment,
W77-06619 5A

WALTERS, K. L.
Water in the Palouse River Basin, Washington,
W77-06978 4B

WALTON, A.
High Seas Oil Pollution: Particulate Petroleum Residues in the North Atlantic,
W77-06911 5B

WALTON, T. L. JR.
Littoral Drift Estimates Along the Coastline of Florida,
W77-06882 2L

WANG, L. K.
Adsorption, Coagulation and Filtration Make a Useful Treatment Combination-Part 2,
W77-07077 5D

WARE, G. C.
Laboratory Studies on the Effect of Metals on Oxygen Uptake by Sewage Sludge in Brackish Water,
W77-06788 5C

WEAVER, W. H.
Potassium in an Arid Loessial Soil: Changes in Availability as Related to Cropping and Fertilization,
W77-06870 3F

WEBBER, L. R.
Application of Municipal Refuse and Liquid Sewage Sludge to Agricultural Land: II. Lysimeter Study,
W77-07080 5D

WEGLENSKA, T.
Primary and Secondary Production of Plankton in Heated Lakes, (In Polish),
W77-06752 5C

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WEINSTEIN, A. I.
Compressed Air for Supercooled Fog Dispersal,
W77-06674 3B

WEISS, R. F.
The Solubility of Nitrogen, Oxygen and Argon in Water and Seawater,
W77-06923 5C

WEN, J.
Mixing and Circulation of Lakes and Reservoirs with Air Plumes,
W77-06633 5G

WENDEIN, M. F.
It's All on the Nameplate: Everything You Always Wanted to Know About Jet Pumps,
W77-06854 8C

WESTPHAL, A.
The Effect of Different Methods on Growth, Development and Yield of Cotton, (In German),
W77-06962 3F

WESTPHAL, J. A.
Water Quality Simulation of Tahoe-Truckee System, Nevada-California-Volume I,
W77-07075 5B

WESTRATE, F. A.
Phosphates in Soils Treated with Sewage Water: III. Kinetic Studies on the Reaction of Phosphates with Aluminum Compounds,
W77-07054 5B

WHARFE, J. R.
Heavy Metals in Macroinvertebrates and Fish from the Lower Medway Estuary, Kent,
W77-06790 5C

WHEATCRAFT, S. W.
Waste Injection into Stratified Ground Water Bodies,
W77-06855 5B

WHELAN, T. III.
Methane-Derived Carbonate Cements in Barrier and Beach Sands of a Subtropical Delta Complex,
W77-06677 2L

WHITE, A. W. JR.
Loss of 2,4-D in Runoff from Plots Receiving Simulated Rainfall and from a Small Agricultural Watershed,
W77-06908 5B

WHITE, M. J. D.
Design and Control of Secondary Settlement Tanks,
W77-07015 5D

WHITE, R. V.
A Self-Contained Facility for Analyzing Near-Bottom Flow and Associated Sediment Transport,
W77-06874 2L

WHITE, W. R.
Determination of Free Formic and Acetic Acids by Gas Chromatography Using the Flame Ionization Detector,
W77-06961 5A

WHITNEY, F. A.
Temperature, Salinity and Light Penetration Structures: Controlled Ecosystem Pollution Experiment,
W77-06626 5A

WHITTLESEY, N. K.
Economic Analysis of Alternative Groundwater Withdrawal Rates in Conjunction with Surface Water Irrigation,
W77-06740 4B

WIENS, J. A.
Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska,
W77-06810 6G

WIESNET, D. R.
River Basin Snow Mapping at the National Environmental Satellite Service,
W77-06915 2C

WILD, K.
Study on Sewage Flow Dynamics Through Dorr Type Clarifier on Stream, (Synopsis),
W77-07048 5D

WILLIAMS, D. C.
State Information Needs Related to Onshore and Nearshore Effects of OCS Petroleum Development,
W77-06934 6G

WILLIAMS, J. R.
Process for the Treatment of Waste Water by Heterogeneous Photosensitized Oxidation,
W77-07006 5D

Sediment Yield Prediction Based on Watershed Hydrology,
W77-06656 4D

WILLIAMS, P. M.
Chlorine Reactions with Seawater Constituents and the Inhibition of Photosynthesis of Natural Marine Phytoplankton,
W77-06637 5C

WILLIAMS, S.
Electrically Powered Sampler for Benthic Macroinvertebrates,
W77-06757 7B

WOJCIECHOWSKA, W.
Dynamics of Phytoplankton Biomass in Two Lakes of Different Limnological Character,
W77-06685 5C

The Share of Algae with Different Dimensions in the Plankton of Two Lakes of Different Trophic Character in the Annual Cycle,
W77-06692 5C

WOLAVER, T. G.
The Distribution of Natural and Anthropogenic Elements and Compounds in Precipitation Across the U.S.; Theory and Quantitative Models,
W77-06675 2B

WOLMAN, M. G.
Changing Needs and Opportunities in the Sediment Field,
W77-06964 2J

WOLOTIRA, R. J. JR.
Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chukchi Sea,
W77-06839 6G

WONG, G. G.
Anaerobic Filter Treats Waste Activated Sludge,
W77-07078 5D

WOOD, L. B.
London's Stormwater Problem,
W77-06983 5D

WOOD, R. B.
Some Effects on Integral Photosynthesis of Artificial Circulation of Phytoplankton Through Light Gradients,
W77-06696 5C

WRIGHT, D. A.
Toxicity of Fluoride to Brown Trout Fry (Salmo trutta),
W77-06628 5C

WRIGHT, L. D.
Effect of Malachite Green and Formalin on the Survival of Largemouth Bass Eggs and Fry,
W77-06612 5C

WRIGLEY, R. C.
The Use of Remote Sensing to Detect How Wind Influences Planktonic Blue-Green Algal Distribution,
W77-06697 5C

WROE, L. R.
London's Stormwater Problem,
W77-06983 5D

WU, C. Y.
Laboratory Study of the Flexural Strength and Elastic Modulus of Freshwater and Saline Ice,
W77-06661 2C

WYATT, T.
Streamflow Regulation by Artificial Recharge Fed from Upstream Surface Storage: Derivation of Control Rules,
W77-06725 4A

YABROFF, I. W.
Energy Development: The Environmental Tradeoffs. Volume 4: The Background Papers,
W77-06957 6G

YATES, T.
Conditioning and Land Application of Aerobically Digested Sludge,
W77-07058 5D

YEH, W. W-G.
Optimal Design and Operation of Reservoir Systems,
W77-06721 4A

YOUNG, D. R.
An Offshore Biomonitoring System for Chlorinated Hydrocarbons,
W77-06641 5A

YOUNG, J. C.
The Electrolytic Respirometer-II. Use in Water Pollution Control Plant Laboratories,
W77-07081 5D

ZAKREZEWSKI, J.
Effect of Water Work's Sludge on Waste Water Treatment,
W77-07085 5D

ZDANOWSKI, B.
The Influence of Heated Effluent Waters on the Thermal-Oxygen Relations and Water Transparency in the Konin Lakes Complex, (In Polish),
W77-06756 5C

The Influence of Heated Effluent Waters on the Water Chemism of Konin Lakes, (In Polish),
W77-06753 5C

Long-Term Changes of the Pelagic Primary Production in Heated Lakes, (In Polish),
W77-06755 5C

Primary and Secondary Production of Plankton in Heated Lakes, (In Polish),
W77-06752 5C

ZHUK, E. G.
Water Decontamination in Northern Regions by Impulse Electric Charges, (In Russian),
W77-06791 5D

ZIELINSKI, J.
General Description of the Vistula River Project and Basic Planning Data,
W77-06733 4A

ZILBERMAN, D.
Two-Goal Regional Environmental Policy: The Case of the Santa Ana River Basin,
W77-06707 5G

ZIMMERMAN, S. T.
Baseline/Reconnaissance Characterization, Littoral Biota, Gulf of Alaska and Bering Sea,
W77-06833 6G

ZOLTEK, J. JR.
Nutrient Removal by Water Hyacinths,
W77-07036 5G

ZOTOVA, V. I.
Quantitative Analysis of Enteroviruses in Water with Various Degrees of Pollution, (In Russian),
W77-07070 5A

ZWOLINSKI, K.
Study on Sewage Flow Dynamics Through Dorr Type Clarifier on Stream, (Synopsis),
W77-07048 5D

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ORGANIZATIONAL INDEX

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. BIOLOGICAL WASTE MANAGEMENT LAB.; AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. SOIL NITROGEN LAB.; AND AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. AGRICULTURAL ENVIRONMENTAL QUALITY INST.
Fate of Nitrogen and Phosphorus in Soils Under Septic Tank Waste Disposal Fields,
W77-06914 5B

AGRICULTURAL RESEARCH SERVICE, BRAWLEY, CALIF. IMPERIAL VALLEY CONSERVATION RESEARCH CENTER.
Salinity Effects on Rice After the Boot Stage,
W77-06871 3C

AGRICULTURAL RESEARCH SERVICE, COSHOCTON, OHIO. NORTH APPALACHIAN EXPERIMENTAL WATERSHED.
The Impact of Fertilizer Use and Crop Management on Nitrogen Content of Subsurface Water Draining from Upland Agricultural Watersheds,
W77-06909 5B

AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.
Smoothing Data with Cubic Splines,
W77-06831 7C

AGRICULTURAL RESEARCH SERVICE, TEMPLE, TEX.
Sediment Yield Prediction Based on Watershed Hydrology,
W77-06656 4D

AGRICULTURAL UNIV., WAGENINGEN (NETHERLANDS).
Phosphates in Soils Treated with Sewage Water: I. General Information on Sewage Farm, Soil, and Treatment Results,
W77-07052 5G

Phosphates in Soils Treated with Sewage Water: II. Fractionation of Accumulated Phosphates,
W77-07053 5B

Phosphates in Soils Treated with Sewage Water: III. Kinetic Studies on the Reaction of Phosphates with Aluminum Compounds,
W77-07054 5B

AGRICULTURAL UNIV., WAGENINGEN (NETHERLANDS). DEPT. OF MICROBIOLOGY.
Some Factors Affecting Floc Formation by Zoogloea Ramigera, Strain I-16-M,
W77-07042 5D

AIR FORCE CAMBRIDGE RESEARCH LABS., L. G. HANSCOM FIELD, MASS. METEOROLOGY LAB.
Compressed Air for Supercooled Fog Dispersal,
W77-06674 3B

AKADEMIYA NAUK SSSR, LENINGRAD. LAB. OF COMPARATIVE CYTOLOGY.
Heat Resistance of Gametes of Marine Invertebrates in Relation to Temperature Conditions Under Which the Species Exist,
W77-06771 5C

AKADEMIYA NAUK SSSR, MOSCOW. CENTRAL ECONOMIC MATHEMATICAL INST.
Optimal Complex Use of Controlled Water Resources of a Basin,
W77-06718 4A

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT MIKROBIOLOGII.
Biogenic Elements and Sulfate Reduction in Water Oil Carbonate Layer, (In Russian),
W77-07040 5B

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT VODNYKH PROBLEM.
Mathematical Model of Water Resources Utilization in a River Basin,
W77-06719 4A

The Methods of Distribution of Water Resources in River Development Systems,
W77-06726 4A

AKADEMIYA NAUK URSR, KIEV. INSTYTUT BOTANIKI.
Foam and Film of Fresh Waters as an Ecological Niche of Aquatic Hyphomycetes, (In Russian),
W77-06787 2I

AKADEMIYA NAUK URSR, KIEV. INSTYTUT BOTANIKI; AND AKADEMIYA NAUK URSR, KIEV. DEPT. OF GEOBOTANY AND PALEBOTANY.
Place and Role of Plant Cover in Optimization of the Donbas Natural Environment, (In Ukranian),
W77-06858 4C

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Dispersion of Liquid Waste from a Moving Barge,
W77-06913 5B

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Spawning Herring Surveys in the Bering Sea and Finfish Resource Surveys in Norton Sound and Kotzebue Sound,
W77-06828 6G

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The Natural History and Ecology of the Bearded Seal (Erignathus Barbatus) and the Ringed Seal (Phoca (Pusa) Hispida),
W77-06799 6G

An Aerial Census of Spotted Seals, Phoca Vitulina Largha,
W77-06800 6G

Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska,
W77-06804 6G

Identification, Documentation, and Delineation of Coastal Migratory Bird Habitat in Alaska, and the Distribution, Abundance and Feeding Ecology of Birds Associated with Pack Ice,
W77-06805 6G

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Beaufort Sea Estuarine Fishery Study,
W77-06840 6G

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Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System,
W77-06829 6G

Demersal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island,
W77-06847 6G

ALASKA DEPT. OF FISH AND GAME, KODIAK. DIV. OF COMMERCIAL FISHERIES.
Razor Clam (Siliqua Patula, Dixon) Distribution and Population Assessment Study,
W77-06830 6G

ALASKA UNIV., COLLEGE. INST. OF ARCTIC BIOLOGY.
Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska. A Composite Study of: (1) Habitat Utilization and Breeding Ecology of Waterbirds, (2) Habitat Utilization and Breeding Ecology of Shorebirds and Nonwaterbird Species, and (3) Habitat Utilization, Breeding Ecology, and Feeding Ecology of Predators of Birds,
W77-06820 6G

Avian Community Ecology of the Akulik - Inglutalik River Delta, Norton Bay, Alaska,
W77-06822 6G

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
Effects of Copper on Silicic Acid Uptake by a Marine Phytoplankton Population: Controlled Ecosystem Pollution Experiment,
W77-06621 5A

Avifaunal Utilization of the Offshore Island Area Near Prudhoe Bay, Alaska,
W77-06812 6G

The Distribution, Abundance, Diversity and Productivity of Benthic Organisms in the Bering Sea,
W77-06826 6G

The Distribution, Abundance, Diversity, and Productivity of Benthic Organisms in the Gulf of Alaska,
W77-06841 6G

Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea,
W77-06842 6G

The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two (Alitak and Ugak) Bays of Kodiak Island, Alaska,
W77-06849 6G

Microbial Methane Consumption Reactions and Their Effect on Methane Distributions in Freshwater and Marine Environments,
W77-06899 5C

ALASKA UNIV., COLLEGE. INST. OF WATER RESOURCES.
Suprapermafrost Water,
W77-06630 2C

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Technical Trawl Survey of the Benthic Epifauna of the Chukchi Sea and Norton Sound.
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Sewerage for a Rural Resort Area,
W77-06987 5D

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Effect of the Nile Flood on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-06907 2L

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Egg Incubation and Larval Rearing of Navaga (Eleginus Navaga Pall.), Polar Cod (Boreogadus Saida Lepechin) and Arctic Flounder (Liopsetta Glacialis Pall.) in the Laboratory,
W77-06792 8I

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Delineation of Flood Hazard Areas: Flood Hazard Report No. 2, Raritan River.
W77-06953 4A

ANDHRA UNIV., WALTAIR (INDIA). COLL. OF ENGINEERING.
Median Tolerance Limits of Some Chemicals to the Fresh Water Fish Cyprinus-Carpio,
W77-06780 5C

AQUINAS COLL., GRAND RAPIDS, MICH.
Growth and Movement of Fish in the Vicinity of a Thermal Discharge,
W77-06766 5C

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Environmental Impact Statements in Water Resources Planning and Decision Making,
W77-06738 6E

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Collective Utility: A Systems Approach to Water Pricing Policy,
W77-06712 6C

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Weather Modification in the Soviet Union--1976,
W77-06644 3B

ARMY ENGINEER DISTRICT, LOS ANGELES, CALIF.
Flood Hazard Information: Cave Creek, Arizona Canal to 19th Avenue, Phoenix, Arizona.
W77-06954 4A

ARMY ENGINEER DISTRICT, SEATTLE, WASH. SEATTLE DISTRICT.
A Preliminary Evaluation of the Effects of Gas Bubble Disease on Fish Populations in the Kootenai River Below Libby Dam,
W77-06919 5C

ASSOCIATION OF GEOSCIENTISTS FOR INTERNATIONAL DEVELOPMENT, ST. JOHN'S (NEWFOUNDLAND).
Preliminary Bibliography on Groundwater in Developing Countries,
W77-06852 2F

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL (ENGLAND).
An Estimate of the Input of Atmospheric Trace Elements into the North Sea and the Clyde Sea (1972-3),
W77-06668 5B

BADEN-WUERTTEMBERG LANDESANSTALT FUER UMWELTSCHUTZ (WEST GERMANY).
A Biological Monitoring System Employing Rheotaxis of Fish,
W77-06609 5C

BADISCHE ANILIN-UND SODA-FABRIK A.G., LUDWIGSHAFEN AM RHEIN (WEST GERMANY). LANDWIRTSCHAFTLICHE VERSUCHSSTATION. (ASSIGNEE).
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W77-06676 4A

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Tissue Accumulation and Enzymatic Effects of Hexavalent Chromium in Rainbow Trout (Salmo Gairdneri),
W77-06639 5C

BDH, INC., ROME, GA. (ASSIGNEE).
Oxidation and Ozonation Chamber,
W77-06999 5D

BEDFORD INST. OF OCEANOGRAPHY, DARTMOUTH (NOVA SCOTIA). ATLANTIC OCEANOGRAPHIC LAB.
High Seas Oil Pollution: Particulate Petroleum Residues in the North Atlantic,
W77-06911 5B

BENDIX AEROSPACE SYSTEMS DIV. ANN ARBOR, MICH.
Application of Landsat to the Surveillance and Control of Eutrophication in Saginaw Bay,
W77-06665 5A

Computer Mapping of Landsat Data for Environmental Applications,
W77-06666 5A

BERGBAU-FORSCHUNG G.M.B.H., ESSEN (WEST GERMANY).
Process for the Purification of Waste Waters with Activated Carbon,
W77-07093 5D

BLACK AND VEATCH, DENVER, COLO.
Subsurface Injection-How Much Does It Cost,
W77-07011 5E

BOEING AEROSPACE CO., SEATTLE, WASH.
NASA Develops Water Monitoring System,
W77-06912 5A

BOEING COMPUTER SERVICES INC., SEATTLE, WASH. MATHEMATICAL ANALYSIS UNIT.
Optimal Planning of Flows in Multi-Reservoir Hydro-Power Systems,
W77-06730 4A

BOLT BERANEK AND NEWMAN, INC., CAMBRIDGE, MASS.
Investigation of the Effects of Nonhomogeneous (or Nonstationary) Behavior on the Spectra of Atmospheric Turbulence,
W77-06678 2B

BRISTOL UNIV. (ENGLAND). DEPT. OF BACTERIOLOGY.
Laboratory Studies on the Effect of Metals on Oxygen Uptake by Sewage Sludge in Brackish Water,
W77-06788 5C

BRISTOL UNIV. (ENGLAND). DEPT. OF BOTANY.
The Uptake of Lead, Zinc, Cadmium, and Copper by the Pulmonate Mollusc, Helix aspersa Muller, and its Relevance to the Monitoring of Heavy Metal Contamination of the Environment,
W77-06629 5C

BRITISH COLUMBIA UNIV., VANCOUVER. INST. OF OCEANOGRAPHY.
The Growth of Young Salmonids (Onchorhynchus Keta): Controlled Ecosystem Pollution Experiment,
W77-06618 5A

Temperature, Salinity and Light Penetration Structures: Controlled Ecosystem Pollution Experiment,
W77-06626 5A

The Influence of Wind on the Surface Layer of a Stratified Inlet: Part I. Observations,
W77-06894 2L

The Influence of Wind on the Surface Layer of a Stratified Inlet: Part II. Analysis,
W77-06895 2L

BUREAU OF SPORT FISHERIES AND WILDLIFE, SEATTLE, WASH. WESTERN FISH DISEASE LAB.
Gas Bubble Disease of Salmonids: A Critical Review,
W77-06920 5

BUREAU OF STUDIES AND DESIGNS FOR HYDRAULIC STRUCTURES, WARSAW (POLAND).
General Description of the Vistula River Project and Basic Planning Data,
W77-06733 4A

CALGARY UNIV., (ALBERTA).
Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and Other Seabirds, When Over the Outer Continental Shelf of the Bering Sea and Gulf of Alaska During the Northern Summer,
W77-06814 6G

CALIFORNIA UNIV., BERKELEY. (ASSIGNEE).
Method of Waste Treatment and Algae Recovery,
W77-07003 5D

CALIFORNIA UNIV., BODEGA BAY. BODEGA MARINE LAB.
Shorebird Dependence on Arctic Littoral Habitats,
W77-06811 6G

CALIFORNIA UNIV., IRVINE. DEPT. OF ECOLOGY AND EVOLUTIONARY BIOLOGY.
Reproductive Ecology of Pribilof Island Seabirds,
W77-06809 6G

CALIFORNIA UNIV., LOS ANGELES, DEPT. OF GEOGRAPHY.
Climatology for Geographers,
W77-06659 2B

CALIFORNIA UNIV., LOS ANGELES. GRADUATE SCHOOL OF MANAGEMENT.
Optimal Oil Tanker Size with Regard to Environmental Impact of Oil Spills,
W77-06702 5G

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF ECONOMICS.
Regulating Activities with Catastrophic Environmental Effects,
W77-06703 6G

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA. INST. OF MARINE RESOURCES.
Dynamics of Micro-Zooplankton Populations Treated with Copper: Controlled Ecosystem Pollution Experiment,
W77-06616 5A

Effects of Four Oils on Marine Bacterial Populations: Controlled Ecosystem Pollution Experiment,
W77-06623 5A

Effects of Copper on Phytoplankton Standing Crop and Productivity: Controlled Ecosystem Pollution Experiment,
W77-06624 5A

Effects of Copper on the Dominance and the Diversity of Algae: Controlled Ecosystem Pollution Experiment,
W77-06625 5A

Chlorine Reactions with Seawater Constituents and the Inhibition of Photosynthesis of Natural Marine Phytoplankton,
W77-06637 5C

CALIFORNIA UNIV., SANTA BARBARA. MARINE SCIENCE INST.
Effects of Pressure, Temperature and Oxygen on the Oxygen-Consumption Rate of the Midwater Copepod Gaussia Princeps,
W77-06642 5C

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Adenosine Triphosphate (ATP) Levels in Microbial Cultures and a Review of the ATP Biomass Estimation Technique,
W77-06942 5A

A Universal Calibration Equation for Price Meters and Similar Instruments,
W77-06943 7B

Acid Solubilization of Sewage Sludge and Ash Constituents for Possible Recovery,
W77-07017 5E

CANADIAN BIO RESOURCES CONSULTANTS LTD., SURREY (BRITISH COLUMBIA).
Drying Potato Wastes for Animal Feed as an Alternative Disposal Method.
W77-06947 5D

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Limnological and Planktonic Studies in the Waterton Lakes, Alberta,
W77-06680 5C

CATANIA UNIV. (ITALY). ISTITUTO DI IDRAULICA IDROLOGIA GESTIONE ACQUE (ITALY).
La Science des Systemes dans la Planification des Ressources en Eau,
W77-06736 6A

CBA ENGINEERING LTD., VANCOUVER (BRITISH COLUMBIA).
Presenting Trends in Lake Eutrophication,
W77-06693 5C

CEA CENTRE D'ETUDES NUCLEAIRES DE FONTENAY-AUX-ROSES (FRANCE). DEPARTEMENT DE PROTECTION.
Effects of Various Ecological Factors on Radiostrontium Uptake in Two Euryhaline Teleosts: Mugil Auratus Risso and Pleuronectes Platessal, (Influence de Divers Facteurs Ecologiques Sur L'Accumulation du Radiostrontium Chez Deux Teleosteens Euryhalins: Mugil Auratus Risso et Pleuronectes Platessa L.),
W77-06777 5C

CH2M/HILL, RESTON, VA.
Fail-Safe Waste Treatment System,
W77-07027 5D

CHERAW NATIONAL FISH HATCHERY, S. C.
Effect of Malachite Green and Formalin on the Survival of Largemouth Bass Eggs and Fry,
W77-06612 5C

CHICAGO UNIV., ILL. DEPT. OF THE GEOPHYSICAL SCIENCES.
A Self-Contained Facility for Analyzing Near-Bottom Flow and Associated Sediment Transport,
W77-06874 2L

CITY UNIV., LONDON (ENGLAND). DEPT. OF CIVIL ENGINEERING.
Hybrid Computer Analysis of a Combined Surface Water--Groundwater System,
W77-06729 4B

CLEMSON UNIV., S. C.
Factors Influencing the Dewatering Characteristics of Sludge,
W77-07097 5D

CLERMONT COUNTY WATER AND SEWER DISTRICT, BATAVIA, OHIO.
Agricultural Disposal of Aerobic Wastewater Sludges in an Urban County,
W77-07057 5D

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N. H. EXPERIMENTAL ENGINEERING DIV.; AND COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N. H. NORTHERN ENGINEERING RESEARCH BRANCH.
An Annular Flow Ice-Water Model Heat Sink,
W77-06889 2C

COLD REGIONS RESEARCH AND ENGINEERING LAB. HANOVER, N.H. RESEARCH DIV.
Use of Remote Sensing to Quantify Construction Material and to Define Geologic Lineations; Dickey-Lincoln School Lakes Project, Maine,
W77-06888 8D

COLLEGE OF THE ATLANTIC, BAR HARBOR, MAINE.
Birds of Coastal Habitat on the South Shore of Seward Peninsula, Alaska,
W77-06813 6G

Studies of Populations, Community Structure and Colony of Marine Birds at King Island, Bering Strait Region, Alaska,
W77-06821 6G

COLOGNE UNIV. (WEST GERMANY). GEOGRAPHISCHES INSTITUT.
Phosphate Prediction Model for Streams by Means of Discriminant Analysis,
W77-06906 5B

COLORADO STATE UNIV., FORT COLLINS.
On-Line Adaptive Control for Combined Sewer Systems,
W77-07100 5D

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF AGRONOMY.
Solubility and Plant Uptake of Cadmium in Soils Amended with Cadmium and Sewage Sludge,
W77-07055 5B

Land Application of Sewage Sludge: IV. Wheat Growth, N Content, N Fertilizer Value, and N Use Efficiency as Influenced by Sewage Sludge and Wood Waste Mixtures,
W77-07079 5D

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA).
Purifying Water,
W77-07061 5D

CONNELL/METCALF AND EDDY, CORAL GABLES, FLA.
Expansion Comes Quickly to AWT Plant,
W77-07009 5D

CORPUS CHRISTI PUBLIC UTILITIES, TEX.
Control Sewer Corrosion with H2O2,
W77-06993 8G

CUBIC CORP., SAN DIEGO, CALIF. (ASSIGNEE).
Ozone Oxidation of Waste Water,
W77-07094 5D

DELAWARE UNIV., LEWES. FIELD STATION.
Occurrence of Gas-Bubble Disease in Three Species of Bivalve Molluscs,
W77-06921 5C

DEMOCRITUS NUCLEAR RESEARCH CENTER, ATHENS (GREECE). CHEMISTRY DEPT.
Stable Elements of Radioecological Importance in Certain Echinoderm Species,
W77-06640 5A

DEPARTMENT OF ENERGY, MINES AND RESOURCES, OTTAWA (ONTARIO). POLAR CONTINENTAL SHELF PROJECT.
Devon Island Ice Cap: Core Stratigraphy and Paleoclimate,
W77-06890 2C

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Evaporation and Advection II: Evaporation Downwind of a Boundary Separating Regions Having Different Surface Resistances and Available Energies,
W77-06897 2D

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Tables and Type Curves for Analysis of Pump Tests in Leaky Parallel-Channel Aquifers,
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W77-06945 5D

State-of-the-Art Review of Processes for Treatment and Reuse of Potato Wastes,
W77-06949 5D

Proceedings Technology Transfer Seminar on Waste Handling, Disposal and Recovery in the Metal Finishing Industry, November 12-13, 1975, Toronto, Ontario.
W77-06950 5D

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Composting of Sewage Sludge and Solid Waste Matter,
W77-07084 5D

DONETSK MUNICIPAL SANITATION EPIDEMIOLOGY STATION (USSR).
Experience in Treating Waste Waters from the Donetsk Mines, (In Russion),
W77-07068 5D

ECOLOTROL, INC., BETHPAGE, N.Y. (ASSIGNEE).
Waste Treatment Apparatus,
W77-07005 5D

Apparatus and Process for Removing Ammonia Nitrogen from Waste Water,
W77-07008 5D

Waste Treatment Process,
W77-07091 5D

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A Model for the Water Regime of a Deciduous Forest with Special Consideration of the Functional Interrelationships Among Meteorological Factors, Soil Water Content and Evapotranspiration, (In German),
W77-06864 2A

EIDGENOESSISCHE ANSTALT FUER WASSERVORSORGUNG, ABWASSERREINIGUNG UND GEWAESSERSCHUTZ, KASTIENBAUM (SWITZERLAND). MARINE RESEARCH LAB.
Lake Restoration by Bottom Water Siphoning (In German),
W77-06689 5G

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A Device for Measuring Seepage Flux in Lakes and Estuaries,
W77-06903 7B

WESTERN WASHINGTON STATE COLL., BELLINGHAM.
Reconnaissance Characterization of Littoral Biota, Beaufort and Chukchi Seas,
W77-06843 6G

WESTERN WASHINGTON STATE COLL., BELLINGHAM. DEPT. OF BIOLOGY.
Temperature Relations of Puget Sound Thaids in Reference to Their Intertidal Distribution,
W77-06767 5C

WINNIPEG WATERWORKS, WASTE, AND DISPOSAL DIV. (MANITOBA).
The Chemical Characteristics of the City of Winnipeg Waste Water,
W77-07047 5A

WISCONSIN UNIV.-MADISON.
Identity, Origin and Development of Off-Flavors in Great Lakes Anadromous Fish,
W77-06931 5A

WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.
Lake Currents and Temperatures Near the Western Shore of Lake Michigan,
W77-06687 2H

WOODS HOLE OCEANOGRAPHI INSTITUTION, MASS.
Response of Macro-Zooplankton Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06620 5A

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Zooplankton Sampling Variability: Controlled Ecosystem Pollution Experiment,
W77-06615 5A

Response of Natural Marine Bacterial Populations to Copper: Controlled Ecosystem Pollution Experiment,
W77-06622 5A

WRIGHT WATER ENGINEERS, INC., DENVER, COLO.
New Design Gives Denver District Iron-Free Well,
W77-06868 8A

WROCLAW TECHNICAL UNIV. (POLAND). INST. OF ENVIRONMENT PROTECTION ENGINEERING.
Renovated Water from Municipal Sewage Treatment Plants,
W77-07086 5D

YALE UNIV., NEW HAVEN, CONN. DEPT. OF GEOLOGY AND GEOPHYSICS.
Interstitial Water Chemistry of Anoxic Long Island Sound Sediments. 1. Dissolved Gases,
W77-06900 5B

YANKEE ATOMIC ELECTRIC CO., WESTBORO, MASS.
Evaluation of Alternative Solutions to Gas Bubble Disease Mortality of Menhaden at Pilgrim Nuclear Power Station,
W77-06928 5G

ACCESSION NUMBER INDEX

W77-06601 6D
W77-06602 2G
W77-06603 2G
W77-06604 2G
W77-06605 2G
W77-06606 2G
W77-06607 5C
W77-06608 5C
W77-06609 5C
W77-06610 5C
W77-06611 5C
W77-06612 5C
W77-06613 5A
W77-06614 5C
W77-06615 5A
W77-06616 5A
W77-06617 5A
W77-06618 5A
W77-06619 5A
W77-06620 5A
W77-06621 5A
W77-06622 5A
W77-06623 5A
W77-06624 5A
W77-06625 5A
W77-06626 5A
W77-06627 5A
W77-06628 5C
W77-06629 5C
W77-06630 2C
W77-06631 5D
W77-06632 5B
W77-06633 5G
W77-06634 6B
W77-06635 2I
W77-06636 5C
W77-06637 5C
W77-06638 5C
W77-06639 5C
W77-06640 5A
W77-06641 5A
W77-06642 5C
W77-06643 2B
W77-06644 3B
W77-06645 3B
W77-06646 2B
W77-06647 2B
W77-06648 2L
W77-06649 2H
W77-06650 2L
W77-06651 2L
W77-06652 2B
W77-06653 7B
W77-06654 2L
W77-06655 2H
W77-06656 4D
W77-06657 4D
W77-06658 5B
W77-06659 2B
W77-06660 5A
W77-06661 2C
W77-06662 8A
W77-06663 8A
W77-06664 8A
W77-06665 5A
W77-06666 5A
W77-06667 3E
W77-06668 5B
W77-06669 2L
W77-06670 7B
W77-06671 5G
W77-06672 5G
W77-06673 5A
W77-06674 3B
W77-06675 2B
W77-06676 4A
W77-06677 2L
W77-06678 2B
W77-06679 5A
W77-06680 5C
W77-06681 2G
W77-06682 5G
W77-06683 2H
W77-06684 5C
W77-06685 5C
W77-06686 5D
W77-06687 2H
W77-06688 5C
W77-06689 5G
W77-06690 5C
W77-06691 3C
W77-06692 5C
W77-06693 5C
W77-06694 5C
W77-06695 5C
W77-06696 5C
W77-06697 5C
W77-06698 5G
W77-06699 5D
W77-06700 5G
W77-06701 5G
W77-06702 5G
W77-06703 6G
W77-06704 6G
W77-06705 6G
W77-06706 6G
W77-06707 5G
W77-06708 2A
W77-06709 2A
W77-06710 2A
W77-06711 6A
W77-06712 6C
W77-06713 4B
W77-06714 4B
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W77-06737 6A
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W77-06739 6B
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W77-06756 5C
W77-06757 7B
W77-06758 5C
W77-06759 5C
W77-06760 5F
W77-06761 3F
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W77-06774 3B
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W77-06786 2H
W77-06787 2I
W77-06788 5C
W77-06789 5C
W77-06790 5C
W77-06791 5D
W77-06792 8I
W77-06793 6G
W77-06794 6G
W77-06795 6G
W77-06796 6G
W77-06797 2B
W77-06798 2H
W77-06799 6G
W77-06800 6G
W77-06801 4D
W77-06802 5C
W77-06803 2I
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W77-06848 6G
W77-06849 6G
W77-06850 5A
W77-06851 5B
W77-06852 2F
W77-06853 5G
W77-06854 8C
W77-06855 5B
W77-06856 8C
W77-06857 8G
W77-06858 4C
W77-06859 5D
W77-06860 8C
W77-06861 5G
W77-06862 5G
W77-06863 8B
W77-06864 2A
W77-06865 8G
W77-06866 8G
W77-06867 8C
W77-06868 8A
W77-06869 8G
W77-06870 3F
W77-06871 3C
W77-06872 2G
W77-06873 4A
W77-06874 2L
W77-06875 5C
W77-06876 5G
W77-06877 5C
W77-06878 6G
W77-06879 2H
W77-06880 2L
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W77-06882 2L
W77-06883 8D
W77-06884 2H
W77-06885 8E
W77-06886 5C
W77-06887 2B
W77-06888 8D
W77-06889 2C
W77-06890 2C
W77-06891 2L
W77-06892 2L
W77-06893 2L
W77-06894 2L
W77-06895 2L
W77-06896 2L
W77-06897 2D
W77-06898 2D
W77-06899 5C
W77-06900 5B
W77-06901 2J
W77-06902 5B
W77-06903 7B
W77-06904 2L
W77-06905 2F
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W77-06907 2L
W77-06908 5B
W77-06909 5B
W77-06910 5B
W77-06911 5B
W77-06912 5A

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W77-06918 6G
W77-06919 5C
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W77-06923 5C
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W77-06925 5C
W77-06926 7B
W77-06927 5C
W77-06928 5G
W77-06929 8B
W77-06930 2L
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W77-06932 5B
W77-06933 5C
W77-06934 6G
W77-06935 5G
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W77-06939 2J
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W77-06942 5A
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W77-06944 5A
W77-06945 5D
W77-06946 5E
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W77-06951 5D
W77-06952 6F
W77-06953 4A
W77-06954 4A
W77-06955 6G
W77-06956 6B
W77-06957 6G
W77-06958 2H
W77-06959 7C
W77-06960 7B
W77-06961 5A
W77-06962 3F
W77-06963 2E
W77-06964 2J
W77-06965 2F
W77-06966 2E
W77-06967 2K
W77-06968 4B
W77-06969 4C
W77-06970 4B
W77-06971 4A
W77-06972 4A
W77-06973 2D
W77-06974 5B
W77-06975 5B
W77-06976 5E
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W77-06979 2E
W77-06980 4D
W77-06981 5B
W77-06982 5C
W77-06983 5D
W77-06984 5B
W77-06985 5D
W77-06986 8G
W77-06987 5D
W77-06988 8E
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W77-06990 8G
W77-06991 8G
W77-06992 8F
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W77-07032 5D
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W77-07034 5D
W77-07035 5D
W77-07036 5G
W77-07037 5D
W77-07038 5G
W77-07039 5A
W77-07040 5B
W77-07041 5D
W77-07042 5D
W77-07043 5D
W77-07044 5A
W77-07045 5A
W77-07046 5D
W77-07047 5A
W77-07048 5D
W77-07049 5B
W77-07050 5C
W77-07051 5G
W77-07052 5G
W77-07053 5B
W77-07054 5B
W77-07055 5B
W77-07056 5B
W77-07057 5D
W77-07058 5D
W77-07059 5D
W77-07060 5D
W77-07061 5D
W77-07062 5D
W77-07063 5D
W77-07064 5D
W77-07065 5D
W77-07066 5B
W77-07067 5A
W77-07068 5D
W77-07069 5D
W77-07070 5A
W77-07071 5B
W77-07072 5B
W77-07073 5B
W77-07074 5D
W77-07075 5B
W77-07076 5A
W77-07077 5D
W77-07078 5D
W77-07079 5D
W77-07080 5D
W77-07081 5D
W77-07082 5D
W77-07083 5D
W77-07084 5D
W77-07085 5D
W77-07086 5D
W77-07087 5D
W77-07088 5D
W77-07089 5G
W77-07090 5D
W77-07091 5D
W77-07092 5D
W77-07093 5D
W77-07094 5D
W77-07095 5D
W77-07096 5B
W77-07097 5D
W77-07098 5A
W77-07099 5D
W77-07100 5D

ABSTRACT SOURCES

URCE	ACCESSION NUMBER	TOTAL
CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W77-06870--06872	3
Cornell University, Policy Models for Water Resources Systems	W77-06707--06737	31
ERDA Oak Ridge National Laboratory, Nuclear Radiation and Safety	W77-06763--06773 06775--06783 06785 06788--06792	26
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W77-06983--07037 07039 07041--07066 07071--07100	112
Illinois State Water Survey, Hydrology	W77-06643--06678 06885--06916	68
National Water Well Association, Water Well Construction Technology	W77-06851--06857 06859--06863 06865--06869	17
University of North Carolina, Metropolitan Water Resources Planning and Management	W77-06601--06606 06952--06957	12
University of Wisconsin, Eutrophication	W77-06679--06680 06682--06690 06692--06697	17
University of Wisconsin, Water Resources Economics	W77-06698--06706	9
STATE WATER RESOURCES RESEARCH INSTITUTES	W77-06631--06634 06740--06742 06760--06762 06917, 06982	12

LIBRARY U. OF I. URBANA-CHAMPAIGN

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER		
BioSciences Information Service	W77-06681, 06691 06745, 06774 06784 06786--06787 06797--06798 06801--06803 06827, 06831 06837--06838 06844, 06858 06864, 06926 06962, 07038 07040 07067--07070	27
Environmental Information Services, Inc. (Gas Bubble Disease)	W77-06919--06925 06927--06928	9
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W77-06607--06629 06635--06642 06743--06744 06746--06759	47
Environment Canada (WATDOC)	W77-06941--06951	11
National Oceanic and Atmospheric Administration	W77-06873--06884 06929--06940	24
Ocean Engineering Information Service (Outer Continental Shelf)	W77-06793--06796 06799--06800 06804--06826 06828--06830 06832--06836 06839--06843 06845--06850	48
Office of Water Research and Technology	W77-06630 06738--06739 06918	4
U. S. Geological Survey	W77-06958--06961 06963--06981	23

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
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- 6 WATER RESOURCES PLANNING
- 7 RESOURCES DATA
- 8 ENGINEERING WORKS
- 9 MANPOWER, GRANTS, AND FACILITIES
- 10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

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VOLUME 10, NUMBER 15
AUGUST 1, 1977

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VOLUME 10, NUMBER 15
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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

A RECONSIDERATION AND A GENERALIZATION OF LAWRANCE AND FIERING TWO-STATION MODELS,
Technical Univ. of Lisbon (Portugal). Dept. of Civil Engineering; and Lisbon Univ. (Portugal). Centre of Urban and Regional Systems.
For primary bibliographic entry see Field 2E.
W77-07157

DESIGN CRITERIA FOR HYDROLOGIC EXTREMES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-07165

THE EFFECT OF SOIL MOISTURE ON CIRCULATION AND RAINFALL IN A TROPICAL MODEL,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W77-07166

HYDROLOGY RESEARCH DIVISION, ANNUAL PROGRESS REPORTS AND SHORT RESEARCH NOTES 1975-76.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 6E.
W77-07336

UTILIZATION OF THE RESULTS FROM REPRESENTATIVE AND EXPERIMENTAL BASINS WITH A VIEW TO THE MANAGEMENT OF WATER RESOURCES,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-07355

REGIONAL STUDY OF THE UPPER BASIN OF THE AAR FROM ITS SOURCES TO BERN: PROFILE OF FLOODS OF A GIVEN RETURN PERIOD AT ANY POINT ON THE RIVER (ETUDE REGIONALE DU BASSIN SUPERIEUR DE L'AAR DE SES SOURCES JUSQU'A BERNE: PROFILE DES CRUES DE PERIODE DONNEE LE LONG DU COURS D'EAU).
Ecole Polytechnique Federale de Lausanne (Switzerland).
For primary bibliographic entry see Field 2E.
W77-07358

HYDROLOGY,
Geological Survey, Reston, Va. Water Resources Div.
L. A. Heindl.
Encyclopedia Britannica Book of the Year, Earth Sciences, (Chicago), p 264-265, 1977.

Descriptors: *Water resources development, *Water supply, *Water pollution control, *United States, Reviews, Remote sensing, Satellites(Artificial), Aerial photography, Waste disposal, Surface waters, Groundwater, Ice, Snow management.

This review of water-resources problems in the United States summarizes the increasing demands for water supplies, hazards of water pollution, and measures being taken to cope with these problems. Withdrawal of groundwater doubled in the U.S. in the past 20 years. By 1976 groundwater provided between one-quarter and one-third of all water used for all purposes, and about half the people in the U.S. depended on it for their domestic supplies. The emphasis of investigations during the year was on the maintenance of groundwater quality. This is particularly a problem where wastes are being injected into the subsurface. Widespread concern for the continuing supply of clean fresh water resurrected interest in the use of mineralized and saline waters for nonpotable domestic, industrial, and agricultural purposes. The use of combinations of data from Landsat 1 and 2 and other satellites demonstrated the practicality of using remote sensing from satellites and high-flying aircraft for preliminary hydrological assessments of the water regimens of large areas. Reports of working groups of the U.S. National Committee for the International Hydrological Decade stressed the need in the United States for better coordination of research in snow-and-ice hydrology, increased application of already proven nuclear techniques in field studies and investigations, more realistically structured programs for drainage-basin research, and additional emphasis on basis hydrology in the university curricula of future water resources experts. (Woodard-USGS)
W77-07494

SYSTEMS APPROACH AND WATERSHED MODELS,
Regional Engineering Coll., Rourkela (India).
G. Krishnaswamy.
Indian Journal of Power and River Valley Development, Vol 24, No 6, p 179-183, June 1974. 4 fig, 7 ref.

Descriptors: *Watersheds(Basins), *Mathematical models, *Hydrology, Parametric hydrology, Stochastic processes, Systems analysis, Simulation analysis, Water resources, Planning.
Identifiers: Component modeling.

Watershed models must be able to forecast floods and the effects of change of land use on various hydrologic phenomena. The types of such models used in hydrology are physical models based on the laws of scaling, analogue models based on the mathematical identity of the governing equations of physically different systems, and mathematical or conceptual models for describing mathematically the response of catchment to the processes of precipitation and evaporation. Considered is the development of the mathematical models for watershed analysis, with particular emphasis on the systems approach. The ideal model would specify completely the properties of and processes occurring in all the relevant components of the watershed. Thus, the hydrologic effects of a rainfall event over a watershed could be determined objectively through modeling. The solution of such problems may involve statistical analysis of samples of observed data or may deal with the interrelationships among individual hydrologic parameters or groups of parameters. The former method of approach can be classified under stochastic hydrology, the latter under parametric hydrology. The systems approach is one method of tackling such problems. The overall operation of the hydrologic system is examined, the complex physical laws of the internal system components not being considered. The process of development of the mathematical watershed model is described, the various available models are indicated, and the enormous possibility of further research work in this new field is hinted. (Bell-Cornell)
W77-07556

2B. Precipitation

THE EFFECT OF SOIL MOISTURE ON CIRCULATION AND RAINFALL IN A TROPICAL MODEL,
British Meteorological Office, Bracknell (England).
J. Walker, and P. R. Rowntree.
Quarterly Journal of the Royal Meteorological Society, Vol. 103, No. 435, p 29-46, January 1977. 13 fig, 5 tab, 32 ref.

Descriptors: *Model studies, *Rainfall, *Tropical regions, *Africa, Mathematical models, *Soil moisture, Arid lands, Deserts, Circulation, Evaporation, Albedo, Energy budget, Heat balance, Persistence, Foreign countries, Foreign research.
Identifiers: *Sahel(Africa), *Sahara.

The sensitivity of a tropical model to soil moisture content was investigated, using a simplified version of the UK Meteorological Office 11-layer model. The model area represented a zonally symmetric version of West Africa. The results of one experiment (D) with a desert in the same latitudes as the Sahara were compared with those of another experiment (W) in which the desert was replaced by moist land. The initial fields contained an idealized easterly wave which developed during the experiments to form depressions whose movement, structure, and associated rainfall were strongly influenced by the dryness of the underlying surface. The energetics of these disturbances were analyzed, and two distinct mechanisms for maintaining their eddy kinetic energy were proposed, depending on the soil moisture. Results from W suggest that once the land was moist it maintained itself in this state for at least several weeks. In D, however, the initial aridity north of 14 deg N was sustained, suggesting that ground dryness alone can cause deserts to persist. An analysis of observed rainfall data for the northern Sahel provided much stronger evidence for the persistence of rainfall anomalies from year to year than did similar analyses for the southern Sahel. The possibility that soil moisture anomalies could contribute to this persistence was briefly discussed. (Humphrey-ISWS)
W77-07166

DYNAMICS OF CLIMATIC HAZARDS IN NORTHEAST BRAZIL,
Wisconsin Univ., Madison. Dept. of Meteorology.
S. Hastenrath, and L. Heller.
Quarterly Journal of the Royal Meteorological Society, Vol. 103, No. 435, p 77-92, January 1977. 8 fig, 3 tab, 31 ref.

Descriptors: *Climatology, *South America, *Rainfall, *Droughts, Forecasting, Floods, Seasonal, Climatic data, Circulation, Air circulation, Analysis, Foreign countries, Meteorology.
Identifiers: *Brazil(Northeast region).

Departure characteristics of the large-scale circulation were studied in relation to extreme drought and flood years in northeastern Brazil. Ship observations during 1911-72, compiled with a one degree square resolution and extending between 30 deg N and 30 deg S from the African coast to the eastern Pacific, form a major observational basis. The rainy season of northeastern Brazil is narrowly centered around March/April and is related to the southernmost seasonal migration of a lower-tropospheric confluence axis over the adjacent eastern tropical Atlantic. The 'Secas' of Ceara province are characterized by an equatorward expansion of the South Atlantic, and a poleward retraction of the North Atlantic high--associated with a northward displacement of the enclosed near-equatorial trough of low pressure. Concurrently, the zonally oriented bands of maximum cloudiness and precipitation frequency stay farther north, the North Atlantic trades weaken, and the South Atlantic trades become stronger than in the long-term mean. The sea surface temperature pattern during a deficient rainy season in northeast Brazil is characterized by positive departures in a broad band across the North Atlantic and in the eastern Pacific, and anomalously cold waters in most of the South and equatorial Atlantic. During abundant rainy seasons in northeast Brazil, departure patterns are approximately in-

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verse to those patterns typical of drought years. A strong negative linkage exists between northeast Brazil rainfall and sea surface temperature along the Ecuador/Peru coast. This seems to be caused by inverse long-term pressure variations over the eastern South Pacific and South Atlantic oceans, which in turn may be part of large-scale mass adjustments of the Southern Oscillation type. Development of the equatorward expansions of the North and South Atlantic highs, preseason precipitation in northeast Brazil and the Guayanas, and location of the cloudiness and precipitation belts over the adjacent western tropical Atlantic are among the more promising predictors for seasonal foreshadowing of extreme rainy season behavior in northeast Brazil. (Humphreys-ISWS)
W77-07167

ESTIMATING ABOVE AND BELOW NORMAL RAINFALL PERIODS OVER SOUTH AFRICA, 1972-2000,
University of the Witwatersrand, Johannesburg (South Africa).
T. G. J. Dyer, and P. D. Tyson.
Journal of Applied Meteorology, Vol. 16, No. 2, p 145-147, February 1977. 1 fig, 12 ref.

Descriptors: *Rainfall, *Estimating, *Climatology, *Africa, Precipitation(Atmospheric), Forecasting, Mathematical model, Time series analysis, Droughts, Wet seasons, Meteorology.
Identifiers: *South Africa, Rainfall predictions.

By fitting a trigonometrical regression model to a regionally averaged time series for the period 1910-72 and by extrapolation to the year 2000, an estimate of future extended wet and dry spells was made for the summer rainfall region of South Africa. It was suggested that the periods 1972-81 and 1991-2000 will experience above normal rainfall and that the period 1981-90 will be drier than normal. Results to date show that mean regional rainfall for the hydrological years 1972-73 to 1975-76 has conformed to the suggested pattern. (Sims-ISWS)
W77-07170

PARAMETERIZATION OF DEPOSITIONAL ICE GROWTH,
Utah Water Research Lab., Logan.
K. G. Hubbard.
Journal of Applied Meteorology, Vol. 16, No. 2, p 177-182, February 1977. 4 fig, 2 tab, 12 ref, 2 append. NSF GA-43181.

Descriptors: *Ice, *Crystal growth, *Model studies, *Mathematical models, Crystals, Cloud physics, Precipitation(Atmospheric), Particle size, Meteorology.
Identifiers: Parameterization.

The physics of ice nucleation as a temperature-dependent process was incorporated into a parameterized equation which simulates the depositional growth of ice at the expense of liquid and vapor phases. The depositional parameterization was examined in the framework of a parcel model, and the results were compared to a more detailed ice model containing 20 mass categories of ice crystals. Comparisons showed that the parametric and detailed models yield nearly identical results. A computational advantage is present with the parameterization because the necessary size distribution information is greatly reduced and the time step is much larger. (Sims-ISWS)
W77-07171

DIGITAL RAINGAGE RECORDER,
Siena Coll., Loudonville, N.Y. Dept. of Physics.
D. P. Donnelly.
Journal of Applied Meteorology, Vol. 16, No. 2, p 205-207, February 1977. 4 fig, 5 ref.

Descriptors: *Rain gages, *Instrumentation, *Rainfall, Equipment, Precipitation(Atmospheric), Time, Timing, Rates, Meteorology.
Identifiers: *Recorders, Recording systems, Digital recorders.

A digital raingage recording system was described. The apparatus includes a tipping bucket raingage and an electronic system which prints out the time of day each time the bucket tips. The electronic system operates on direct current and is capable of printing 3 lines per second. With a bucket mechanism designed to trip on 0.254 mm of rain, a rainfall rate of 1000 mm/h would require 1.1 lines per second. (Sims-ISWS)
W77-07172

AN OXYGEN-ISOTOPE CLIMATIC RECORD FROM THE DEVON ISLAND ICE CAP, ARCTIC CANADA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Polar Continental Shelf Project.
For primary bibliographic entry see Field 2C.
W77-07175

SIMULATION OF A SERIES OF DAILY AREAL MEAN RAINFALLS FOR A BASIN USING RAINFALL OBSERVATIONS AT A REFERENCE STATION LOCATED OUTSIDE THE BASIN,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
F. Bultot, and G. L. Dupriez.
Hydrological Sciences Bulletin, Vol 21, No 4, p 569-585, December 1976. 7 fig, 7 tab, 3 ref.

Descriptors: *Rainfall, *Watershed(Basins), *Model studies, *Mathematical models, Correlation analysis, Time series analysis, Estimating, Estimating equations, Probability, Foreign countries, Distribution patterns, Foreign research, Weather patterns, Precipitation(Atmospheric), Meteorology.
Identifiers: *Belgium.

A mathematical model was built which enables daily estimates to be made of the areal mean rainfalls for a basin using rainfall observations at a reference station of the same climature, but which may be situated at some distance from the basin. The method consistes of: (1) determining the probabilities of the characteristic types of association between areal mean rainfalls of varying magnitude at the basin and rainfall events of various types at the reference station, (2) establishing the conditional distributions of areal mean rainfalls at the basin, and (3) estimating the areal mean rainfalls at the basin by the Monte Carlo method and by accepting that the mean basin rainfalls and the reference station rainfall are, in their respective statistical distributions, fractiles of the same order. The validity of the simulated series was checked by means of various tests. (Sims-ISWS)
W77-07356

PHYSICAL PROBLEMS OF WEATHER MODIFICATION,
Warsaw Univ. (Poland). Faculty of Geophysics.
For primary bibliographic entry see Field 3B.
W77-07357

PREDICTABILITY OF EFFECTS OF A SEVERE LOCAL STORM IN PENNSYLVANIA,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
W. J. Gburek, R. L. Hendrick, A. S. Rogowski, and M. L. Paul.
Journal of Applied Meteorology, Vol 16, No 2, p 136-144, February 1977. 9 fig, 3 tab, 13 ref.

Descriptors: *Precipitation(Atmospheric), *Rainfall, *Excessive precipitation, *Pennsylvania, Storms, Thunderstorms, Hurricanes, Erosion, Sheet erosion, Rill erosion, Soil erosion, Runoff, Watersheds(Basins), Rain gages, Stream gages, Rainfall disposition, Precipitation intensity, Precipitation excess, Soil water movement, Surface runoff, Subsurface runoff, Meteorology.
Identifiers: *Hurricane Agnes.

On 24 May 1975, an isolated thunderstorm in east-central Pennsylvania produced more than 4 inches of rain in 2 h over an Agricultural Research Service instrumented area. The return period for that storm appears to exceed 650 years. Simulation of the precipitation excess from all soils within the storm area, using a modification of the Mein and Larson infiltration equation, indicated surface runoff from a limited number of soil types--the same soils which exhibited severe erosion plus the alluvial soils of the stream channels. About 17% of the area affected by the storm accounted for nearly all of the measured surface runoff. Post-storm field investigation showed that the principal damage by erosion was restricted to corn fields on two soil groups, both silty clay loams over a fragipan. Soil losses due to sheet and rill erosion were estimated in the field as ranging from 15 to 110 tons/acre. Soil losses resulting from gully erosion could have been as high as 300 tons/acre in some areas. Simulation of the event by using modification of the universal soil loss equation showed that the location and amount of damage could have been predicted. Analysis of the impact of the storm illustrated that: (1) the lack of a general wind field which would give the storm horizontal motion accounted for the extreme 2 h rainfall, (2) presently available techniques for the simulation of runoff and erosion can be successful under these most extreme conditions, and (3) the source-area concept of runoff and sediment production must be considered in modeling such events. (Sims-ISWS)
W77-07369

MAXIMUM 5-MINUTE AND HOURLY RAINFALLS ON METROMEX NETWORK, 1971-1975,
Illinois State Water Survey, Urbana.
F. A. Huff, and J. L. Vogel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 714, Price codes: A05 in paper copy, A01 in microfiche. Circular 126, 1977. 81 p, 1 fig, 2 ref, 1 append. NSF ENV 73-07796.

Descriptors: *Rainfall, *Data collections, *Illinois, *Missouri, Networks, Measurement, Hydrology, Hydrologic data, Urban hydrology, Cities, Rainfall intensity, Basic data collections, On-site data collections.
Identifiers: *METROMEX.

During the summers (June-August) of 1971-1975, a network of 223 recording raingages was operated in circular area of 2000 sq mi centered on the St. Louis Gateway Arch. This network was operated in conjunction with Metromex (Metropolitan Meteorological Experiment) which involved comprehensive research concerning urban effects upon precipitation (inadvertent weather modification). The weighing bucket raingages were spaced approximately 3 mi apart, with the recording charts rotating once every 24 hours, which permitted reading of rainfall amounts for any period of 5 minutes or longer. Heavy rainfall data from this network were tabulated. The first set of data lists gage, data, and amount for each occurrence of point rainfall that equalled or exceeded 0.45 inch in 5 minutes. This corresponds to the 5-minutre rainfall having an average recurrence interval of 2 years at any given point in the Metromex network. The second set of data provides similar information for hourly rainfall amounts that equal or exceed the average 2-year recurrence value of 1.50 inches. Raingage amounts were listed for every storm during the summers of 1971-1975 in which one or more gages recorded an hourly amount of 1.50 inches or more. Hourly amounts were listed for each gage for each hour during each storm. The date of the storm, its time

of occurrence, and the synoptic storm type associated with the rainfall were shown. Legal descriptions of the raingage locations were included as an appendix to this report for the convenience of the user. (See also W76-03353, W76-06680 and W76-09734) (Humphreys-ISWS)
W77-07374

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 1, TEXT OF REPORT,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W77-07566

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 2, APPENDICES,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W77-07567

DEPOSITION OF MINERAL NITROGEN BY RAIN IN THE LAMTO SAVANNA, (IN FRENCH),
Ecole Normale Superieure, Paris (France). Laboratoire de Zoologie.
For primary bibliographic entry see Field 5B.
W77-07574

2C. Snow, Ice, and Frost

PARAMETERIZATION OF DEPOSITIONAL ICE GROWTH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2B.
W77-07171

AN OXYGEN-ISOTOPE CLIMATIC RECORD FROM THE DEVON ISLAND ICE CAP, ARCTIC CANADA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Polar Continental Shelf Project.
W. S. B. Paterson, R. M. Koerner, D. Fisher, S. J. Johnsen, and H. B. Clausen.
Nature, Vol. 266, No. 5602, p 508-511, April 7, 1977. 6 fig, 23 ref.

Descriptors: Isotope studies, *Oxygen, Ice, , *Glaciers, *Canada, Climates, *Climatic data, Climatology, Dating, Radioactive dating, Cores, Core logging, Temperature, Laboratory tests, Data processing, Glaciology.
Identifiers: *Devon Island(Canada), *Ice caps, *Greenland.

Isotope measurements on two adjacent cores through the Devon Island ice cap provide a well-dated climatic record for the past 5000 yr. Fluctuations in annual values include much 'noise', and ice flow over a rough bed produces distortions in the lowest 5% of core which covers roughly 120,000 yr. Comparison with the Camp Century, Greenland, record helped to separate climatic changes from changes in ice thickness or flow pattern. (Sims-ISWS)
W77-07175

FRAZIL--THE INVISIBLE STRANGLER,
Department of the Environment, Ottawa (Ontario). Inland Water Directorate.
D. M. Foulds, and T. E. Wigle.
American Water Works Association Journal, Vol. 69, No. 4, p 196-199, April 1977. 10 fig, 3 ref.

Descriptors: *Frazil ice, *Intake structures, *Great Lakes, Lakes, Rivers, Ice, Crystals, Cooling, Radiation, Temperature, Water temperature, Winds, Mixing, Freezing, On-site investigations, Ice loads.

Frazil is an ice phenomenon that usually occurs between midnight and dawn and only when the water has become supercooled. Frazil can choke intakes and open channels through its 'stickiness,' blocking the water flow to facilities. The development of frazil was traced, and suggestions to alleviate the problems it causes were made. (Sims-ISWS)
W77-07177

RECTILINEAR LEADS AND INTERNAL MOTIONS IN THE ICE PACK OF THE WESTERN ARCTIC OCEAN,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
J. R. Marko, and R. E. Thomson.
Journal of Geophysical Research, Vol 82, No 6, p 979-987, February 20, 1977. 9 fig, 1 tab, 14 ref.

Descriptors: *Sea ice, *Arctic Ocean, *Ice cover, *Remote sensing, Satellites(Artificial), Rock mechanics, Movement, Winds, Water circulation, Currents(Water), Stress, Shear stress, Cold regions, Arctic.
Identifiers: *Ice leads, Faults(Ice), Fractures(Ice), Rectilinear leads, Brittle fracture, LANDSAT, *Ice packs.

Large-scale (100 km) rectilinear lead patterns are a common feature of the Arctic Ocean ice cover. It was shown that many of the characteristics of these patterns can be explained by analogy with rock mechanics. In particular, the existence of two intersecting lead sets, the typical intersection angles of 28 deg, and the observed relative shearing motions are consistent with faulting associated with semibrittle failure. Further support for this explanation has been obtained by using NOAA and Landsat satellite imagery over an approximately 100-km-square area of the Beaufort Sea. These data provided coverage of 2 days of ice deformation prior to the formation of a lead at 14 deg to the axis of compression. Strains of 4% over the 2-day period were within the range attributed to rock distortion preceding semibrittle failure. It was suggested that the range from brittle to plastic type behavior is feasible within the Arctic Ocean sea ice, depending upon the applied rate of strain and/or the ambient confining pressures. (Sims-ISWS)
W77-07373

THE RELATIONSHIPS OF MARINE MAMMAL DISTRIBUTIONS, DENSITIES AND ACTIVITIES TO SEA ICE CONDITIONS,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-07409

SNOW AND ICE HYDROLOGY IN THE UNITED STATES--CURRENT STATUS AND FUTURE DIRECTIONS,
National Committee for the International Hydrological Decade, Washington, D.C.
Work Groups on Snow and Ice Hydrology, Final Report 1976. 73 p, 86 ref, 2 append.

Descriptors: *International hydrologic decade, *United States, *Snow, *Ice, *Hydrology, Glaciers, *Research priorities, Reviews, Documentation, Research and development, Planning, Instrumentation, Remote sensing, Surveys, *Bibliographies.
Identifiers: *Research needs.

The Work Group on Snow and Ice Hydrology was organized to coordinate U.S. efforts in this field and to promote the development of knowledge in the area. The Work Group identified four major areas in which it could make significant contributions: (1) Identification of research needs and accomplishments; (2) Improvement of the fragmented communications in the U.S. within the field of snow and ice studies; (3) Elimination, wherever possible, of the duplication of effort; and (4) Translation of research results into applications and management techniques. The primary function of this report was to discharge the responsibilities under the first objective. This was done through a critical review of the field of snow and ice hydrology, which resulted in identification of major problems as well as research needs. On the basis of this review, several recommendations were made, which if implemented, will help to satisfy the last three objectives. (Humphreys-ISWS)
W77-07565

2D. Evaporation and Transpiration

HORIZON HYDRAULIC CONDUCTIVITIES DETERMINED IN SITU FOR THE WILDERNESS, MEXICO AND MENFRO SOILS AND USED TO PREDICT SOIL WATER CONTENT,
Missouri Univ.-Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-07103

EVAPORATION OF WASTEWATER FROM MOUNTAIN CABINS,
Colorado State Univ., Fort Collins, Solar Energy Applications Lab.
For primary bibliographic entry see Field 5E.
W77-07284

2E. Streamflow and Runoff

MISSOURI RIVER POWER CURVE REGRESSION EQUATIONS,
Missouri Univ., St. Louis. Dept. of Geology.
L. J. Lee.
Journal of Hydrology, Vol. 33, No. 1/2, p 123-132, March 1977. 2 tab, 19 ref.

Descriptors: *Missouri River, *Regression analysis, *Statistical methods, Discharge(Water), Width, Depth, Slopes, Meanders, Flow, Streamflow, Hydrologic properties, Equations, Correlation analysis, Analytical techniques, Data processing, Hydrology, Rivers, *Computer programs.
Identifiers: Power curve equations.

By the use of a statistical computer program power curve regression, equations and correlation coefficients were developed for as many river parameters as could be accurately quantified for the Missouri River. This was done with the expectation that these equations would be useful in (1) sorting from the many river parameters those variables that are strongly relted, and (2) aid in predicting changes the river might undergo as a result of the manipulative behavior of man. Results indicated that the equations developed may be useful for both purposes. (Sims-ISWS)
W77-07152

A RECONSIDERATION AND A GENERALIZATION OF LAWRANCE AND FIERING TWO-STATION MODELS,
Technical Univ. of Lisbon (Portugal). Dept. of Civil Engineering; and Lisbon Univ. (Portugal). Centre of Urban and Regional Systems.
L. Valadares Tavares.
Journal of Hydrology, Vol. 33, No. 1/2, p 185-190, March 1977. 6 ref.

Descriptors: *Streamflow, *Model studies, *Mathematical models, Flow, Equations, Formulas, Analytical techniques, Time series analysis, Synthetic hydrology, Simulation analysis, Statistical methods, Hydrologic aspects, Hydrology, Rivers, Streams, River systems.

Lawrance and Fiering two-station models were reconsidered; and a more general model for the generation of flow sequences at satellite stations,

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assuming that flows at master stations are known, was obtained and presented. There are no restrictions about the number of parameters of the time-series models which were adopted to describe the studied flow sequences. (Sims-ISWS)
W77-07157

STOCHASTIC PROPERTIES OF DAILY TEMPERATURE IN RIVERS,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5B.
W77-07159

DESIGN CRITERIA FOR HYDROLOGIC EXTREMES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-07165

REGIONAL STUDY OF THE UPPER BASIN OF THE AAR FROM ITS SOURCES TO BERN: PROFILE OF FLOODS OF A GIVEN RETURN PERIOD AT ANY POINT ON THE RIVER (ETUDE REGIONALE DU BASSIN SUPERIEUR DE L'AAR DE SES SOURCES JUSQU'A BERNE: PROFILE DES CRUES DE PERIODE DONNEE LE LONG DU COURS D'EAU).
Ecole Polytechnique Federale de Lausanne (Switzerland).
J. M. Giovannoni, and J. R. Schneider.
Hydrological Science Bulletin, Vol 21, No 4, p 603-616, December 1976. 6 fig, 4 tab, 3 ref, append.

Descriptors: *Watersheds(Basins), *Runoff, *Foreign countries, *Flood discharge, Europe, Hydrology, Surface waters, Rives, Statistical methods, Correlation analysis, Regression analysis, Frequency, Flood recurrence interval, Flood flow.
Identifiers: *Switzerland, *Aar River(Switzerland).

The peak discharge Q sub T of a flood (annual series) with a recurrence interval T was ascertained using equation Q sub t = (A sub T) (S to the a power) for the upper reaches of the River Aar above the city of Bern, Switzerland. In the equation, S = basin area, and a and A sub T are basin parameters. The discharge Q sub T was calculated from direct measurements at hydrological stations on the river after extrapolation of short series and correction of possible erros. A sub T and a were calculated by linear regression, and their values were established between the logarithms of Q sub T and S. (Humphreys-ISWS)
W77-07358

MANNING N AND THE OVERLAND FLOW EQUATION,
Agricultural Research Service, Stillwater, Okla.
W. O. Ree, F. L. Wimberly, and F. R. Crow.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 1, p 89-95, January-February 1977. 7 fig, 5 tab, 9 ref.

Descriptors: *Mannings equation, *Watersheds(Basins), *Overland flow, *Model studies, Laboratory tests, Small watersheds, Hydrograph analysis, Grassed waterways, Range grasses, Flow, Runoff, Vegetation, Channel flow, Hydraulics, Hydrology.

Manning n values for the overland flow surfaces of a grassed watershed were derived by hydrograph analysis and by using average watershed slope and overland flow length values determined by geomorphic methods. These values were compared with Manning n values from laboratory tests on channels having similar grass covers. Close agreement was found for poor grass, but not for fair and good grass. The methods can be used to estimate the overland flow equation for an ungaged watershed if a Manning n value for the overland flow surface can be estimated. (Sims-ISWS)
W77-07371

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO. 2, REGRESSION OF MEAN ANNUAL FLOWS ON PHYSIOGRAPHIC PARAMETERS,
Department of the Environment, Vancouver (British Columbia). Inland Water Directorate (Pacific Region); and Department of the Environment, Vancouver (British Columbia). Water Resource Branch.
R. M. Leith.
Report Series No. 46, 1976, Ottawa, Canada, 21 p., 4 fig., 3 tab, 5 ref, 4 append.

Descriptors: *Streamflow, *Average flow, Regions, Regression analysis, Parametric hydrology, Drainage, Drainage area, Ponding, Sampling, River basins, Mathematical models, *Canada.
Identifiers: *British Columbia, *Annual flows.

Mean annual flows have been regressed on physiographic parameters for 62 hydrometric stations in British Columbia. The equation for unit mean annual flow, UMAF, UMAF = 10.4 + 0.0319 NPOSI - 0.172 x 1/100 ELEV - 0.131 x 1/100 DSNW - RAFOR + 0.909 RASWP + 0.758 x 1/10,000 SEW explained 61% of the total variation and had a standard error of estimate of 1.71 cfs/sq.mi. This equation was developed by backward elimination of variables and was tested by examination of residuals, by geographic plot, by runs test and by tests of normalcy. In the process of building the equation, subsamples of the 62 stations were taken and regression equations developed. This allowed the identification of important parameters, other than those which appear in the above equation. For example, Barrier Height to North, BHN, appeared in five of the seven intermediate equations. (See also W76-04180) (WATDOC)
W77-07434

EFFECTS OF THE CATASTROPHIC FLOOD OF DECEMBER 1966, NORTH RIM AREA, EASTERN GRAND CANYON, ARIZONA,
Geological Survey, Cheyenne, Wyo. Water Resources Div.; Geological Survey, Tucson, Ariz.; and Prescott Coll., Ariz.
M. E. Cooley, B. N. Aldridge, and R. C. Euler.
Availabile from Supt. of Documents, GPO Washington, DC 20402, price $2.70. Professional Paper 980, 1977. 43 p, 41 fig, 1 plate, 3 tab, 18 ref.

Descriptors: *Floods, *Flood damage, *Mudflows, *Maximum probable flood, *Arizona, Flood data, Channel erosion.
Identifiers: *Grand Canyon(Ariz), North rim.

Precipitation from the unusual storm of December 1966 was concentrated on highlands in northern Arizona, southwestern Utah, southern Nevada, and south-central California and caused widely scattered major floods in the four States. In Arizona the largest amount of precipitation was in the north rim area of eastern Grand Canyon, where about 14 inches was measured. The largest flows occurred along Bright Angel Creek and the MilK Creek-Dragon Creek part of the Crystal Creek drainage basin. The maximum effects of the flood were along Milk Creek-Dragon Creek, where a mudflow caused extensive channel modification. Floods that occurred in the Bright Angel and Crystal Creek basins have a recurrence interval of only once in several centuries. The streamflow that resulted from the storm on the Kaibab Plateau caused considerable local scouring and deepening of channels, including some renewed arroyo cutting. The most catastrophic effects of the 1966 floods were caused by two mudflows that extended from the edge of the Kaibab Plateau along Dragon Creek in the Crystal Creek basin and Lava Creek in the Chuar Creek basin to the Colorado River. More than 10 other large mudflows occurred in Nankoweap, Kwagunt, Crystal, and Shinumo Creek basins. About 80 large debris slides left conspicuous scars in the amphitheaters at the heads of the side gorges, and at least 10 small slides occurred on the Kaibab Plateau. (Woodard-USGS)
W77-07480

APPARENT REGIONAL SKEW,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.; and Geological Survey, Reston, Va. Water Resources Div.
J. R. Wallis, N. C. Matalas, and J. R. Slack.
Water Resources Research, Vol 13, No 1, p 159-182, February 1977. 16 fig, 15 tab, 4 ref.

Descriptors: *Historic floods, *Regional analysis, *Correlation analysis, Methodology, Spatial distribution, Temporal distribution, Flood frequency, Estimating, Equations.
Identifiers: *Skew estimates.

Differences in the relationships between the mean and standard deviation of regional estimates of skewness for historical flood sequences and the relations derived from several well-known distribution functions may be explained in terms of spatial or temporal distribution of values of skewness. Unless skewness is large, variations in estimates of skewness for different time periods are unlikely to be ascribable to chance. (Woodard-USGS)
W77-07484

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70--PART 15. ALASKA.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07493

TECHNIQUES FOR ESTIMATING FLOW CHARACTERISTICS OF WYOMING STREAMS,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-07495

2F. Groundwater

NON-EQUILIBRIUM THERMODYNAMICS OF GROUNDWATER FLOW SYSTEMS: SYMMETRY PROPERTIES OF PHENOMENOLOGICAL COEFFICIENTS AND CONSIDERATIONS OF HYDRODYNAMIC DISPERSION,
Nevada Univ., Reno. Desert Research Inst.
C. L. Carnahan.
Journal of Hydrology, Vol. 31, No. 1/2, p 125-150, September 1976. 2 tab, 50 ref. OWRT B-067-NEV(2).

Descriptors: *Groundwater, *Groundwater movement, *Thermodynamics, Dispersion, Porous media, Hydrology, Base flow, Hydrodynamics, Mathematical studies.
Identifiers: *Hydrodynamic dispersion, Transport process, Phenomenological coefficients, Anisotropic media, Groundwater hydrology, Dissipation function, Transformed coefficients.

The theory of non-equilibrium thermodynamics was applied to transport processes in groundwater flow systems. The theory was postulated to be applicable to a continuum model of porous medium in which fluxes and forces at points in the fluid phase are averaged over a representative elementary volume. Group-theoretic principles were applied to the phenomenological coefficients, and it was shown that these considerations can simplify the phenomenological equations both by removing unallowed coupled effects and by reducing the ap-

parent number of independent, numerical components contained in a given phenomenological coefficient. It was found, for example, that in porous media having certain symmetry properties, chemical reaction rates cannot be coupled to vector flows of heat and matter. Examination of the current theory of hydrodynamic dispersion in the light of non-equilibrium thermodynamics led to a proposed modification of the former. It was proposed that phenomenological coefficients for coupled and direct dispersive processes be formed of the product of a fourth-rank tensor, dispersivity of the medium, with the dyadic product of solute velocities, rather than with fluid flow velocities. Group theory was applied to the resulting coefficients, and new results were obtained for the forms assumed by the coefficients in certain anisotropic media. (Lee-ISWS)
W77-07143

TYPE CURVES FOR ANALYSIS OF PUMP TESTS IN LEAKY STRIP AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Vandenberg.
Journal of Hydrology, Vol. 33, No. 1/2, p 15-26, March 1977. 5 fig, 1 tab, 5 ref.

Descriptors: *Curves, *Pumping, *Aquifer testing, *Mathematical models, *Observation wells, Graphical methods, Test wells, Aquifers, Leakage, Analytical techniques, Boundaries(Surfaces), Drawdown, Theis equation, Transmissivity, Storage coefficient.
Identifiers: *Type curves, *Strip aquifers, *Leaky aquifers, Time-drawdown curves, Matching procedure, Image wells.

The analysis of pump test data for strip aquifers, for example, buried bedrock channels, can be carried out by fitting the early part of the time-drawdown curve with the Theis non-equilibrium curve or with one of Hantush's curves for leaky aquifers. The width of the strip can then be deduced from the behavior of the later part of the time-drawdown curve. However, if the width of the strip is of the same, or less, magnitude as the distance between pumped well and observation well, the method can no longer be applied since the boundaries cause a strong deviation from the type curves even at early times. Also, analysis of the data by the Theis method leads to a severe underestimation of the transmissivity. The boundary value problem for linear horizontal groundwater flow in a leaky aquifer towrds a face of constant discharge was formulated and then solved, leading to an expression from which transmissivity can be determined by a type-curve matching procedure similar to the Hantush and theis methods for radial flow. (Visocky-ISWS)
W77-07145

WATER FLUX IN SOIL AND SUBSOIL ON A STEEP FORESTED SLOPE,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W77-07147

FINITE-ELEMENT ANALYSIS OF GROUNDWATER FLOW IN MULTIAQUIFER SYSTEMS, I. THE BEHAVIOR OF HYDROLOGICAL PROPERTIES IN AN AQUITARD WHILE BEING PUMPED,
Kyoto Univ. (Japan). Dept. of Agricultural Engineering.
K. Fujinawa.
Journal of Hydrology, Vol. 33, No. 1/2, p 59-72, March 1977. 6 fig, 11 ref.

Descriptors: *Groundwater movement, *Aquitards, *Model studies, Mathematical models, Groundwater, Aquifers, Pumping, *Finite element analysis, Analytical techniques, Flow, Movement, Hydrologic properties, Hydrology.
Identifiers: *Multiaquifer systems.

In multiaquifer systems, aquifers are separated by aquitards through which water flows from one aquifer to another. The asumption of vertical flow in aquitards and horizontal flow in aquifers has been found reasonble in many field situations and has been utilized in the design of quasi three-dimensional flow models. It has also been revealed by earlier workers that the vertical leakage is affected by the storage in the aquitard as well as by its permeability and the properties of the adjacent aquifers. In this paper, one-dimensional, finite-element analysis was used to determine the effect of storage in an aquitard separating two confined aquifers on the distribution of hydraulic head in the aquitard and on the flux from or into the adjacent aquifer. This paper also considered how many nodes are required to solve the problem numerically with adequate accuracy. The results of this study should be helpful in the design of numerical schemes for analyzing multiaquifer systems. (Sims-ISWS)
W77-07148

INTERCONNECTION OF SURFACE AND UNDERGROUND WATER RESOURCES IN SOUTHEAST DURHAM,
Teesside Polytechnic, Middlesborough (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 4B.
W77-07149

ANALYSIS OF FLOW AGAINST DISPERSION IN POROUS MEDIA,
Birmingham Univ. (England), Dept. of Civil Engineering.
A. N. S. Al-Niami, and K. R. Rushton.
Journal of Hydrology, Vol. 33, No. 1/2, p 87-97, March 1977. 3 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Dispersion, *Porous media, *Model studies, Mathematical models, Soil water movement, Groundwater movement, Aquifers, Groundwater, Flow, Aqueous solutions, Water quality, Pollutants, *Path of pollutants, Water pollution, Hydrology.

Analytical solutions were presented for dispersion in a finite porous media which is controlled by the flow of a low concentration fluid towards a region of higher concentration. The flow was assumed to be one-dimensional in a horizontal direction. A step function concentration was enforced at the source of the dispersion, while zero concentration, or a condition in which the change in concentration is proportional to the flow, was applied at the other boundary. Different forms for the solutions were given to facilitate the computation of particular values. Special attention was paid to the situation when the flow balances the effect of the dispersion. (Sims-ISWS)
W77-07150

SPECIFIC YIELD DETERMINATIONS FROM A CONSOLIDATED SANDSTONE AQUIFER,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
M. Price.
Journal of Hydrology, Vol. 33, No. 1/2, p 147-156, March 1977. 4 fig, 23 ref.

Descriptors: *Specific yield, *Aquifers, *Sandstones, *Laboratory tests, Centrifugation, Groundwater, Groundwater movement, Groundwater resources, Pores, Porosity, Pore water, Hydrologic properties, Specific retention, Water storage, Hydrology, Foreign research, Foreign countries.

The centrifuge method of measuring specific yield was described briefly. Measurements of samples of Penrith Sandstone from a site in Cumbria indicate a much higher value than that derived from a pumping test by curve fitting. A previous explanation for the discrepancy, based on a capillarity mechanism, is only partly borne out by further work, but the mechanism could be significant at other sites in other aquifers. Further research is needed to define standard conditions for measuring specific yield by the centrifuge method. (Sims-ISWS)
W77-07153

CALCULATION OF THE LEAKY AQUIFER FUNCTION,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
B. Hunt.
Journal of Hydrology, Vol. 33, No. 1/2, p 179-183, March 1977. 6 ref.

Descriptors: *Aquifers, *Model studies, *Mathematical models, Equations, Formulas, Analytical techniques, Mathematics, Wells, Water wells, Pumping, Transmissivity, Hydrology.
Identifiers: *Leaky aquifer function, Infinite series functions.

Two infinite series representations were obtained for the leaky aquifer function of Hantush and Jacob. These infinite series are absolutely convergent and can be used to calculate values of the leaky aquifer function for all possible values of the arguments. Some example calculations were carried out. (Sims-ISWS)
W77-07156

LOCATION OF FREE SURFACE IN POROUS MEDIA,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
J. A. Liggett.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY4, Proceedings Paper 12851, p 353-365, April 1977. 7 fig, 6 ref, 3 append.

Descriptors: *Free surfaces, *Porous media, *Mathematical models, Equations, Numerical analysis, Boundaries(Surfaces), Groundwater movement, Water table, Steady flow, Unsteady flow, Permeability, Seepage.
Identifiers: Boundary integral equation method, Coefficient matrices.

The boundary integral equation method (BIEM) was applied to the problem of locating the free surface in both steady and unsteady flow through porous media. The method is numerical in its application and uses boundary data only. Thus, the position of the free surface can be found without solving the complete flow problem. The method can be continued to find the solution to the complete problem. The method is especially efficient when the solution is desired at a limited number of points (e.g., on a failure surface in determining slope stability) or in a limited area of the flow. Examples were given in which there is a free surface and a seepage surface and in which zones of different permeability appear. (Visocky-ISWS)
W77-07162

SUBSIDENCE: SETTLING DOWN WITHIN THE LAWS OF ACCRETION, RELICTION, EROSION, AND SUBMERGENCE,
For primary bibliographic entry see Field 6E.
W77-07238

PRELIMINARY MAPS SHOWING GROUNDWATER RESOURCES IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07478

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ANALOG-MODEL ANALYSIS OF REGIONAL THREE-DIMENSIONAL FLOW IN THE GROUND-WATER RESERVOIR OF LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y. Water Resources Div.
R. T. Getzen.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $1.35. Professional Paper 982, 1977. 49 p, 40 fig, 4 tab, 58 ref.

Descriptors: *Analog models, *Groundwater movement, *Aquifer characteristics, *Model studies, Hydrogeology, Groundwater recharge, Seepage, Surface-groundwater relationships, Analytical techniques, Regression analysis, Hydraulic conductivity, Specific yield, New York.
Identifiers: *Long Island(NY), Three-dimensional flow.

A three-dimensional analog model of the groundwater system beneath Long Island, N.Y., provides a practical means for studying anisotropic flow on a regional scale. Constructional and operational techniques influence the simulation almost as much as model design does. Usefulness and accuracy of the model depend on (1) inherent and practical limitations of the finite-difference method, (2) accuracy and completeness of the data base, and (3) accuracy of the assumptions and approximations that were made in applying the simulation technique to this particular ground-water reservoir. Reliable data used in design of the model are (1) horizontal hydraulic conductivity and thickness of three major aquifers, (2) extent of confining beds, (3) specific yield, and (4) locations of streams. Estimates of vertical hydraulic conductivity and specific storage were applied to the model. Most spatially fixed model boundaries are good representations of prototype (real-world) boundaries. Most dynamic boundaries are only approximately represented, and some dynamic boundaries require application of unproved assumptions. The simulated ground-water reservoir generally agrees with prototype hydrology, and the model is being used for predictive studies. (Woodard-USGS)
W77-07479

MAJOR AQUIFERS IN DEUEL AND HAMLIN COUNTIES, SOUTH DAKOTA,
Geological Survey, Vermillion, S. Dak. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07483

GROUND-WATER LEVELS IN MASSACHUSETTS, 1936-74,
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07485

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1973-77,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07486

CHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07487

CONVECTIVE HEAT FLOW FROM HOT SPRINGS IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07488

GEOCHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07489

WATER MOVEMENT IN SOIL FROM TRICKLE SOURCE,
Utah State Univ., Logan. Dept. of Agriculture and Irrigation Engineering.
For primary bibliographic entry see Field 2G.
W77-07550

2G. Water In Soils

HORIZON HYDRAULIC CONDUCTIVITIES DETERMINED IN SITU FOR THE WILDERNESS, MEXICO AND MENFRO SOILS AND USED TO PREDICT SOIL WATER CONTENT,
Missouri Univ.-Columbia. Dept. of Agronomy.
J. C. Doll.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 339, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. dissertation, December 1976. 180 p, 47 fig, 14 tab, 60 ref, 2 append. OWRT B-005-MO(3), B-022-MO(3), 14-01-0001-556- 1845 and 3025.

Descriptors: *Limestone, Soils, Seismographs, Soil types, *Soil water, *Hydraulic conductivity, *Soil properties, Evapotranspiration.
Identifiers: *Soil matrix potential, Wilderness soils, Mexico soils, Menfro soils.

The interrelationships between hydraulic conductivity, soil matrix potential and soil water content were determined by in situ methods for a fragipan soil of the Wilderness series, a claypan soil of the Mexico series and a deep loess soil of the Mexico series. Hydraulic properties of a draining profile were determined by the instantaneous profile method. Hydraulic properties of a wetting profile were determined by the crust infiltration method for the Mexico and Menfro soils. The hydraulic conductivity values determined by both methods compared favorably when examined at a given matrix potential. Hydraulic conductivities decreased sharply as the soil dried from saturation. The hydraulic conductivity of all horizons in all soils approached a value of 0.01 cm/day. This supports the use of a field capacity definition based upon an hydraulic conductivity of 0.01 cm/day. The measured hydraulic properties of the Menfro soil were used in a soil-plant-atmosphere model (Saxton, 1974) to predict seasonal soil water content. The predicted amounts of soil water and evapotranspiration were compared with measured seasonal amounts of soil water at a forested Menfro site and with evapotranspiration estimated by the method of Thornthwaite and Mather. The model prediction of actual evapotranspiration computed by Thornthwaite's method (assumed to be equal to actual evapotranspiration at the forested Menfro site) was 127.32 cm for the same 18 month period. Close agreement was found between the observed and predicted time distribution of total amounts of water in the soil.
W77-07103

THE EFFECT OF THE USE OF PESTICIDES AND FERTILIZERS IN THE WATER PROTECTION ZONE WITH SOURCES OF ARTIFICIAL REPLENISHMENT OF UNDERGROUND WATER RESERVES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 5B.
W77-07107

VARIATIONS IN THE LEAD, ZINC AND CALCIUM CONTENT OF DENDROBAENA RUBIDA (OLIGOCHAETA) IN A BASE METAL MINING AREA,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-07135

NITROGEN CONTAMINATION SOURCES IN SHALLOW GROUND WATER, LAS VEGAS AREA, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 5B.
W77-07141

SOLUTION OF EQUATION FOR TWO-DIMENSIONAL INFILTRATION PROBLEMS,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
G. Zyvoloski, J. C. Bruch, Jr., and J. M. Sloss.
Soil Science, Vol. 122, No. 2, p 65-70, August 1976. 2 fig, 15 ref. (Calif WRC Project UCAL-WRC-W-336). OWRT A-039-CAL(14).

Descriptors: *Infiltration, *Soil water movement, *Equations, Soil physical properties, Diffusivity, *Finite element analysis, Numerical analysis, Capillary conductivity, Moisture content, Loam, Silts, Trenches, Soils, Unsteady flow, Unsaturated flow, Shape, Boundaries(Surfaces), Mathematical studies, Algorithms.
Identifiers: Galerkin method, Time steps, Iteration, Wetting front.

A finite element, weighted residual, successive substitution algorithm was used to solve two-dimensional infiltration problems whose governing partial differential equation and boundary conditions are highly nonlinear. The results compared favorably with other published numerical solutions to similar examples. The soil water diffusivity, as well as the capillary conductivity, were approximated within a finite element in terms of shape functions and discretized values of these functions calculated using guessed values or previously calculated values at a certain time level of the water content at the nodes. This successive substitution scheme converged rapidly within each time step. The method is general and can be extended to three-dimensional flows and the use of higher order approximations. (Visocky-ISWS)
W77-07142

NON-EQUILIBRIUM THERMODYNAMICS OF GROUNDWATER FLOW SYSTEMS: SYMMETRY PROPERTIES OF PHENOMENOLOGICAL COEFFICIENTS AND CONSIDERATIONS OF HYDRODYNAMIC DISPERSION,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2F.
W77-07143

SUCTION HEAD AT WET FRONT IN UNSATURATED-FLOW PROBLEMS--A NEW DEFINITION,
Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
J. T. Panikar, and G. Nanjappa.
Journal of Hydrology, Vol. 33, No. 1/2, p 1-14, March 1977. 9 fig, 3 tab, 21 ref.

Descriptors: *Soil moisture, *Infiltration, *Model studies, Mathematical models, Analytical techniques, *Soil water movement, Soil water, Soils, Graphical analysis, Soil properties, Moisture content, Equations, Unsaturated flow.
Identifiers: *Suction head, Wet front, Richards equation, Green-Ampt model.

Richard's equation governs the soil moisture movement in the unsaturated zone. However, practical difficulties in using the equation are the

nonavailability of soil properties and excessive computer costs. The Green-Ampt approach has been found to hold a promise of being used as a good approximation to Richards' equation. The suction head at wet front is the important information that is needed in the use of the Green-Ampt equation. Mein and Larson have defined S sub av for this purpose. The validity of this definition was discussed. The suction head at the wet front was re-defined and denoted as S sub ig x S sub av (theta) sub*, and S sub ig (theta) sub * was compared for a typical clayey soil. The variation of S sub ig with moisture content was shown graphically for five soils. The conditions favorable for application of the Mein-Larson model were identified. (Sims-ISWS)
W77-07144

AUTOMATIC MONITORING OF SOIL MOISTURE CONDITIONS IN A HILLSLOPE SPUR AND HOLLOW,
Bristol Univ., (England). Dept. of Geography.
M. G. Anderson, and T. P. Burt.
Journal of Hydrology, Vol. 33, No. 1/2, p 27-36, March 1977. 6 fig, 6 ref.

Descriptors: *Soil moisture, *Tensiometers, *Automation, Soil water, Slopes, Soil water movement, Runoff, Base flow, Instrumentation, On-site investigations, Hydraulic conductivity, Unsaturated flow, Storms, Precipitation(Atmospheric), Rainfall, Topography, Hydrology, Foreign research.
Identifiers: *England.

An automatic recording tensiometer system was designed and installed to record the spatial variation of soil moisture in a hillslope spur and hollow. Results were presented which demonstrate the significant control of topography on soil moisture conditions and the resulting stream flow response. From the storm event examined and the month-long recession which followed, the hillslope hollow was shown to be significant in both generating a throughflow peak in stream discharge and in maintaining the subsequent base flow. (Sims-ISWS)
W77-07146

WATER FLUX IN SOIL AND SUBSOIL ON A STEEP FORESTED SLOPE,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
R. D. Harr.
Journal of Hydrology, Vol. 33, No. 1/2, p 37-58, March 1977. 8 fig, 3 tab, 45 ref. NSF GB-38610X.

Descriptors: *Soil water movement, *Slopes, *Forests, *Oregon, On-site investigations, Soils, Soil properties, Soil water, Infiltration, Flow, Unsaturated flow, Tensiometers, Piezometers, Precipitation(Atmospheric), Runoff, Streamflow, Subsurface flow, Subsurface runoff, Subsurface waters, Storms, Subsoil.

Soil analyses and tensiometer, piezometer, and precipitation data were used to evaluate water flux in soil and subsoil on a steep forested slope. Although unsaturated flow predominated in the soil during fourteen moderate-size winter storms, discontinuous saturation of upslope subsoil did occur at depths of 110-150 cm after at least 30 mm of rain fell in 12 h or less. This saturation persisted les than 20 h. Very slight changes in soil water pressure head during storms effected relatively large changes in both magnitude and direction of water flux. Maximum water fluxes in the top meter of soil were 3-4.5 mm/h, and maximum flux in the subsoil was 0.5 mm/h, slightly less than the minimum flux in the soil. Between storms, the vertical component of flux at the 10-cm depth was much less than the downslope component, but the component of flux equaled the downslope component during storms. Conversely, vertical components of flux at 70- and 130-cm depths were much less than downslope components during storms, but the vertical components equaled downslope components between storms. Analysis of piezometric levels, discharge from a seep, and streamflow revealed an abrupt decrease in rate of water flux to the lower part of the slope about 10 h after the end of rainfall. This decrease corresponded with nearly complete draining of larger pores that had filled with water during storms. Subsurface flow and channel interception averaged 97 and 3% of storm flow which, in turn, averaged 38% of total storm precipitation. No overland flow was observed. (Sims-ISWS)
W77-07147

INTERCONNECTION OF SURFACE AND UNDERGROUND WATER RESOURCES IN SOUTHEAST DURHAM,
Teesside Polytechnic, Middlesborough (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 4B.
W77-07149

THE EFFECT OF SOIL MOISTURE ON CIRCULATION AND RAINFALL IN A TROPICAL MODEL,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W77-07166

STUDY OF THE STATE OF WATER ON THE SURFACE OF H+, NA+, MG2+ SATURATED KAOLINITE BY THE NMR METHOD, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
A. D. Voronin, V. F. Babanin, V. I. Malinovskii, and Y. E. Shapiro.
Pochvovedenie 4, p 156-160, 1976.

Descriptors: *Kaolinite, *Soil analysis, *Cation exchange, Ion exchange, Hydrogen, Ions, Magnesium, Sodium, Analytical techniques, Soil chemistry, Soil surfaces.
Identifiers: *Hydrogen ions, *Magnesium ions, *Sodium ions, *Nuclear magnetic resonance.

Five water retention zones (in the soil) were detected in suspensions of cation-substituted forms of kaolinite by the NMR method. The state of combined water depends on the type of exchangeble cations. Na+ and H+ demonstrate similar effects in the region of low concentrations: in the high concentration region similar effects are exerted by Mg2+ and H+.--Copyright 1977, Biological Abstracts, Inc.
W77-07241

ENTEROVIRUS AND BACTERIOPHAGE INACTIVATION IN SUBSURFACE WATERS AND TRANSLOCATION IN SOIL,
New Mexico State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W77-07283

WATER MOVEMENT IN SOIL FROM TRICKLE SOURCE,
Utah State Univ., Logan. Dept. of Agriculture and Irrigation Engineering.
A. Y. Hachum, J. F. Alfaro, and L. S. Willardson.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. IR2, Proceedings paper No. 12204, p 179-192, June 1976. 9 fig, 3 tab, 10 ref.

Descriptors: *Groundwater movement, *Flow, *Deep percolation, *Irrigation, *Seepage, *Water sources, Design, Loam, Silts, Equations, Soils, Water distribution(Applied).
Identifiers: *Trickle irrigation.

A two-dimensional water movement within a homogeneous soil profile from a surface water line source was investigated. In the experiment, various trickle water application rates were used to irrigate two types of soil. The effect of soil type and water application rate on the movement and distribution of water within the soil profile were considered. The experiment revealed that for the same volume of water, the vertical penetration of wetting front decreased and the horizontal water movement increased as the water application rate increased. The water movement in the horizontal and vertical directions was described by an exponential equation and the two-dimensional wetting pattern in the soil profile was approximated by a semiellipse without a significant loss of accuracy. A general mathematical consideration, utilizing the results of the present work for designing a tricle irrigation system is presented. A simple field test for obtaining system design parameters is described. (Bell-Cornell)
W77-07550

SOLUTIONS TO GREEN-AMPT INFILTRATION EQUATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07553

2H. Lakes

CAGE CULTURE OF CHANNEL CATFISH IN A HEATED EFFLUENT FROM A POWER PLANT, THOMAS HILL RESERVOIR,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-07101

ASPECTS OF RESERVOIR-POWER STATION INTERACTIONS: SOME EFFECTS OF HEAT ON PHYSICO-CHEMISTRY, AUFWUCHS ECOLOGY AND PLANKTON METABOLISM,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-07102

THE FORMATION OF A LOCAL POPULATION OF BREAM ABRAMIS BRAMA ORIENTALIS, IN THE HEATED WATER ZONE OF KONAKOVO POWER STATION,
Vserossiiskii Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khozyaistva, Konakovo (USSR). Upper Volga Div.
For primary bibliographic entry see Field 5C.
W77-07105

RESPONSES TO ODORS BY FINGERLING CUTTHROAT TROUT FROM YELLOWSTONE LAKE,
Western Illinois Univ., Macomb. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-07111

OBSERVATIONS ON A PEAT BOG'S ABILITY TO WITHSTAND INCREASING PUBLIC PRESSURE,
University of Wales Inst. of Science and Technology, Cardiff.
For primary bibliographic entry see Field 5C.
W77-07139

FAR FIELD CIRCULATION VELOCITIES IN SHALLOW LAKES,
North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
J. C. Uzzell, Jr., and M. N. Ozisik.

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Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY4, Proceedings Paper 12873, p 395-407, April 1977. 6 fig, 12 ref, 3 append.

Descriptors: *Circulation, *Environmental engineering, *Lakes, *Water circulation, *Mathematical models, Temperature, Model studies, Water pollution, Winds, Thermocline, Turbulent flow, *Forecasting.
Identifiers: *Three-dimensional model, *Steady-state circulation, Far field, Reverse flow, Wind circulation, Wind stresses.

A three-dimensional model was developed for the prediction of steady-state circulation induced by the discharges, wind stresses, and horizontal temperature gradients in the far field regions of shallow lakes. For the case of lakes having rectangular geometrics and uniform depth, explicit analytical solutions were presented for the velocity distribution. The results of the analysis showed that a negative temperature gradient along the lake in a given direction gives rise to a flow in the same direction at the upper layer of the lake and to a reverse flow at the lower layer. The circulations induced by horizontal temperature gradients could be as important as those generated by wind stresses. (Roberts-ISWS)
W77-07164

A NEW METHOD FOR PHYSICAL LIMNOLOGY--TRITIUM-HELIUM-3 AGES--RESULTS FOR LAKE ERIE, HURON, AND ONTARIO,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
T. Torgersen, Z. Top, W. B. Clarke, W. J. Jenkins, and W. S. Broecker.
Limnology and Oceanography, Vol. 22, No. 2, p 181-193, March 1977. 5 fig, 4 tab, 20 ref. NSF GB 36348, GA 33124.

Descriptors: *Tritium, *Helium, *Radioisotopes, *Great Lakes, *Lake Erie, *Lake Huron, *Lake Ontario, Lakes, Sampling, On-site data collections, Epilimnion, Hypolimnion, Annual turnover, Data processing, Limnology, Pollutant identification, Methodology.

A new method in physical limnology, based on the radioactive tracer tritium and its stable daughter product, 3He, was examined. The 3He produced by the in situ decay of tritium can be used to calculate an effective water mass age. These ages can then be used to estimate gas exchange rates, gas renewal at turnover, and vertical diffusivity in the epilimnion. (Sims-ISWS)
W77-07168

DISSOLVED HELIUM IN LAKES: URANIUM PROSPECTING IN THE PRECAMBRIAN TERRAIN OF CENTRAL LABRADOR,
McMaster Univ., Hamilton (Ontario). Dept. of Physics.
For primary bibliographic entry see Field 5A.
W77-07174

TRANSPORTS IN LAKE SUPERIOR,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 5B.
W77-07176

FRAZIL--THE INVISIBLE STRANGLER,
Department of the Environment, Ottawa (Ontario). Inland Water Directorate.
For primary bibliographic entry see Field 2C.
W77-07177

RESIDUES OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) UNDETECTED IN LAKE TROUT AND CHINOOK SALMON FROM THE UPPER GREAT LAKES,
Fish and Wildlife Service, Warm Springs, Ga. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 5A.
W77-07187

PLANKTONIC INFUSORIA IN TWO LAKES OF THE GORKI OBLAST, (IN RUSSIAN),
Gorkii State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W77-07234

WATER QUALITY AND CHEMICAL MODELS,
Harvard Univ., Boston, Mass. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 5C.
W77-07246

ENCROACHMENTS ON NAVIGABLE LAKE.
For primary bibliographic entry see Field 6E.
W77-07264

ECOLOGICAL STUDIES OF THE BRUSSELS URBAN ECOSYSTEM: CONTRIBUTION 8. FIRST SURVEY OF THE HYDROBIOLOGY OF THE WOLUWE VALLEY IN BRUSSELS, (IN FRENCH),
Brussels Univ. (Belgium). Faculte des Sciences.
For primary bibliographic entry see Field 5C.
W77-07292

COMPARATIVE CHARACTERISTICS OF THE PARASITE FAUNA OF BREAM IN LAKES DUSIOS, OBELIJOS, SALVANTU AND GALSTAS, WHICH HAVE DIFFERENT THERMAL REGIMES, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
E. Y. Rautskis.
Liet Tsr Mokslu Akad Darb Ser C Biol Mokslai 4, p 87-94, 1975.

Descriptors: *Fish parasites, Lakes, *Thermal water, Fish population, Shallow water.
Identifiers: Abramis-brama, *Bream parasites, USSR, *Lake Obelija(Lithuania SSR).

In 1971-1973, the bream (Abramis brama) of thermally shallow Lake Obelija (S. Lithuania) had parasitofauna more numerous (23 spp.) than other lakes studied. The same parasites were found in bream caught in thermally deep Lake Galstas. Bream parasitofauna were considerably less numerous (12 spp.) in thermally deep Lake Slavantas, where benthos is scarce. The paucity of bream parasitofauna (9 spp.) in thermally modestly deep Lake Dusia may be accounted for by the scarcity of bream population and its acclimitization there.--Copyright 1977, Biological Abstracts, Inc.
W77-07312

DISTRIBUTION THICKNESS AND CERTAIN PHYSICAL AND CHEMICAL PROPERTIES OF BOTTOM SEDIMENTS IN THE KIEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2J.
W77-07321

OBSERVATIONS ON BACTERIOLOGICAL CONDITIONS IN THE UPPER GREAT LAKES 1968-1974,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W77-07340

THERMAL AND ISOTOPIC STUDIES ON THE CRATER LAKES OF MONTICCHIO (LUCANIA, ITALY), (IN ITALIAN),
Bari Univ. (Italy). Istituto di Geodesia e Geofisica.
F. Mongelli, C. Panichi, and E. Tongiorgi.
Arch Oceanogr Limnol 18(2), p 167-188, 1975.

Descriptors: *Isotopic studies, Thermal water, *Oxygen isotopes, Sampling, *Thermal springs, Measurement, Lakes.
Identifiers: Crater lakes, *Oxygen-18, *Lake Piccolo(Italy).

The thermometric measurements and the isotopic composition of the O2 of Lake Piccolo water samples indicate that this lake is made up of 2 different water bodies. That nearest the surface shows strong variations in temperature (from 5-21C) and 18O content (delta 18O: from -6.7 to -5.5%) whereas in the deeper water the temperature increases progressively towards the lake bottom with an anomalous temperature gradient (2.5C in 20 m) and the isotopic composition remains considerably constant and more negative that the surface part delta 18O: from -9.5 to -.88%). The thermal and isotopic anomalies are interpreted as the result of the particular feeding of the lake itself, i.e., mainly from springs emerging from the lake bottom. The springs come from the Vulture slopes at heights of more than 900 m. Measurements carried out in Lago Grande show that the thermal and isotopic variations are similar to those of other Italian lakes.--Copyright 1977, Biological Abstracts, Inc.
W77-07392

PRIMARY PRODUCTION AND BIOMASS OF ALGAE POPULATIONS IN AN OLIGOTROPHIC LAKE IN THE FRENCH MASSIF CENTRAL, (IN FRENCH),
For primary bibliographic entry see Field 5C.
W77-07398

MINERALIZING MICROBIAL ACTIVITY IN LAKE FARO,
Messina Univ. (Italy). Instituto di Idrobiologia.
For primary bibliographic entry see Field 5C.
W77-07418

PRELIMINARY INVESTIGATIONS ON BIVALVES BIVALVIA OF THE DAM RESERVOIR AT GOCZALKOWICE,
Polish Academy of Science, Pszcyna. Lab. of Water Biology.
For primary bibliographic entry see Field 5C.
W77-07440

NITROGEN, PHOSPHORUS, PARTICULATE AND COLLOIDAL CARBON CONTENT OF SEDIMENTING SESTON OF A HARD-WATER LAKE,
For primary bibliographic entry see Field 5C.
W77-07441

SUCCESSION RATES IN LAKE PHYTOPLANKTON COMMUNITIES,
For primary bibliographic entry see Field 5C.
W77-07442

SPATIAL AND TEMPORAL CHANGES IN THE PRIMARY PRODUCTIVITY OF LAKE TAHOE, CALIFORNIA-NEVADA BETWEEN 1959 AND 1971,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W77-07443

A MODEL OF THE PHOSPHORUS CYCLE AND PHYTOPLANKTON GROWTH IN SKAHA LAKE, BRITISH COLUMBIA, CANADA,
For primary bibliographic entry see Field 5C.
W77-07445

PREDICTING THE IMPACTS OF PHOSPHORUS MANAGEMENT POLICIES ON THE EUTROPHICATION OF SKAHA LAKE, BRITISH COLUMBIA, CANADA,
For primary bibliographic entry see Field 5C.

W77-07446

SUB-THERMOCLINE BIOMASS CONCENTRATION DETECTED BY TRANSMISSOMETER IN LAKE SUPERIOR,
For primary bibliographic entry see Field 5C.
W77-07447

SYNERGISTIC EFFECTS OF PHOSPHATE AND MANGANESE ON GROWTH OF LAKE SUPERIOR ALGAE,
For primary bibliographic entry see Field 5C.
W77-07448

PLUTONIUM IN THE LAURENTIAN GREAT LAKES: COMPARISON OF SURFACE WATERS,
For primary bibliographic entry see Field 5C.
W77-07449

PHOTOSYNTHETIC RATES IN LAKE SUPERIOR,
For primary bibliographic entry see Field 5C.
W77-07450

LAKE RESTORATION THROUGH MECHANICAL HARVESTING OF AQUATIC VEGETATION,
For primary bibliographic entry see Field 5G.
W77-07451

INFLUENCE OF THE DRAINAGE BASIN ON THE EUTROPHICATION OF THE AMESOTROPHIC LAKE PIASECZNO AND DISEUTROPHICATION OF THE POND LAKE BIKCZE,
Instytut Przyrodniczych Podstaw, Lublin (Poland). Produkeji Roslinnej AR.
For primary bibliographic entry see Field 5C.
W77-07452

EFFECT OF ZOOPLANKTON GRAZING ON PHOTOSYNTHETIC ACTIVITY AND COMPOSITION OF PHYTOPLANKTON,
For primary bibliographic entry see Field 5C.
W77-07453

THE VERTICAL DISTRIBUTION OF PLANKTON ROTIFERS IN A SMALL ALPINE LAKE WITH A SHARP OXYGEN DEPLETION (LUNZER OBERSEE),
For primary bibliographic entry see Field 5C.
W77-07456

COMPOSITION AND DYNAMICS OF THE BOTTOM ANIMALS IN THE LITTORAL ZONE OF DOJRAN LAKE, MACEDONIA,
For primary bibliographic entry see Field 5C.
W77-07457

PIGMENT CYCLE IN A NORTH GERMAN LAKE,
For primary bibliographic entry see Field 5C.
W77-07459

A SURVEY OF THE PHYSICAL AND CHEMICAL LIMNOLOGY OF LAKE TITICACA,
For primary bibliographic entry see Field 5C.
W77-07460

SEDIMENT RESPIRATION IN SIX ITALIAN LAKES IN DIFFERENT TROPHIC CONDITIONS,
For primary bibliographic entry see Field 5C.
W77-07461

MODELING THE ANNUAL THERMAL EVOLUTION OF MID-LATITUDE LAKES,
S. Outcalt, and P. Kilham.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1333-1338, 1975. 4 fig., 7 ref.

Descriptors: *Mathematical models, *Water temperature, *Diffusivity, *Thermal properties, Depth, *Temporal distribution, Equations, Annual, Model studies, Simulation analysis, Theoretical analysis, Mixing, *Lakes.

A model is given through which sophisticated simulations of freeze up-break of ice can be made and which requires only an initial thermal profile and minimal weather data. Analytical schemes frequently employed to generate thermal evolutionary histories from an initial temperature profile and from the sequence of surface temperature observations fail because the effective diffusivity includes density downmixing during the cooling portion of the year. In addition, the upper layers are mixed by the wind in the absence of ice cover. When the first depth derivative of temperature is constant at the computation node, then the second depth derivative would be zero, and the effective diffusivity would be infinite, as observed when the monthly mean depth-dependent thermal regimes of mid-latitude lakes are arrayed. To calculate the time and depth-dependent thermal diffusivity of lake water, finite difference equations are used, representing temperture depth, time, second depth derivative of temperature, depth extent of thermal disturbance, Fourier Modulus, node number, density temperature node at base of wind mixed region node at top of bottom sediment and absolute value of arg. The model was designed to operate from daily total solar radiation, cloud cover, air temperature, air relative humidity, and wind velocity. (Auen-Wisconsin)
W77-07462

POPULATION CHANGES IN THE AQUATIC FAUNA INHABITING THE BLADDERWORT, UTRICULARIA FLEXUOSA VAHL., IN A TROPICAL SWAMP, TASEK BERA, MALAYSIA,
For primary bibliographic entry see Field 5C.
W77-07465

SEASONAL VARIATION IN SEDIMENT-WATER EXCHANGE OF NUTRIENT IONS IN LAKE ESROM,
For primary bibliographic entry see Field 5C.
W77-07467

UPWELLING IN A MODEL OF AN INTERMONTANE LAKE,
For primary bibliographic entry see Field 5B.
W77-07469

AN ORGANIC CARBON BUDGET FOR AN OLIGOTROPHIC LAKE IN NEW HAMPSHIRE, U.S.A.,
For primary bibliographic entry see Field 5C.
W77-07470

ALGAL PRODUCTIVITY OF NATURAL AND ARTIFICIALLY ENRICHED FRESH WATERS IN MALAYA,
For primary bibliographic entry see Field 5C.
W77-07471

THE STRUCTURE OF PHYTOPLANKTON ASSOCIATIONS IN LAKE TAHOE (CALIFORNIA-NEVADA),
For primary bibliographic entry see Field 5C.
W77-07473

AREAL DISTRIBUTION AND STRATIGRAPHY OF DIATOMS IN THE SEDIMENTS OF LAKE SALLIE, MINNESOTA,
Geological Survey, Lakewood, Colo. Water Resources Div.; and Geological Survey, Denver, Colo. Geologic Div.
For primary bibliographic entry see Field 5C.
W77-07481

WIND CONTROL OF ALGAE GROWTH IN EUTROPHIC LAKES,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5G.
W77-07497

PRELIMINARY ESTIMATES OF PRODUCTION BY A CALANOID COPEPOD IN SUBTROPICAL LAKE SIBAYA,
For primary bibliographic entry see Field 5C.
W77-07500

CHANGES IN PHYTOPLANKTON SPECIES COMPOSITION SINCE 1894 IN TWO LAKES IN EAST-HOLSTEIN, GERMANY,
For primary bibliographic entry see Field 5C.
W77-07501

THE EFFECT OF FOOD CONCENTRATION AND TEMPERATURE ON RESPIRATION AND EXCRETION IN HERBIVOROUS ZOOPLANKTON,
For primary bibliographic entry see Field 5C.
W77-07502

A SURVEY OF THE BIOLOGICAL LIMNOLOGY OF LAKE TITICACA,
For primary bibliographic entry see Field 5C.
W77-07503

LAKE IZABAL, GUATEMALA,
For primary bibliographic entry see Field 5C.
W77-07504

ANNUAL CONTRIBUTION OF CARBON, NITROGEN AND PHOSPHORUS BY MIGRANT CANADA GEESE TO A HARDWATER LAKE,
For primary bibliographic entry see Field 5C.
W77-07505

GRAZING EFFECTS ON NANNOPLANKTON IN GATUN LAKE, PANAMA,
For primary bibliographic entry see Field 5C.
W77-07507

ROLE OF OLIGOCHAETES IN THE CIRCULATION OF WATER AND SOLUTES ACROSS THE MUD-WATER INTERFACE,
For primary bibliographic entry see Field 5C.
W77-07508

SIMILARITIES AND DIFFERENCES IN THE CHEMICAL COMPOSITION OF WATERS FROM WEST, CENTRAL, AND EAST AFRICA,
For primary bibliographic entry see Field 5A.
W77-07510

SYMAP COMPUTER PROJECTIONS OF SUMMER ZOOPLANKTON POPULATIONS IN VAN LAKE, MONTANA,
For primary bibliographic entry see Field 7C.
W77-07511

ALGAL RESPONSE TO NUTRIENT INPUTS IN SOME IOWA LAKES,
For primary bibliographic entry see Field 5C.
W77-07515

LIBRARY U. OF I. URBANA-CHAMPAIGN

THE RELEASE OF DISSOLVED ORGANIC CARBON FROM SUBMERSED AQUATIC MACROPHYTES: DIEL, SEASONAL AND COMMUNITY RELATIONSHIPS,
For primary bibliographic entry see Field 5C.
W77-07516

THE ROLE OF PHOSPHATE IN EUTROPHICATION. STIMULATION OF PLANKTON GROWTH AND RESIDENCE TIMES OF INORGANIC PHOSPHATE IN LAKE KINNERET WATER,
For primary bibliographic entry see Field 5C.
W77-07517

THE INFLUENCE OF SPRING CIRCULATION ON ZOOPLANKTON DYNAMICS IN THE PLUSSEE,
For primary bibliographic entry see Field 5C.
W77-07518

RESPONSE TO EUTROPHIC SHAGAWA LAKE, MINNESOTA, U.S.A., TO POINT-SOURCE, PHOSPHORUS REDUCTION,
For primary bibliographic entry see Field 5C.
W77-07519

MEROMIXIS IN ULMENER MAAR (GERMANY).
For primary bibliographic entry see Field 5C.
W77-07520

MATHEMATICAL MODELS OF STRONTIUM-90 BEHAVIOR IN 'WATER-FRESH WATER FISH SPAWN' SYSTEM FOR PARTICULAR CASES OF RADIOACTIVE CONTAMINATION OF RESERVOIRS, (IN RUSSIAN),
Institute of Radiation Health, Leningrad (USSR).
For primary bibliographic entry see Field 5C.
W77-07539

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
E. J. Pluhowski.
Transportation Engineering Journal of ASCE, Proceedings of the American Society of Civil Engineers, Vol. 102, No. TE3, Proceedings paper No. 12306, p 475-488, August 1976. 13 fig, 6 ref.

Descriptors: *Lake Ontario, *Remote sensing, *Currents, *Beach erosion, Lakes, Rivers, Turbidity, Hydrology, Monitoring, Outlets.
Identifiers: *Turbidity plumes.

Space imagery and high-altitude photography provide an effective method of monitoring the dynamics of turbidity plumes in Lake Ontario. The Niagara River Plume, as much as 200 sq miles (520 km) in area, is by far the largest turbidity feature in the lake. Plume analyses corroborate the presence of a prevailing eastward flowing longshore current along the entire south shore of the lake. This current is most persistent at the Oswego River outlet but it is quite variable in the Rochester embayment, where rapid shifts in water movement were occasionally detected. The position of the spring thermal bar, a zone of maximum density water corresponding in the 4 C isotherm, was located near the Niagara River outlet in images obtained during April, 1973. (Bell-Cornell)
W77-07549

SATELLITE OBSERVATIONS OF WATER QUALITY,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-07554

STUDIES ON THE TYPOLOGY OF BALTIC LAKES WITH DIFFERENT STATES OF EUTROPHICATION, (IN GERMAN),
For primary bibliographic entry see Field 5B.
W77-07576

LAKE RESTORATION BY BOTTOM WATER SIPHONING, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland).
For primary bibliographic entry see Field 5G.
W77-07577

MODELS FOR SIMULATION OF EUTROPHICATION OF LAKES FOR LAKE CONSTANCE (BODENSEE-OBERSEE): I. DATA FROM LAKE CONSTANCE USED IN SIMULATION MODELS, (IN GERMAN),
Baden-Wuerttemberg Landesanstalt Fuer Unweltschutz (West Germany). Inst. of Seenforschungs Fischereiwesen.
For primary bibliographic entry see Field 5C.
W77-07579

HEAVY METALS (FE, MN, CD, CR, CU, PB AND ZN) IN THE PELAGIC ZONE OF LAKE CONSTANCE (OBERSEE AND UNTERSEE) AND THE GREIFENSEE, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5A.
W77-07580

A COMPARISON OF SPECTROPHOTOMETRIC METHODS FOR THE DETERMINATION OF PHYTOPLANKTON PIGMENTS, (IN FRENCH),
Biological Station, Besse-en-Chandesse (France).
For primary bibliographic entry see Field 5A.
W77-07581

MACROPHYTES AND PHOSPHORUS IN LAKE ANDSJON, CENTRAL SWEDEN, (IN SWEDISH),
For primary bibliographic entry see Field 5C.
W77-07582

FIRST INFORMATION ABOUT N, P NUTRIENTS AND THE PRODUCTION OF LAKE TRASIMENO, (IN ITALIAN),
Perugia Univ. (Italy). Istituto di Idrobiologia e Pescicultura.
For primary bibliographic entry see Field 5C.
W77-07593

PHYTOMICROBENTHOS OF THE KURTLI RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Botaniki.
For primary bibliographic entry see Field 5C.
W77-07596

2I. Water In Plants

ANNOTATED BIBLIOGRAPHY ON HYDROBIOLOGY AND HYDROCHEMISTRY OF THE KARA KUM CANAL 1955-74, (IN RUSSIAN),
E. S. Ataeva, and S. I. Kogan.
Izv Akad Nauk Turkm SSR Ser Biol Nauk 2, p 89-94, 1976.

Descriptors: *Hydrobiology, *Bibliographies, *Water chemistry, Canals.
Identifiers: *Kara-Kum Canal(Turkmen-SSR), USSR.

A list of 76 books, brochures and journal articles relating to the Kara Kum Canal, its associated reservoir and other areas in the Turkmen SSR (USSR) is given. The entries are arranged alphabetically according to authors and are accompanied by annotations except in the cases of these, oral reports and authors' abstracts. No non-Soviet entries are included. Some of the literature covers flora or fauna of the Kara Kum area.--Copyright 1977, Biological Abstracts, Inc.
W77-07540

2J. Erosion and Sedimentation

TRANSPORTS IN LAKE SUPERIOR,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 5B.
W77-07176

SUBSIDENCE: SETTLING DOWN WITHIN THE LAWS OF ACCRETION, RELICTION, EROSION, AND SUBMERGENCE,
For primary bibliographic entry see Field 6E.
W77-07238

DISTRIBUTION THICKNESS AND CERTAIN PHYSICAL AND CHEMICAL PROPERTIES OF BOTTOM SEDIMENTS IN THE KIEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
I. A. Zapol'skii, and B. G. Es'kov.
Gidrobiol Zh 12(2), p 22-30, 1976.

Descriptors: *Distribution, *Bottom sediments, Reservoirs, *Sediment distribution.
Identifiers: Dreissensia, Paludian, USSR, Unio, *Kiev Reservoir(Ukranian SSR), *Sediment thickness.

In connection with the construction of the Kiev reservoir (Ukranian SSR, USSR) the water regime of the Dnieper (River) changed. This resulted in reformation of the bottom sediments. A survey of bottom sediments for the period of the reservoir's existence and rocks formed before its filling established variations in the sediment distribution. Considerable changes are observed in indexes of composition and properties of the sediments(Eh decrease, Ph increase, decrease in specific weight, growth in coefficients of porosity and maximum molecular moisture content). Plant remains and shells of Unio, Dreissensia and Paludinia in bottom sediments are mentioned.--Copyright 1976, Biological Abstracts, Inc.
W77-07321

WASSAW ISLAND EROSION STUDY. PART 1: SEDIMENTARY FRAMEWORK OF A CHANNEL MARGIN SHOAL OF AN EBB DELTA, WASSAW SOUND, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.; and Georgia Marine Science Center, Savannah.
For primary bibliographic entry see Field 2L.
W77-07324

THE DUNE BOOK. HOW TO PLANT GRASSES FOR DUNE STABILIZATION,
North Carolina State Univ. at Raleigh. Center for Marine and Coastal Studies.
J. Seltz.
North Carolina University Sea Grant Publication No. UNC-SG-76-16, December 1976. 16 p. SG-04-6-158-44054.

Descriptors: *Grasses, *Dunes, Sands, Sedimentation, Resources development, *North Carolina, Bank stabilization.
Identifiers: *Dune stabilization, Ammophila breviligulata, Uniola paniculate, Panicum amarum, Spartina patens, American beachgrass, Sea oats, Bitter panicum, Saltmeadow cordgrass.

Engineers have tried to copy nature by building dunes with bulldozers and dredges or by stringing long fences across the sand. A simpler, usually less expensive and often more successful method exists where blowing sand is available. By planting sand and sand-resistant grasses anyone (homeowners and developers, restaurant owners and motel keepers) can encourage the wind to slow and drop its load of sand, beginning the natural cycle of dune growth. A grass planting 40 to 50 feet wide can trap several cubic yards of blowing sand per foot of beach in a year. Four grasses meet the requirements in North Carolina: American beachgrass, Sea oats, Bitter panicum and Saltmeadow cordgrass. (NOAA)
W77-07326

DUNE STABILIZATION WITH PANICUM AMARUM ALONG THE NORTH CAROLINA COAST,
North Carolina State Univ. at Raleigh. Center for Marine and Coastal Studies.
For primary bibliographic entry see Field 2L.
W77-07327

ACOUSTIC MEASUREMENT OF SEDIMENT TRANSPORT,
Canada Centre for Inland Waters, Burlington (Ontario).
C. K. Jonys.
Scientific Series No. 66, 1976, Ottawa, Canada, 118 p., 64 fig., 10 tab., 18 ref., 2 append.

Descriptors: *Acoustics, *Measurement, *Sediment transport, Research and development, Bed load, Sounding, Analysis, Underwater, Hydrophones, River beds, *Instrumentation, On-site tests, Laboratory tests, Theoretical analysis.
Identifiers: *Pebbles, Collision.

Three studies are combined on the acoustic method of sediment bed-load measurement in gravel-bearing rivers. Laboratory experiments were carried out to verify some acoustical aspects of impact noise in water for application in the development of a theoretical relationship between the noise generated by riverbed pebble collisions and bed-load transport rates. Underwater pebble noise was simulated by rolling ceramic balls on a bed of similar balls in a large laboratoy flume. Sound was measured with a stationary hydrophone located in the water above the pebble bed. Specific information was obtained on the interparticle collision frequency delineating the limit of transition from impact to continuous type of sound; the applicability of theoretical relationship in the determination of total sound pressure levels owing to impact sources; the acoustic directivity of pebble collision noise; the sound field characteristics surrounding pebble collision sources; the effect of pebble velocity on the generated sound pressure level; and the spectrum characteristics of the pebble collision generated noise. In field experiments, underwater sound samples were recorded in two gravel-bearing rivers during periods with and without bed-load movement. Also, samples of artificially generated interparticle collision noise by different sizes of gravel pebbles were recorded. Flow velocities and bed-load transport were measured as well. The purpose of the observations was to obtain field data for the study of the feasibility of the acoustic method for bed-load measurement.(WATDOC)
W77-07338

PROCEEDINGS OF THE SEVENTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
For primary bibliographic entry see Field 8D.
W77-07342

PROBLEMS ASSOCIATED WITH CONSTRUCTION OF SUBMARINE PIPELINES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-07349

MATHEMATICAL MODELING OF SEDIMENTATION TRANSIENTS IN SAND-BED CHANNELS,
Colorado State Univ., Fort Collins, Engineering Research Center.
K. Mahmood, and V. M. Ponce.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 274, Price codes: A07 in paper copy, A01 in microfishe. Research Report No. CER75-76KM-VMP28, April 1976. 132 p, 17 fig, 12 ref, 3 append.

Descriptors: *Sediment transport, *Alluvial channels, *Computer models, Numerical analysis, *Mathematical models, Sedimentation, Streams, Stream erosion, Suspended load, Hydrology, Aggradation, Degradation.
Identifiers: *Sand-bed channels, Sedimentation transients, Sedimentation Courant number.

A mathematical model of sedimentation transients in straight alluvial channels was presented. A coupled solution of the momentum and sediment continuity equations enables the numerical solution with longer time steps than are possible for uncoupled models. The model solves the finite difference analog of the governing equations by a linerized implicit numerical scheme. The linerization imposes the limitation that for a time step Delta t the change in depth of flow Deta h/h be less than 0.10. Criteria were developed to assess the stability and cnvergence properties of the numerical scheme. Theoretically optimum values of the weighting factor delta and a sedimentation Courant number were presented. Results of test runs derived from hypothetical examples were presented. The numerical model effectively simulates the formation of a bed wave in the upstream reach of a straight alluvial channel due to a non-equilibrium sediment inflow hydrograph. Examples of various types of aggradation and degradation problems that can be simulated by the model were given. (Lee-ISWS)
W77-07354

EFFECT OF THE ASWAN HIGH DAM ON THE NILE FLOOD AND ON THE ESTUARINE AND COASTAL CIRCULATION PATTERN ALONG THE MEDITERRANEAN EGYPTIAN COAST,
Alexandria Univ. (Egypt). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-07363

THE STABILITY DURING MANY YEARS OF THE MID-TIDAL SHORE AT PENRHYN BAY, NORTH WALES, AND A NOTE ON THE PEAT BEDS AT RHOS-ON-SEA,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 2L.
W77-07367

PREDICTABILITY OF EFFECTS OF A SEVERE LOCAL STORM IN PENNSYLVANIA,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2B.
W77-07369

EFFECT OF SILT AND SALINITY ON THE MORTALITY OF MERETRIX LUSORIA (ROEDING), (IN KOREAN),
Pusan National Univ. (Republic of Korea).
For primary bibliographic entry see Field 5C.
W77-07428

NITROGEN, PHOSPHORUS, PARTICULATE AND COLLOIDAL CARBON CONTENT OF SEDIMENTING SESTON OF A HARD-WATER LAKE,
For primary bibliographic entry see Field 5C.
W77-07441

EXPERIMENTAL SEDIMENT ADDITION STUDIES ON THE HARRIS RIVER, N.W.T., CANADA: THE EFFECT ON MACROINVERTEBRATE DRIFT,
For primary bibliographic entry see Field 5C.
W77-07455

SEDIMENT RESPIRATION IN SIX ITALIAN LAKES IN DIFFERENT TROPHIC CONDITIONS,
For primary bibliographic entry see Field 5C.
W77-07461

TRIPTON SEDIMENTATION IN EUTROPHIC LAKES--SAMPLE CORRECTION FOR THE RESUSPENDED MATTER,
For primary bibliographic entry see Field 5C.
W77-07463

ALGAL SEDIMENTATION: THE CAUSE OF A DIATOM-BLUE-GREEN SUCCESSION,
For primary bibliographic entry see Field 5C.
W77-07464

POST-GLACIAL HISTORY OF MIRROR LAKE AND ITS WATERSHED IN NEW HAMPSHIRE, U.S.A.: AN INITIAL REPORT,
For primary bibliographic entry see Field 5C.
W77-07472

AREAL DISTRIBUTION AND STRATIGRAPHY OF DIATOMS IN THE SEDIMENTS OF LAKE SALLIE, MINNESOTA,
Geological Survey, Lakewood, Colo. Water Resources Div.; and Geological Survey, Denver, Colo. Geologic Div.
For primary bibliographic entry see Field 5C.
W77-07481

RECONNAISSANCE OF SEDIMENT TRANSPORT AND CHANNEL MORPHOLOGY IN THE LOWER RIO BERMEJO BASIN, ARGENTINA--WITH A SECTION ON RECONNAISSANCE OF THE LOWER RIO PILCOMAYO BASIN, ARGENTINA AND PARAGUAY,
Geological Survey, Harrisburg, Pa. Water Resources Div.
J. R. Ritter.
Open-file report 76-564, 1977. 41 p, 18 fig, 1 plate, 6 tab, 16 ref.

Descriptors: *Sediment transport, *Streamflow, *Sediment yield, *Channel morphology, *South America, Stream erosion, Alluvial channels, Sediment load, Sediment control, Evaluation.
Identifiers: *Argentina, *Lower Rio Bermejo basin(Arg-Para), *Paraguay, *Lower Rio Pilcomayo basin(Arg).

Sediment transport conditions are described for the Lower Rio Bermejo and the Rio Pilcomayo in the Gran Chaco region of northern Argentina and southern Paraguay. The Lower Rio Bermejo is in many ways atypical, as its channel narrows downstream. Also its flow decreases downstream even though average annual rainfall at its mouth is twice that at its head (1,200 mm vs. 600 mm) and its suspended-sediment at El Yacare was about 41 million metric tonnes per year during 1970-73 and 82 million metric tonnes per year at El Colorado. The Rio Pilcomayo 'Superior' disappears near Laguna Escalante, owing to plugging of its channel by sediment, into a network of shallow lakes and marshes. Another stream known as the Rio Pil-

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comayo 'Inferior' appears about 160 km to the southeast and meanders downstream to the Rio Paraguay. The Rio Pilcomayo 'Superior' carries about 100 million metric tonnes of sediment per year. The average annual concentration of sediment is more than 6 kg per cubic meter of flow. (Woodard-USGS)
W77-07490

2K. Chemical Processes

INTERACTIONS OF CUPRIC ION WITH HUMIC ACID,
Missouri Univ. Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-07104

STUDY OF THE STATE OF WATER ON THE SURFACE OF H+, NA+, MG2+ SATURATED KAOLINITE BY THE NMR METHOD, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-07241

DYNAMICS OF O2 AND CO2 EXCHANGE, PHOTOSYNTHESIS, AND RESPIRATION IN RIVERS FROM TIME-DELAYED CORRELATIONS WITH IDEAL SUNLIGHT,
Washington Univ., Seattle. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-07364

CHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
L. M. Willey, J. R. O'Neil, and J. B. Rapp.
Open-file report, January 1974. 19 p, 1 fig, 6 tab, 13 ref.

Descriptors: *Geothermal studies, *Thermal water, *Chemical analysis, *Temperature, *California, Data collections, Methodology, Energy, Water chemistry, Geochemistry, Water types, Alkaline water.
Identifiers: Mono County(Calif), Probable energy sources, Geothermometers, *Long Valley(Calif).

Exploration for geothermal energy in the Long Valley area of Mono County, California, the site of a major collapse caldera, began in 1959. Since then the area has been the subject of intensive studies to determine its potential for geothermal power. In 1972, ground waters were sampled to study the hydrogeochemistry of the area, utilizing the most advanced techniques available to insure accurate chemical analysis. The waters are either a sodium bicarbonate or sodium chloride bicarbonate type. Relatively high values for chloride indicate that the thermal waters probably are part of a hot-water rather than a vapor-dominated hydrothermal system. Subsurface temperatures were calculated using six different geochemical methods. (Woodard-USGS)
W77-07487

CONVECTIVE HEAT FLOW FROM HOT SPRINGS IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
M. L. Sorey, and R. E. Lewis.
Journal of Geophysical Research, Vol 81, No 5, p 785-791, February 10, 1976. 3 fig, 4 tab, 23 ref.

Descriptors: *Geothermal studies, *Thermal springs, *Water chemistry, *California, Water temperature, Hot springs, Flow rates, Analytical techniques, Geochemistry, Correlation analysis, Heat flow, Boron.
Identifiers: *Long Valley Caldera(Calif).

The heat discharged by the hot spring system in Long Valley, California, has been estimated from measured spring discharges by using geochemical mixing models. Of the total flow of 1300 liter/s from 11 thermal springs in the caldera, approximately 20% or 150 liter/s is contributed by the hydrothermal system at depth with temperatures near 210 C. The effects of heat loss by conductive cooling, mixing, and boiling are quantified for the springs in Hot Creek Gorge, which are the major source of hot water discharge in the caldera. The estimated total convective heat discharge is 4.3 x 10 to the 7th power cal/s, which is in agreement with an estimate obtained from the rate of boron discharge from the caldera into Lake Crowley. (Woodard-USGS)
W77-07488

GEOCHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. H. Mariner, and L. M. Willey.
Journal of Geophysical Research, Vol 81, No 5, p 792-800, February 10, 1976. 8 fig, 6 tab, 27 ref.

Descriptors: *Geochemistry, *Geothermal studies, *Thermal springs, *Chemical analysis, *Water temperature, Water chemistry, Evaluation, Chemical reactions, Dissolved solids, *California.
Identifiers: Mono County(Calif), *Long Valley(Calif), Geothermometer.

Thermal springs and wells in Long Valley, California, issue sodium bicarbonate-chloride waters containing 1000-1420 mg/liter of dissolved solids. Thermal waters of sodium bicarbonate-chloride composition are usually associated with hot-water reservoirs. Chloride concentrations and stable isotope data indicate that the thermal waters have had varied histories. All of the thermal springs issue a mixture of fluid from the thermal reservoir and less saline, cooler water from one or more shallow aquifers. The composition of springs in Hot Creek Gorge may have been further altered by minor subsurface boiling. Thermal springs between Hot Creek and Lake Crowley issue mixtures of fresh and thermal waters which have lost heat by conductive cooling and changed composition by reaction with rock in the shallow aquifer. The silica content of water from Magma Richie 5 and mixing calculations based on the concentrations of silica in thermal waters collected from springs in Hot Creek Gorge and along Little Hot Creek indicate a temperature of at least 200 degrees C in the thermal reservoir. The sodium-potassium-calcium geothermometer yields a reservoir temperature estimate near 200 degrees C for most of the thermal springs. If geothermal energy is developed in Long Valley, the high concentrations of arsenic (up to 2.2 mg/liter), boron (up to 15 mg/liter), and total dissolved solids in the thermal fluids will make it necessary to isolate the effluent of production wells from the freshwater system. (Woodard-USGS)
W77-07489

2L. Estuaries

ROLE OF MUSSELS MYTILUS EDULIS IN REMOVAL OF PETROLEUM PRODUCTS FROM SEAWATER (UNDER EXPERIMENTAL CONDITIONS),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
For primary bibliographic entry see Field 5C.
W77-07116

THE UTILIZATION OF DISSOLVED FREE AMINO ACIDS BY ESTUARINE MICROORGANISMS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07117

COMPARISON OF ARTIFICIAL AND NATURAL SEA WATER AS CULTURE MEDIA FOR JUVENILE LOBSTERS,
California Univ., Davis. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W77-07118

OCCURRENCE OF TOXIC BIVALVES IN ASSOCIATION WITH THE BLOOM OF GONYAULAX SP. IN OWASE BAY,
Tokyo Univ. (Japan). Lab. of Marine Biochemistry.
For primary bibliographic entry see Field 5C.
W77-07119

USE OF QUICKLIME TO INCREASE OYSTER SEED PRODUCTION,
National Marine Fisheries Service, Highland, N.J. Sandy Hook Lab.
For primary bibliographic entry see Field 5C.
W77-07122

SHELL DEFORMITY AMONG SCALLOPS (ARGOPECTEN IRRADIANS LAMARK) CULTURED IN A RECIRCULATING SEAWATER SYSTEM,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5C.
W77-07123

THE DYNAMICS OF METALS IN THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA. II. ENVIRONMENTAL EFFECTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Medicine.
For primary bibliographic entry see Field 5C.
W77-07129

EFFECTS OF PASSAGE THROUGH POWER PLANT COOLING SYSTEMS ON ESTUARINE COPEPODS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5C.
W77-07134

EFFECTS OF BENZENE (A TOXIC COMPONENT OF PETROLEUM) ON SPAWNING PACIFIC HERRING, CLUPEA HARENGUS PALLASI,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Lab.
For primary bibliographic entry see Field 5C.
W77-07137

RED TIDE IN THE UPWELLING REGION OF BAJA CALIFORNIA,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
For primary bibliographic entry see Field 5C.
W77-07169

THE ECOLOGICAL CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART I: ECOLOGICAL STUDIES,
Maine State Dept. of Marine Resources, Augusta.
For primary bibliographic entry see Field 5C.
W77-07178

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART II. CHEMICAL STUDIES,
Bowdoin Coll., Brunswick, Maine. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-07179

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART III: HISTOPATHOLOGICAL STUDIES,
National Water Quality Lab., West Kingston, R. I.
For primary bibliographic entry see Field 5C.
W77-07180

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS I. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIERS FOR SOME MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-07181

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS-II. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIER COMPONENTS FOR MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-07182

THE DISTRIBUTION AND ECOLOGY OF COMMON MARINE AND ESTUARINE GASTROPODS IN THE DELAWARE BAY AREA,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5C.
W77-07185

ACUTE TOXICITY OF ZINC, CADMIUM, AND CHROMIUM TO THE MARINE FISHES, YELLOW-EYE MULLET (ALDRICHETTA FORSTERI C. AND V.) AND SMALL MOUTHED HARDYHEAD (ATHERINASOMA MICROSTOMA WHITLEY),
Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group.
For primary bibliographic entry see Field 5C.
W77-07190

HEAVY METAL POLLUTION IN TRONDHEIMSFJORDEN, NORWAY, AND THE RECORDED EFFECTS ON THE FAUNA AND FLORA,
Kongelige Norske Videnskabers Selskab, Trondheim. Museet.
For primary bibliographic entry see Field 5C.
W77-07194

OFFSHORE OIL AND FISHERY RESOURCES,
New York State Dept. of Environmental Conservation, Delmar. Div. of Marine and Coastal Resources.
For primary bibliographic entry see Field 5C.
W77-07195

RESPONSES OF THE LICHENS PELTIGERA APHTHOSA AND CETRARIA NIVALIS AND THE ALGA NOSTOC COMMUNE TO SULFUR DIOXIDE, NATURAL GAS, AND CRUDE OIL IN ARCTIC ALASKA,
Louisville Univ., Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07197

SUBTIDAL AND INTERTIDAL MARINE FOULING ON ARTIFICIAL SUBSTRATA IN NORTHERN PUGET SOUND, WASHINGTON,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-07201

UPTAKE, DISTRIBUTION, AND DEPURATION OF 14C-BENZENE IN NORTHERN ANCHOVY, ENGRAULIS MORDAX, AND STRIPED BASS, MORONE SAXATILIS,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Lab.
For primary bibliographic entry see Field 5C.
W77-07202

ENVIRONMENTAL DEPENDENCE OF MANGANESE AND ZINC IN THE SCALES OF ATLANTIC SALMON, SALMO SALAR (L) AND BROWN TROUT, SALMO TRUTTA (L),
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-07203

POLLUTION SUSCEPTIBILITY: AN ENVIRONMENTAL PARAMETER FOR COASTAL ZONE MANAGEMENT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5G.
W77-07230

FEDERAL RIVERBASIN PLANNING IN THE COASTAL ZONE: THE LONG ISLAND SOUND STUDY,
Yale Univ., New Haven, Conn. School of Forestry and Environmental Studies.
L. C. Irland.
Coastal Zone Management Journal, Vol 2, No 3, p 247-72, 1976. 4 fig, 21 ref.

Descriptors: *Water Resource Planning Act, *Governmental interrelations, *Institutional constraints, *Federal project policy, Interagency cooperation, Administration, Multiple-purpose projects, Water management(Applied), Long term planning, Project planning, Planning, Regional development, Interstate, Federal government, Local governments, State governments, Management.
Identifiers: *Coastal zone management, *Coastal waters, *Long Island Sound Study, Water planning, Coastal zone, Coastal zone planning.

Coastal zone planning has been attempted through a variety of institutional systems. The Long Island Sound Study (LISS) is an important case study in federal water planning in coastal zones because it illustrates the limitations imposed on planning by the traditional multiagency committee format, as well as the weaknesses in traditional planning concepts. The LISS was successful to the extent that it went beyond the traditional water planning process in areas such as local involvement and public participation, but because of the framework of established pattern of riverbasin planning, it was unable to go far enough. The existing riverbasin planning approach needs to be adjusted to adapt to administrative and political realities in the coastal zone. Planning efforts for coastal zone management should emphasize state leadership, since implementation is largely state responsibility. In addition, current approaches of basing plans on projected demands must be abandoned in favor of a system based on description and analysis of alternatives. (Petruff-Florida)
W77-07232

PROPERTY-COASTAL SHORES-PRIVATE PROPERTY RIGHTS UPHELD OVER CLAIMED PUBLIC RIGHT TO RECREATIONAL USE OF BEACH-IMPLIED DEDICATION, EASEMENT BY PRESCRIPTION, PUBLIC TRUST THROUGH CUSTOM AND GRANT, AND DOCTRINE OF SUBMERGENCE NOT APPLICABLE. DEPARTMENT OF NATURAL RESOURCES V. MAYOR AND COUNCIL OF OCEAN CITY, 274 MD. 1, 332 A.2D 630 (1975).
For primary bibliographic entry see Field 6E.
W77-07239

ATOMIC ABSORPTION MEASUREMENTS OF LEAD, CADMIUM, COPPER, IRON, AND ZINC IN SESTON OF THE BALTIC SEA,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5A.
W77-07309

PCB CONTENTS IN THE MUSCLE OF MARINE ANIMALS COLLECTED IN THE SEA NEAR HAKODATE (IN JAPANESE),
Hokkaido Univ., Hakodate (Japan). Lab. of Food Hygiene.
For primary bibliographic entry see Field 5C.
W77-07315

PRELIMINARY EXPERIMENT OF COBALT 60 POLLUTION OF A MARINE FOOD CHAIN: RESULTS OF A SINGLE INGESTION,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Departement de Protectione; CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Service de Recherches Toxicologiques et Ecologiques; and CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Laboritorie de Radioecologie Continental.
For primary bibliographic entry see Field 5C.
W77-07317

NUTRIENT TRANSFORMATIONS IN LOUISIANA SALT MARSH SOILS,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
For primary bibliographic entry see Field 5C.
W77-07319

CIRCULATION AND SURGE MODELING IN PAMLICO SOUND, N.C.,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
M. Amein, and D. S. Airan.
Sea Grant Reprint No. 100, Reprinted from: Proceedings of ASCE National Water Resources and Ocean Engineering Convention held San Diego, California, April 5-8, 1976. Preprint No. 2665. 32 p, 12 fig, 3 tab, 12 ref.

Descriptors: *North Carolina, *Ocean circulation, Circulation, Surges, Model studies, Winds, Mathematical models, Hurricanes, Water resources development.
Identifiers: *Pamlico Sound(NC).

Pamlico Sound is a large semi-enclosed body of partially saline water on the coast of North Carolina separated by a narrow strip of barrier islands from the Atlantic Ocean. Freshwater inflow is from two major rivers and from Albemarle Sound. There is tidal flow across the inlets. Wind is a major factor in circulation, and there is considerable surge action during the hurricanes. A numerical model based on the two-dimensional shallow water hydrodynamic equations is used to compute water surface elevations and currents. The model uses an explicit finite difference representation, and includes convective acceleration, and nonlinear surface and bottom stress. The time dependent water movements are computed for an observed hurricane with good success. The model can be used to predict surge heights for coastal protection, and it will provide data for water resource management and for pollution control. (NOAA)

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W77-07320

PHYSICAL ENVIRONMENT ATLAS OF COASTAL ALABAMA,
Alabama Univ. System, Dauphine Island. Marine Science Programs; and Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss.
W. W. Schroeder.
Mississippi-Alabama Sea Grant Consortium Report No. MASGP-76-034, (1976). 239 p. Also as: MESC Contribution No 104. SG-04-5-158-54, 04-6-158-44060; and NASA NAS-5-21876, NAS-8-30810.

Descriptors: *Alabama, *Data collections, Physical properties, *Baseline studies, Coasts, Temperature, Salinity, Hydrography, *Maps.
Identifiers: Oceanographic data.

The purpose of this atlas is to document the physical environment of coastal Alabama. Data are presented as facts without any interpretation. Geographic units are treated individually and environmental conditions described are for the period of 1973 to 1976. (NOAA)
W77-07322

WIND AND CURRENT PATTERNS IN AN ARCTIC COAST LAGOON,
Alaska Univ., College. Inst. of Marine Science.
J. A. Dygas, and D. C. Burrell.
Reprinted from: Ocean Engineering, Vol 3, p 317-327, 1976. 9 fig, 14 ref. Also as: Alaska Univ. Inst. Marine Science Contribution No. 281. SG-04-6-158-44039 EPA-R-801124.

Descriptors: *Winds, *Currents(Water), *Arctic Ocean, *Lagoons, *Alaska.
Identifiers: Beaufort Sea(Simpson Lagoon Alas).

The response of wind-drift currents to the prevailing summer wind regime is reported for Simpson Lagoon on the Beaufort Sea (Arctic Ocean) coast of Alaska. Wind and current measurements were taken over the period July 17 to October 20 and August 11 to September 18, 1972, respectively, at a site eastward of the Colville River delta. Mean wind speeds and the frequency of occurrence of westerly storms tend to increase from July to October. Prevailing currents within the lagoon are towards the W to NW driven by the prevailing northeasterly winds. Relatively rapid reversals of current direction occur in response to alternating easterly and westerly winds. Cross correlations of power spectral of the filtered E-W components of the lagoon current record with the concurrent wind data gave a periodicity of 4-5 days at a 70% level of coherence. A linear correlation of -0.83 was obtained between the E-W components of the filtered current record and the wind record, and net water transport (from a progressive current vector analysis) over this period was determined to be towards the WNW with a mean vector velocity of 10.6 cm/sec. (NOAA)
W77-07323

WASSAW ISLAND EROSION STUDY. PART 1: SEDIMENTARY FRAMEWORK OF A CHANNEL MARGIN SHOAL OF AN EBB DELTA, WASSAW SOUND, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.; and Georgia Marine Science Center, Savannah.
G. F. Oertel.
Sea Grant Technical Report Series No. 77-1, January 1976. 19 p, 9 fig, 7 ref. SG-10-32-RR-273-077.

Descriptors: *Georgia, *Sedimentation, *Spatial distribution, *Sediment distribution, Shoals, Deltas, Coasts, Beach erosion.
Identifiers: Bioturbation, Wassaw Island(Geo).

A detailed description of the sediment carpet on the shoal is given based on the analysis of 36 box cores taken from a 2 x 4 mile grid. The coring device took relatively undisturbed samples that could be analyzed for primary and biogenic sedimentary structures, grain size and textures. The fine and very-fine grained sands on the marginal shoal have low threshold velocities. These well sorted, fine sediments are very susceptible to rapid transit with increases in physical energy. The general lack of secondary mixing in shoal sediments suggests that these sediments undergo continuous reporking and apparently the shoal is in dynamic equilibrium with physical forces. The coarse sediment on the channel margin is a 'lag' deposit and is also in dynamic equilibrium with reversing inlet tidal currents. The offshore area and the area 'shielded' by the shoal have relatively stable sediment carpets and were less susceptible to ambient energy conditions. These relatively stable substrates were periodically reworked by large storm waves. (NOAA)
W77-07324

LONG ISLAND BEACH POLLUTION: JUNE 1976,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W77-07325

DUNE STABILIZATION WITH PANICUM AMARUM ALONG THE NORTH CAROLINA COAST,
North Carolina State Univ. at Raleigh. Center for Marine and Coastal Studies.
E. D. Seneca, W. W. Woodhouse, Jr., and S. W. Broome.
Sea Grant Publication No. UNC-SG-77-03, Feb 1977. Reprint of U.S. Army Coastal Engineering Research Center Miscellaneous Rept. No. 76-3, Feb 1976. 42 p, 16 fig, 13 tab, 8 ref. Also as NCSU Rept. 77-1. SG-2-35178, 04-3-158-40. CERC-DACW72-73-C-0025.

Descriptors: *Dunes, *Shore protection, Water resources, *Stabilization, *North Carolina, Grasses, Vegetation, Sedimentation, Bank stabilization, Coasts.
Identifiers: *Panicum amarum, American beachgrass, Sea oats, *Dune stabilization, *Bitter panicum.

Information is presented to assist coastal engineers in dune stabilization by the establishement and development of vegetation. Sand accumulation and profile data suggest that bitter panicum should not be used in monospecific plantings to build dunes along the North Carolina coast. The results indicate that the mixed species planting is almost as good at dune building as monospecific stands of American beachgrass. These mixed species plantings are ecologically more desirable because of the insect, disease, and physiological problems associated with American beachgrass at this latitude. In a mixed species planting of American beachgrass, bitter panicum, and sea oats, a dune can be built primarily by the sand trapping potentials of American beachgrass and sea oats; when American beachgrass begins dying out, it can rapidly be replaced by the other two native grasses to stabilize the area. The principal values of bitter panicum are in stabilizing sand coastal areas and in mixed species plantings to build and stabilize coastal dunes in the southeastern United States. (NOAA)
W77-07327

HYDROGRAPHIC PROPERTIES, MESA NEW YORK BIGHT ATLAS MONOGRAPH 1,
New York Sea Grant Inst., Albany,
M. J. Bowman, and L. D. Wunderlich.
Report NYSSGP-AM-77-002, February 1977. 78 p, 14 fig, 2 tab, 105 ref, 13 maps. SG-2-35281 and ONR-00014-68-C-0298.

Descriptors: Hydrography, *Continental shelf, Water properties, Seasonal, *Salinity, *Temperature, New York, *Hydrologic properties, *Density, Environment, Maps.
Identifiers: Environmental conditions, *Seasonal variations, *New York Bight, *Middle Atlantic Bight, Oceanographic data.

Cycles of temperature, salinity, and density characteristic of the Middle Atlantic Bight, which includes New York Bight, are determined by seasonal patterns of insolation, river runoff, evaporation minus precipitation, winds, ocean currents, and shelf/slope exchange processes. Shelf temperatures have a large annual nearshore range around 25 degree C; the water column is unstratified in winter but is dominated by a strong thermocline in summer. A cool pool of bottom shelf water on the middle and outer continental shelf remains during the summer as a remnant of the previous winter and persists throughout the entire Middle Atlantic Bight. (NOAA)
W77-07328

THE EFFECT OF COLLECTOR DISCHARGE WATER FROM RICE FIELDS ON THE ZOOPLANKTON OF SOME KUBAN ESTUARIES, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5C.
W77-07331

A STUDY ON STANDING CROPS IN PHRAGMITES COMMUNIS COMMUNITIES AND THEIR ENVIRONMENTAL FACTORS, (IN KOREAN),
Mokpo Teachers' Coll. (South Korea).
For primary bibliographic entry see Field 5C.
W77-07335

PROCEEDINGS OF THE SEVENTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
For primary bibliographic entry see Field 8D.
W77-07342

SALVOPS-HOPPER DREDGE 'A. MACKENZIE',
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 8D.
W77-07343

THE PORT OF NEW ORLEANS AND ITS DREDGING PROGRAM,
Williams-McWilliams Co., Inc., New Orleans, La.
For primary bibliographic entry see Field 8D.
W77-07348

THE RESPONSES OF SOME ESTUARINE ORGANISMS TO SUSPENDED SOLIDS,
Lawler, Matusky and Skelly Engineers, Tappan, N.Y.
For primary bibliographic entry see Field 8D.
W77-07353

THE ANALYSIS OF AMMONIA IN POLLUTED SEA WATER,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
For primary bibliographic entry see Field 5A.
W77-07362

EFFECT OF THE ASWAN HIGH DAM ON THE NILE FLOOD AND ON THE ESTUARINE AND COASTAL CIRCULATION PATTERN ALONG THE MEDITERRANEAN EGYPTIAN COAST,
Alexandria Univ. (Egypt). Dept. of Oceanography.
S. H. Sharaf El Din.

Limnology and Oceanography, Vol 22, No 2, p 194-207, March 1977. 17 fig, 24 ref.

Descriptors: *Dams, *Floods, *Estuaries, *Circulation, Estuarine environment, Hydrography, Biological communities, Nutrients, Flood flow, Foreign research, Foreign countries, *Sediment transport.
Identifiers: *Aswan High Dam, *Nile River, *Egyptian coast, *Mediterranean Sea, *Levantine Sea, Biological economy, Nutrient budget, Flood season.

From 60-180 million tons of sediments and 18 x 10 to the 9th power to 55 x 10 to the 9th power cu m of water were transported to the Mediterranean Sea by the Nile annually before the Aswan High Dam was erected in 1964. Before completion of the dam, during the flood period the estuarine circulation pattern was a two-layer flow at the mouth of the two estuaries. In winter, the circulation pattern was a one-layer flow of seawater; this pattern had persisted during most of the year since 1964. The velocity of the currents at the mouth of the Nile branches reached more than 4 knots at the surface but was less than 0.5 knot at the bottom during the flood period before 1964. After 1964, the velocity dropped considerably. General oceanographic conditions in the offshore region beyond the continental shelf did not change noticeably, but hydrographic conditions over the continental shelf in front of the delta showed considerable change after 1964. Also, since 1964 almost no sediment has been discharged from the Nile. As a result, an imbalance in the near-coast sediment budget was produced which increased erosion at the two mouths of the river and caused a shift of the sediments along the coast. (Roberts-ISWS)
W77-07363

FURTHER TRANSITION STATES OF THE BAJA CALIFORNIA UPWELLING ECOSYSTEM,
Brookhaven National Lab., Upton, N.Y. Oceanographic Sciences Div.
For primary bibliographic entry see Field 5C.
W77-07365

THE RESPONSE OF AN ESTUARY TO THE CLOSURE OF A MOBILE BARRIER; RICHMOND BARRIER ON THE UPPER THAMES ESTUARY,
Institute of Oceanographic Sciences, Birkenhead (England).
A. J. Bowen, and S. J. Pinless.
Estuarine and Coastal Marine Science, Vol 5, No 2, p 197-208, March 1977. 7 fig, 1 tab, 5 ref.

Descriptors: *Estuaries, *Barriers, *Mathematical models, Foreign research, Foreign countries, Tides, Tidal effects, Hydraulic models, Numerical analysis, Estuarine environment, Model studies.
Identifiers: *Mobile barrier, Richmond barrier, *Thames Estuary, Woolwich barrier, Tidal regime, Tidal gages, Estuarine motion.

A detailed, one-dimensional, numerical model of the Thames Estuary above Chelsea was developed to examine the dynamics of this complex region, a region which has been represented crudely in previous models of the whole estuary. The model was found to describe accurately the tidal regime in this area, correctly reproducing the effect of a mobile barrier closing across the tide. Opportunities for verification of predicted changes due to major alteration in the geometry of the system were rare, usually being possible only in a follow-up study after a new structure has been completed. The half-tide barrier at Richmond was used to check predictions against direct observations. The Thames Flood Prevention Investigation, commissioned by the Greater London Council, supported the project which was to evaluate changes in the tidal regime and extreme levels in the River Thames resulting from the closure of the Woolwich Barrier. (Roberts-ISWS)
W77-07366

THE STABILITY DURING MANY YEARS OF THE MID-TIDAL SHORE AT PENRHYN BAY, NORTH WALES, AND A NOTE ON THE PEAT BEDS AT RHOS-ON-SEA,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
D. P. Wilson.
Estuarine and Coastal Marine Science, Vol 5, No 2, p 209-213, March 1977. 3 plate, 10 ref.

Descriptors: *Peat, *Stability, *Tides, Shores, Shoreline cover, Topography, Storms, Boulders, Erosion, Photography, Rocks, Bays.
Identifiers: *Penrhyn Bay, *North Wales, *Rhos-on-Sea, Mid-tidal shore, Photographs, Mid-tidal area, Cliffs.

It was shown that the shore level at Penrhyn Bay, North Wales, seaward of the shingle slope at the foot of the promenade wall had not changed appreciably for over 50 years. Previously published material contradicted this statement, but the statement is substantiated not only by reference to old photographs, but also by personal knowledge of the author. The shore and its major structures, natural and man-made, have remained virtually unchanged since almost 60 years ago. Storms have little effect on the almost level boulder-strewn, mid-tidal area. Except for human interference, there is no reason to anticipate any major change in the topography for many years in the future. Similarly, peat beds at Rhos-on-Sea, reported to have long since been lost by erosion, still exist. (Roberts-ISWS)
W77-07367

PHOSPHORUS AND CARBON DISTRIBUTIONS IN A POLLUTED COASTAL ENVIRONMENT,
Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W77-07368

PREDICTING CHANGES IN TIDAL REGIME: THE OPEN BOUNDARY PROBLEM,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 8B.
W77-07370

INTERACTION OF TEMPERATURE AND SALINITY ON OXYGEN CONSUMPTION OF THE ESTUARINE CRAB PANOPEUS HERBSTII,
Wake Forest Univ., Winston-Salem, N. C. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07375

DAY DEGREE GROWTH MODELS FOR INTERTIDAL OYSTERS,
South Carolina Univ., Georgetown. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
R. F. Dame.
Contribution in Marine Science, Vol 19, 1975, p 107-112, 2 fig, 2 tab, 17 ref.

Descriptors: *Mathematical models, *Forecasting, *Growth rates, *Oysters, Intertidaal areas.
Identifiers: Day degree growth models.

Data are presented which show linear and polynomial day degree models to be capable of predicting oyster growth in terms of height or weight. Linear day degree models utilizing whole weight observations explain at least 94% of the variability in the seasonal growth of intertidal oysters, but fail to accurately describe all the fluctuation in growth rate. Growth data from observation utilizing shell height measurements did not fit either the linear not the quadratic day degree models as well as the whole weight observations. Quadratic day degree models offered an increase in the accuracy of prediction for the observed data, but gave completely erroneous predictions of growth if extended to future years without new data. The coefficients of the quadratic or polynomial models have not as yet been shown to have any biological meaning. (Chilton-ORNL)
W77-07376

SUMMER GROWTH DEPRESSION IN THE STRIPED MULLET, MUGIL CEPHALUS L.,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5C.
W77-07378

BACTERIOLOGY OF CHESAPEAKE BAY SURFACE WATERS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-07382

INFLUENCE OF LIGHT AND TEMPERATURE ON THE PHOTOSYNTHETIC RATE OF MARINE BENTHIC DIATOMS,
Groningen Rijksuniversiteit (Netherlands). Dept. of Systematic Botany.
For primary bibliographic entry see Field 5C.
W77-07385

LIFE HISTORY PATTERNS IN THE COASTAL SHINER, NOTROPIS PETERSONI, FOWLER,
University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07386

ASPECTS OF THE LIFE HISTORY OF TRESUS NUTTALLII IN ELKHORN SLOUGH,
Moss Landing Marine Lab., Calif.
P. Clark, J. Nybakken, and L. Laurent.
California Fish and Game, Vol. 61, No. 4, 1975. p 215-227, 9 fig, 9 ref.

Descriptors: *Life history studies, Period of growth, *Growth rates, *Clams, Reproduction, *California.
Identifiers: Caper clams, Tresus nuttallii, *Elkhorn slough(Calif).

Gonadal sections examined for the period of February 1970-June 1972 suggested that the primary spawning period of the gaper clams was from February through April although some spawning probably occurs throughout the year. Growth curves were established which can be used to estimate clam length at a given age. (Chilton-ORNL)
W77-07388

QUALITATIVE AND QUANTITATIVE STUDIES ON THE MEIOFAUNA OF A TROPICAL FRESH WATER STREAM SUBJECT TO TIDAL INFLUENCE, (IN ITALIAN),
Andhra Univ., Waltair (India). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-07390

AQUATIC ORGANISM CONTAMINATION BY MERCURY RESIDUES IN THE COATZACOALCOS RIVER ESTUARY, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto Nacional de Energia Nuclear.
For primary bibliographic entry see Field 5C.
W77-07394

ACCUMULATION AND DISTRIBUTION OF TRACE METALS AND RADIONUCLIDES IN MARINE ORGANISMS (PARTICULARLY

LIBRARY U. OF I. URBANA-CHAMPAIGN

TAPES DECUSSATUS L.) IN THE IZMIR BAY AREA, TURKEY,
Aegean Univ., Bornova (Turkey). Marine Biological Lab.; and Aegean Univ., Bornova (Turkey). Dept. of General Zoology.
For primary bibliographic entry see Field 5C.
W77-07395

DEVELOPMENT OF EGGS AND EMBRYOS OF THE SURF CLAM, SPISULA SOLIDISSIMA, IN SYNTHETIC SEAWATER,
National Marine Fisheries Service, Milford, Conn. Middle Atlantic Coastal Fisheries Center; and National Marine Fisheries Service, Milford, Conn. Milford Lab.
For primary bibliographic entry see Field 5C.
W77-07396

COMPARATIVE ECOPHYSIOLOGY OF GAMMARIDS (CRUSTACEA: AMPHIPODA) FROM MARINE, BRACKISH AND FRESH-WATER HABITATS, EXPOSED TO THE INFLUENCE OF SALINITY-TEMPERATURE COMBINATIONS. I. EFFECT ON SURVIVAL,
Amsterdam Univ., Netherlands, Dept. of Experimental Biology.
For primary bibliographic entry see Field 5C.
W77-07397

EFFECT OF NUTRIENT ENRICHMENT ON THE HETEROTROPHIC UPTAKE OF ORGANIC SOLUTES BY MICROORGANISMS,
For primary bibliographic entry see Field 5C.
W77-07466

AN INVESTIGATION OF COLLOIDAL ORGANIC PARTICLES ISOLATED FROM DIFFERENT POPULATIONS OF BIVALVES,
For primary bibliographic entry see Field 5A.
W77-07498

ASPECTS OF ZOOBENTHOS ECOLOGY OF THE MACKENZIE DELTA, N.W.T.,
For primary bibliographic entry see Field 5C.
W77-07499

UPTAKE AND RETENTION OF KUWAIT CRUDE OIL AND ITS EFFECTS ON OXYGEN UPTAKE BY THE SOFT-SHELL CLAM, MYA ARENARIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W77-07506

BACTERIOLOGICAL STUDIES IN THE CIENAGA GRANDE (GREAT MARSH) OF SANTA MARIA, COLUMBIA, (IN SPANISH),
For primary bibliographic entry see Field 5C.
W77-07512

THE LENTIC AND LOTIC FRESHWATER TYPES OF MARION ISLAND (SUB-ANTARCTIC): A LIMNOLOGICAL STUDY,
For primary bibliographic entry see Field 5C.
W77-07514

INSTABILITY IN TIDAL FLOW COMPUTATIONAL SCHEMES,
Hydraulics Research Station, Wallingford (England).
T. J. Weare.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. HY5, Proceedings paper No. 12100, p 569-580, May 1976. 6 fig, 3 ref.

Descriptors: *Hydraulics, *Tidal waters, *Numerical analysis, *Mathematical models, Tides, *Stability, Equations, Systems analysis.
Identifiers: *Finite difference theory, Tidal currents.

A careful analysis of the multioperational finite difference schemes proposed by Leendertse reveals a nonlinear numerical instability. This instability arises from the imperfect time centering of certain nonlinear terms in the shallow water equations. For many applications, the natural damping due to the friction term controls or masks the instability. The results of the stability analysis suggest that the instability becomes uncontrollable when a small grid spacing is used. These conclusions are confirmed by numerical experiment. (Bell-Cornell)
W77-07548

SUBJECT KEYWORD LIST, (ESTUARINE AND COASTAL MARINE SCIENCE),
Estuarine and Coastal Marine Science, Vol. 5, No. 2, p 1-34, March 1977.

Descriptors: *Information retrieval, *Estuaries, *Estuarine environment, *Indexing, Information exchange, Documentation, Publications, *Thesauri, Abstracts, Coasts, Classification.
Identifiers: *Glossaries, Subject keyword list.

A list was tabulated of 7800 subject keywords which will be used in the future to define the subject matter of papers published in Estuarine and Coastal Marine Science (ECMS), and to compile an annual index. The abstract of each paper will be preceeded by up to 8 Keywords chosen by the author to define the paper. These Keywords can then be used by librarians indexing papers; by readers searching for literature on a given subject; or in computerized information retrieval systems. The efficient allocation of Keywords to papers should increase the potential readership of all papers in the Journal. The ECMS list was compiled from the following sources; (1) Oceanic Abstracts, word list (1976); (2) FAO Aquatic Sciences and Fisheries draft list of permitted Keywords (1976); (3) Illiffe Science and Technology, Underwater Bulletin; (4) Subject heads from 'Encyclopaedia of Beaches and Coasts', edited by M. Schwartz; (5) Wordlist submitted by Estuarine and Brackish-Water Sciences Association; (6) US Army Beach Erosion Board, Glossary of Terms (1973); (7) Commercial Oceanology Study Group, word list (1965); and (8) Index from 'Estuaries', by K. R. Dyer. Every Keyword on the ECMS list has a 4-letter code preceeding it so that its source can be identified when matching other index systems. Where a Keyword occurs in several lists, the code indicates the largest list in which it occurs. The ECMS Keyword List is not a fully structured list, and it is not backed by a structured Thesaurus. The decision to publish and use the ECMS list in its present form was made because of the urgent need for a finite list of some kind. (Humphreys-ISWS)
W77-07564

STUDIES ON FUNGAL PROPAGULES IN THE WESER ESTUARY (GERMAN BIGHT): I. QUANTITATIVE DATA 1974, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5C.
W77-07583

DATA 1973/1974 REGARDING HYDROGRAPHY AND WATER QUALITY IN THE WESER ESTUARY, GERMANY, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5C.
W77-07584

STUDY OF BACTERIAL CONTAMINATION IN THE PORT MAHON HARBOR: EFFECT OF ECOLOGICAL CONDITIONS OF THE HARBOR, (IN SPANISH),
Instituto Espanol de Oceanografia, Palma de Mallorca (Spain). Coastal Lab.
For primary bibliographic entry see Field 5A.
W77-07588

BACTERIOLOGIC ANALYSIS IN THE AROSA, VIGO AND PONTEVEDRA ESTUARIES, (IN SPANISH),
For primary bibliographic entry see Field 5A.
W77-07589

SELF-PURIFICATION IN THE COASTAL WATERS OF THE BLACK SEA, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-07592

STUDY OF BACTERIA ASSOCIATED WITH THE REARING OF LARVAE OF MARINE BIVALVES, (IN FRENCH),
Universite de Bretagne-Occidentale, Brest (France). Laboratoire de Zoologie.
For primary bibliographic entry see Field 5C.
W77-07599

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PHENOL-SELECTIVE, HIGHLY RESISTANT RO-MEMBRANES MADE FROM PVA FOR THE PURIFICATION OF TOXIC INDUSTRIAL WASTES,
Erlangen-Nuremberg Univ. (West Germany). Institut fuer Technische Chemisches.
For primary bibliographic entry see Field 5D.
W77-07206

LARGE-SCALE REVERSE OSMOSIS PROCESSING OF METAL FINISHING RINSE WATERS,
Universal Oil Products Co., San Diego, Calif. Fluid Systems Div.
For primary bibliographic entry see Field 5D.
W77-07207

THE DESALTING AND RECYCLING OF WASTE WATERS FROM TEXTILE DYEING OPERATIONS USING REVERSE OSMOSIS,
Mansoura Univ. (Egypt). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5D.
W77-07220

BRACE RESEARCH INSTITUTE, ANNUAL REPORT, (1976),
Macdonald Coll. Montreal (Quebec). Brace Research Inst.
T. A. Lawand, and G. L. d'Ombrain.
Annual Report No. M32, August 1976. 53 p, 44 photo, 10 dwg.

Descriptors: *Research and development, *Energy, *Solar radiation, *Winds, Saline water, Desalination, Universities, Agriculture, Energy conservation, Energy budget, Irrigation water, Irrigation, Water quality, Irrigation engineering, Deserts, Arid climates, Arid lands, Tropical regions, Africa, Foreign countries, Canada, Geographical regions.
Identifiers: Solar energy.

The Brace Research Institute of McGill University concentrates its research on eliminating the salt content of sea water so that it may be used for irrigation, and on developing methods for making

desert or arid land available for agricultural purposes. The institute's annual report discusses its myriad research and development activities. For example, the principal thrust of the institute's overseas sector in the past year has been their role in the establishment of a Rural Energy Centre utilizing renewable energy resources in Senegal. The institute undertook a study on the possibility of meeting the village's basic energy requirements for cooking, some lighting, and water supply pumping through solar, wind, and biogas energies. Negotiations are pending with other underdeveloped countries for a program of similar activities. Due to its unique expertise in both solar and wind energy, and saline water conversion, the institute has played a major role as a consultant in the field of international technical collaboration. The institute disseminated a considerable number of do-it-yourself leaflets, plans and specifications of simple equipment for the conversion of natural energies to useful purposes. The institute also participated in the United Nations Habitat Conference, and demonstrated its new version of a solar steam cooker. (Moorhouse-Florida)
W77-07242

THE FEASIBILITY OF A WATER IMPORTATION PROJECT FOR SOUTH FLORIDA,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07259

3B. Water Yield Improvement

PARAMETERIZATION OF DEPOSITIONAL ICE GROWTH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2B.
W77-07171

PHYSICAL PROBLEMS OF WEATHER MODIFICATION,
Warsaw Univ. (Poland). Faculty of Geophysics.
K. E. Haman.
Hydrological Sciences Bulletin, Vol 21, No 4, p 587-602, December 1976. 19 ref, 1 append.

Descriptors: *Weather modification, *Cloud seeding, *Precipitation(Atmospheric), Cloud physics, Climatology, Evaluation, Artificial precipitation, Rain, Rainfall, Snow, Silver iodide, Storm structure, Storms, Clouds, Weather, Meteorology, Reviews.

There are many contrasting views on the success of experiments with weather modification. This paper reviewed a large number of studies, commencing with a summary of some of the pertinent problems in cloud physics and those leading to cloud modification. The report dealt with the techniques of modification such as the use of dry ice and silver iodide and gave details of the results of experiments with clouds of different types. The conclusion reached was that the result of methods of modification used at present are not sufficiently predictable to warrant their use commercially and that the results of most of the interesting studies have not been evaluated by sufficiently reliable methods. (Sims-ISWS)
W77-07357

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 1, TEXT OF REPORT,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
January 1977, 251 p. Edited by Patrick Squires. Bur Reclam 14-06-D-7000.

Descriptors: Atmospheric physics, Climates, Cloud physics, *Cloud seeding, Meteorology, *Weather modification, Silver iodide, *Nevada, California, *Precipitation(Atmospheric), Data collections, Instrumentation, Measurement, Networks.
Identifiers: Truckee River, *Pyramid Lake project.

A randomized cloud seeding project was carried out over an area of 1052 sq. mi. near Lake Tahoe for 3 winter-spring seasons. Six remotely controlled silver iodide generators were located on the upper western slopes of the Sierra Nevada, and precipitation was measured by means of 23 recording gauges and 54 non-recording gauges. A total of 132 experimental periods (corresponding to forecast synoptic scale storms) averaged some 35 hours in duration. The preliminary statistical analysis is based on a comparison of periods randomly assigned to be seeded, or not seeded, on a 50-50 basis. However, for a variety of reasons, seeding actually occurred for only about half the total hours assigned to be seeded. Thus, the effect of seeding can appear here only in a somewhat diluted form. The varying duration of experimental periods was taken into account by assuming a Gamma distribution of precipitation amounts, with the shape parameter a linear function of duration; the effect of seeding then appeared as a change in the scale parameter. By means of a forecast, storms were classified as heavy, moderate, light or marginal. The evidence for a positive seeding effect is not conclusive; however, the apparent effect or seeding all categories of storms was an increase of 16%. In the group comprising heavy and moderate storms, the apparent increase was 25%. If the true effect had been equal to this, the chance of detecting it, at the 5% significance level, would have been about 1 in 5. (See also W77-07567) (Bur Reclam)
W77-07566

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 2, APPENDICES,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
January 1977, 224 p. Edited by Patrick Squires. BuRec 14-06-D-7000.

Descriptors: Atmospheric physics, Climates, Cloud physics, *Cloud seeding, Meteorology, *Weather modification, *Silver iodide, *Nevada, California, Precipitation(Atmospheric), Data collections, Instrumentation, Measurement, Networks.
Identifiers: Truckee River, *Pyramid Lake project.

The fourteen appendices are entitled: Rare and Endangered Wildlife Species of the Lake Tahoe Region; Remote Controlled Mobile AgI Aerosol Generator; Observed or Actual Storm Periods, 1972-75; Typical Synoptic Examples of Sierra Nevada Storms; Total Seasonal Precipitation October 1 to May 31; Control Center Operations Summaries; Daily Record of Weather Modification Activities; Record Structure; Control Center Data; Non-Recording (True) Precipitation Measurements; Major Computer Programs Developed for Data Acquisition and Processing; Data Set 5; Precipitation Amounts for 11 Selected Stations; Data as Used in Analysis (d); and Sample Teletype Messages as Transmitted Between Desert Research Institute and Berkeley Statistical Laboratory. (See also W77-07566) (BuRec).
W77-07567

RECLAMATION RESEARCH IN THE SEVENTIES, SECOND PROGRESS REPORT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W77-07600

3C. Use Of Water Of Impaired Quality

BRACE RESEARCH INSTITUTE, ANNUAL REPORT, (1976),
Macdonald Coll. Montreal (Quebec). Brace Research Inst.
For primary bibliographic entry see Field 3A.
W77-07242

CONSUMPTIVE USE OF GROUND WATER,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07257

PROTEIN PRODUCTION BY RUSSIAN THISTLE: EFFECTS OF WATER AND NITROGEN ON PROTEIN YIELDS,
New Mexico State Univ., University Park. Dept. of Chemistry.
For primary bibliographic entry see Field 3F.
W77-07281

EFFECT OF THE PRESENCE OF SODIUM CHLORIDE IN THE MEDIUM ON GROWTH, DEVELOPMENT AND DISTRIBUTION OF CHLORINE AND SODIUM IN SORGHUM DOCHNA F., (IN FRENCH),
Ecole National Superieure Agronomique de Toulouse (France). Laboratoire de Physiologie Vegetale Appliquee's.
M. Garcia, P. Morard, and J. Berducou.
Bull Soc Hist Nat Toulouse 111(1/2), p 153-159, 1975.

Descriptors: *Sodium chloride, *Sorghum, Chlorine, Sodium, Salt tolerance, Irrigation, Growth rates, Root zone, Mineralogy.
Identifiers: Sorghum-Dochna.

Because of decreasing freshwater supplies, it was considered important to examine effects of using water with higher salt levels in irrigation. The plants were grown in hothouse conditions and varying amounts of NaCl were supplied. A dose of 6 meq/l was beneficial to plant growth. Stronger doses retarded growth, however. Large amounts of sodium accumulated in the roots, while C concentrations were higher in aerial parts, espcially the leaves. Levels of these elements in various plants parts was always related to the amount of NaCl in the nutrient solution.--Copyright 1977, Biological Abstracts, Inc.
W77-07291

WATER QUALITY AND AQUITARD PERMEABILITY,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-07551

3E. Conservation In Industry

LARGE-SCALE REVERSE OSMOSIS PROCESSING OF METAL FINISHING RINSE WATERS,
Universal Oil Products Co., San Diego, Calif. Fluid Systems Div.
For primary bibliographic entry see Field 5D.
W77-07207

WASTE WATER RECLAMATION SYSTEM UPS PRODUCTIVITY, CUTS WATER USE,
Beckman Instruments, Inc., Porterville, Calif.
For primary bibliographic entry see Field 5D.
W77-07210

LIBRARY U. OF I. URBANA-CHAMPAIGN

ULTRAFILTRATION OIL RECLAMATION PROCESS,
Chester Engineers, Inc., Coraopolis, Pa.
For primary bibliographic entry see Field 5D.
W77-07212

GREAT LAKES PAPER LAUNCHES FIRST CLOSED-CYCLE KRAFT PULP MILL.
For primary bibliographic entry see Field 5D.
W77-07218

A MINI-POLLUTION TANNERY,
Environmental Protection Agency, Kansas City, Mo. Region VII.
For primary bibliographic entry see Field 5D.
W77-07225

GEOTHERMAL POWER, THE 'SLEEPER' IN THE ENERGY RACE,
Magma-Thermal Power Project, Santa Rosa, Calif.
R. Lengquist, and F. Hirschfeld.
Mechanical Engineering, Vol. 98, No. 12, p 25-31, December, 1976.

Descriptors: *Geothermal studies, *Thermal powerplants, *Energy conversion, *Electric power production, Thermal water, Hot springs, Turbines, Generators, Electric power costs, Corrosion, Environmental effects, Hydrogen sulfide, California.
Identifiers: The Geysers Geothermal Power Plant, Pacific Gas and Electric Company, Sonoma County(California).

Although geologic understanding of geothermal energy is still in relative infancy, potential for the expanded use of this valuable resource is great, as is demonstrated by the Geysers Geothermal Power Plant in Sonoma County, California. Once a popular health resort, the Geysers area has undergone extensive development by private enterprise. The present electric plant has an installed capacity of 522 MW, with projected expansion to 1000 MW by 1980. Individual generating units of up to 110 MW are now in operation, with even larger units in the planning stages. Use of natural steam and the consequent elimination of boilers are the key factors in making the Geysers plant such an economical and simple operation. Both capital costs and operating costs compare favorably with those of installations fueled by other means, and it is estimated that the Geysers has saved 25 million bbl of fuel oil since 1960. Some environmental problems, notably H2S gas and well noise, have been encountered and largely corrected. Corrosion effects of the H2S are avoided by substituting aluminum, stainless steel, cast iron, and epoxy-coated asbestos cement for copper in piping and condenser lines and hardware. (Eberle-NWWA)
W77-07296

ELECTRIC POWER GENERATION FROM GEOTHERMAL HOT WATER DEPOSITS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 8C.
W77-07300

GEOTHERMAL ENERGY: NEEDED, EFFECTIVE HEAT TRANSFER EQUIPMENT,
International Society for Geothermal Engineering, Whittier, Calif.
For primary bibliographic entry see Field 8G.
W77-07301

GEOTHERMAL SYSTEMS AND POWER DEVELOPMENT,
Department of Scientific and Industrial Research, Auckland (New Zealand).
For primary bibliographic entry see Field 4B.
W77-07302

PHYSICAL MODELING OF COMBINED FORCED AND NATURAL CONVECTION IN WET GEOTHERMAL FORMATIONS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 4B.
W77-07303

WASTEWATER AND SLUDGE CONTROL IN THE CANADIAN METAL FINISHING INDUSTRY, SEGMENT INCLUDING CHEMICAL, ELECTROLYTIC TREATMENT; ELECTROCHEMICAL MACHINING AND POLISHING; CYANIDE HARDENING,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W77-07333

REVIEW OF TREATMENT TECHNOLOGY IN THE FRUIT AND VEGETABLE PROCESSING INDUSTRY IN CANADA.
Stanley Associates Engineering Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5D.
W77-07341

ASSESSMENT OF GEOTHERMAL RESOURCES OF THE UNITED STATES--1975.
Geological Survey, El Paso, Tex.; and Geological Survey, Albany, N.Y. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07476

GEOTHERMAL RESOURCES, A NEW LOOK,
For primary bibliographic entry see Field 4B.
W77-07477

PROCEEDINGS, WATER POLLUTION ABATEMENT TECHNOLOGY IN THE PULP AND PAPER INDUSTRY, (1975),
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W77-07562

3F. Conservation In Agriculture

PROTEIN PRODUCTION BY RUSSIAN THISTLE: EFFECTS OF WATER AND NITROGEN ON PROTEIN YIELDS,
New Mexico State Univ., University Park. Dept. of Chemistry.
J. H. Hageman, and J. L. Fowler.
Available from the National Technical Information Service, Springfield, VA, 22161 as PB-266 709, Price codes: A02 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Couces. Report No. 085, March 1977. 17 p, 14 tab, 9 ref. OWRT A-049-NMEX(2). 14-34-0001-6032.

Descriptors: *Forages, *Weeds, Plant growth, *Proteins, *Water requirements, Irrigation effects, Nutrient requirements, *Drought resistance, Productivity, Vegetation establishment, Nitrogen, Salt tolerance, *Nitrates, Crop production, New Mexico.
Identifiers: *Russian thistle, Salsola, Protein content, Water use efficiency.

The purpose was to determine whether Russian thistle (Salsola spp.) might have potential as either a protein source or a forage under conditions of restricted water. Salsola was chosen because it was reported to be a C4 plant which is efficient in water use, drought resistant, salt tolerant and because it had been used as a feed previously. In two seasons of field cultivation the following results were obtaind: (1) average percentage protein contents are 16% (range: 23-8.5%); (2) the protein is very well balanced with regard to amino acid content; (3) at water and nitrogen levels which provide maximal yields the nitrate content does not exceed 0.6% of dry weight; (4) the average percentage of crude fiber content (acid detergent fiber-acid detergent lignin) is 23% (range: 27%-16%); (5) average yield of above-ground dry matter for 1975, overall water and nitrogen treatments, was 7781 kg/ha; (6) the same yield figure for 1976 was 8645 kg/ha; (7) under optimal treatments yields greater than 10,000 kg/ha were obtained; and (8) with 35 cm total applied water and 112 kg/ha of nitrogen, conditions giving optimal yields, water use efficiency was 329 g water/g above-ground dry matter. These results compare favorably with alfalfa, which is the most widely grown forage in New Mexico. (Stockton- NMex State)
W77-07281

THE CHIEF DRILLER'S REPORT ON JCCIP,
Christian Organization for Relief and Rehabilitation, New York.
For primary bibliographic entry see Field 8C.
W77-07288

REDUCING POWER CONSUMPTION IN IRRIGATION SYSTEMS WITH THE AID OF A MATHEMATICAL MODEL FOR PIPE DIMENSIONING,
Academia de Studii Economice, Bucharest (Rumania). Dept. of Economic Cybernetics.
U. Berar, V. Ionescu, and R. Marinescu.
In: Economic Computation and Economic Cybernetic Studies and Research, No. 4, p 55-68, 1974. (Published in Rumania) 6 fig, 5 ref.

Descriptors: *Irrigation systems, *Pipes, *Optimization, Water supply, Pumping, Electric power, Flow, Pressure, Costs, Hydraulics, Dimensions, Computer models, Computer programs, Investment, Simulation analysis, Equations, Systems analysis.
Identifiers: Cost minimization, Sizing, Power minimization, Power consumption, Pipe diameter, Economic effects.

Presented is a mathematical model for the sizing of irrigation pipes (called antennae) by considering the simulation of the functioning conditions specific to these pipes. Calculated is the dimensioning of the antennae under real topographic conditions and under the conditions of flow and pressure characteristic of each case taken separately in the irrigation system. Derived is a solution for minimizing power and materials costs. The objective function is represented by the minimization of investments in the pipe and of costs of power to dissipate at some hydrants by eliminating to the maximum the use of pressure and/or flow limiters. The model allows the choice of diameters and materials after interchangeable catalogues. The calculus hypotheses taken into consideration are the same as in the case of the classical calculus, but laboratory research is also necessary for determining some possible minor phenomena yet unknown. (Bell Cornell)
W77-07547

WATER MOVEMENT IN SOIL FROM TRICKLE SOURCE,
Utah State Univ., Logan. Dept. of Agriculture and Irrigation Engineering.
For primary bibliographic entry see Field 2G.
W77-07550

SATURATED AND UNSATURATED FLOW TO PARALLEL DRAINS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W77-07552

SOLUTIONS TO GREEN-AMPT INFILTRATION EQUATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07553

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

BIBLIOGRAPHY AND INDEX OF NORTH DAKOTA WATER RESOURCES 1878-1970,
North Dakota Univ., Grand Forks.
For primary bibliographic entry see Field 10C.
W77-07140

WATER FLUX IN SOIL AND SUBSOIL ON A STEEP FORESTED SLOPE,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W77-07147

MISSOURI RIVER POWER CURVE REGRESSION EQUATIONS,
Missouri Univ., St. Louis. Dept. of Geology.
For primary bibliographic entry see Field 2E.
W77-07152

A RECONSIDERATION AND A GENERALIZATION OF LAWRANCE AND FIERING TWO-STATION MODELS,
Technical Univ. of Lisbon (Portugal). Dept. of Civil Engineering; and Lisbon Univ. (Portugal). Centre of Urban and Regional Systems.
For primary bibliographic entry see Field 2E.
W77-07157

FREE FLOW IMMEDIATELY BELOW SLUICE GATES,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-07161

HYDRAULIC JUMPS AND WAVES AT ABRUPT DROPS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-07163

FAR FIELD CIRCULATION VELOCITIES IN SHALLOW LAKES,
North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 2H.
W77-07164

INSTREAM FLOW REGIMENS FOR FISH, WILDLIFE, RECREATION AND RELATED ENVIRONMENTAL RESOURCES,
Fish and Wildlife Service, Billings, Mont.
For primary bibliographic entry see Field 5C.
W77-07192

EVOLUTION AND OBJECTIVES OF RIVER BASIN COMMISSIONS IN THE UNITED STATES,
Department of Justice, Washington, D.C. Land and Natural Resources Div.
For primary bibliographic entry see Field 6E.
W77-07249

SOME SUGGESTIONS FOR THE MANAGEMENT OF INTERNATIONAL RIVER BASINS,
New Mexico Univ., Albuquerque. School of Law.
For primary bibliographic entry see Field 6E.
W77-07250

FLORIDA STATUTES, CHAPTER 253--THE 1969 AMENDMENTS AND PROPOSED LEGISLATION,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07258

THE FEASIBILITY OF A WATER IMPORTATION PROJECT FOR SOUTH FLORIDA,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07259

PECOS RIVER COMPACT.
For primary bibliographic entry see Field 6E.
W77-07262

ARTESIAN WELLS AND STORAGE RESERVOIRS, AND WORKS CONNECTED THEREWITH.
For primary bibliographic entry see Field 6E.
W77-07263

APPROPRIATION OF WATER--PERMITS, CERTIFICATES AND LICENSES--SURVEY.
For primary bibliographic entry see Field 6E.
W77-07265

HYDROGEOLOGICAL APPLICATIONS OF EARTH RESOURCES TECHNOLOGY SATELLITE LANDSAT 1 IMAGERY,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7B.
W77-07339

MAINTENANCE DREDGING IN THE NEW ORLEANS DISTRICT, US ARMY CORPS OF ENGINEERS,
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 8D.
W77-07347

UTILIZATION OF THE RESULTS FROM REPRESENTATIVE AND EXPERIMENTAL BASINS WITH A VIEW TO THE MANAGEMENT OF WATER RESOURCES,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Hydrology Section.
J. A. Rodier.
Hydrological Sciences Bulletin, Vol 21, No 4, p 531-544, December 1967. 6 fig, 6 ref.

Descriptors: *Rainfall, *Runoff, *Watersheds(Basins), *Africa, Spatial distribution, Temporal distribution, Distribution patterns, Model studies, Mathematical models, Land use, Streams, Rivers, Precipitation(Atmospheric), Rainfall-runoff relationships, Permeability, Hydrologic cycle, Hydrology.
Identifiers: *Sahel(Africa), *Congo(Africa).

The management of water resources requires knowledge of the spatial and temporal distribution of surface and groundwater resources and an assessment of the influence of man on the hydrological regime. For small water courses, regional estimates can be made from representative basins which offer guidelines (1) for the computation of mean annual flow and in some cases for the determination of the statistical distribution of the annual flows; and (2) for the computation of the 10-yr flood maximum discharge and volume. An example concerning the tropical African Sahel was given. From a general study of the daily precipitation, a simple rainfall/runoff model used on a daily basis and calibrated on data from representative basins, and the direct comparison of results from 55 representative basins, statistical distribution curves were established for annual runoff based on mean annual precipitation and the geomorphological characteristics of the basins. Another example concerning tropical Africa west of Congo presented a methodology for the computation of the 10-yr flood (maximum discharge and volume). The systematic study of 60 representative basins makes it possible to plot the runoff coefficient R/P as a function of basin climate, mean slope, and soil permeability. Other curves are used to determine the time of rise and the base time of the hydrograph as a function of the basin area and the mean slope. The experimental basin is a good tool for the assessment of the influence of man on hydrological parameters. An example showed the influence of land use on the regression between annual precipitation and annual runoff. (Sims-ISWS)
W77-07355

SIMULATION OF A SERIES OF DAILY AREAL MEAN RAINFALLS FOR A BASIN USING RAINFALL OBSERVATIONS AT A REFERENCE STATION LOCATED OUTSIDE THE BASIN,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
For primary bibliographic entry see Field 2B.
W77-07356

REGIONAL STUDY OF THE UPPER BASIN OF THE AAR FROM ITS SOURCES TO BERN: PROFILE OF FLOODS OF A GIVEN RETURN PERIOD AT ANY POINT ON THE RIVER (ETUDE REGIONALE DU BASSIN SUPERIEUR DE L'AAR DE SES SOURCES JUSQU'A BERNE: PROFILE DES CRUES DE PERIODE DONNEE LE LONG DU COURS D'EAU).
Ecole Polytechnique Federale de Lausanne (Switzerland).
For primary bibliographic entry see Field 2E.
W77-07358

PREDICTABILITY OF EFFECTS OF A SEVERE LOCAL STORM IN PENNSYLVANIA,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2B.
W77-07369

A BIBLIOGRAPHY OF SOVIET LITERATURE ON FRESHWATER HYDROBIOLOGY AND RELATED PROBLEMS FOR 1975: PART 21, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-07402

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO. 2, REGRESSION OF MEAN ANNUAL FLOWS ON PHYSIOGRAPHIC PARAMETERS,
Department of the Environment, Vancouver (British Columbia). Inland Water Directorate (Pacific Region); and Department of the Environment, Vancouver (British Columbia). Water Resource Branch.
For primary bibliographic entry see Field 2E.
W77-07434

LAKE RESTORATION THROUGH MECHANICAL HARVESTING OF AQUATIC VEGETATION,
For primary bibliographic entry see Field 5G.
W77-07451

LIBRARY U. OF I. URBANA-CHAMPAIGN

EFFECTS OF THE CATASTROPHIC FLOOD OF DECEMBER 1966, NORTH RIM AREA, EASTERN GRAND CANYON, ARIZONA,
Geological Survey, Cheyenne, Wyo. Water Resources Div.; Geological Survey, Tucson, Ariz.; and Prescott Coll., Ariz.
For primary bibliographic entry see Field 2E.
W77-07480

APPARENT REGIONAL SKEW,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.; and Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-07484

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07491

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07492

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70--PART 15. ALASKA.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07493

TECHNIQUES FOR ESTIMATING FLOW CHARACTERISTICS OF WYOMING STREAMS,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
H. W. Lowham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 224/As, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 76-112, November 1976. 83 p, 31 fig, 4 tab, 27 ref.

Descriptors: *Flood forecasting, *Flow characteristics, *Peak discharge, *Channel morphology, *Wyoming, Analytical techniques, River basins, Streamflow, Flow rates, Flood data, Historic floods, Regression analysis.

This report presents relations for estimating peak flows and mean annual flow characteristics are: (1) The Channel-geometry method, whereby flow characteristics are related to channel dimensions; and (2) the basin-characteristics method, whereby flow characteristics are related to physiographic and climatic features of the drainage basin. Development of the channel-geometry method showed channel width to be the most significant channel dimension for estimating flow characteristics. Use of this method requires a field measurement of channel width. Development of the basin-characteristics method showed drainage-area size to be the most significant basin feature for estimating streamflow. In the mountainous areas, basin elevation also affect streamflow. Because these basin features can be determined from maps, this method does not require a visit to the site. (Woodard-USGS)
W77-07495

EVALUATION OF FLOOD FORECASTING-RESPONSE SYSTEMS,
Princeton Univ., N.J. Dept. of Civil Engineering.
M. Sniedovich, and D. R. Davis.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings Paper No. 12937, p 83-97, May 1977. 1 fig, 5 tab, 19 ref.

Descriptors: *Flood forecasting, *Flood damage, *Warning systems, *Systems analysis, *Evaluation, Decision making, Efficiency, Responses, Rivers, Probability, Optimization, Forecasting, Measurement, Equations, Mathematical models.
Identifiers: *Decision theory, Probability theory.

When the objective of operating a flood forecasting-response system is to reduce damage caused by flooding, rather than to provide 'accurate and timely' flood forecasts, improvements and changes to the system must be evaluated considering all components of the system and their interactions. For this purpose, a methodology is presented which considers the following components of the system: (1) the hydrometric system; (2) the forecasting model; (3) the dissemination system; and (4) the decision model used by the floodplain dweller and his protective system. Quantification is accomplished by a mathematical model that enables flood forecasing systems to be evaluated on the basis of expected reduction in damage due to the use of the system. Uncertainties in the forecast are handled in a decision theoretic manner that enables the calculation of an optimal response to a forecast. Comparison of optimal and nonoptimal responses illustrates the importance of considering the response when examining the effectiveness of flood forecasts. (Bell-Cornell)
W77-07524

PUMPED STORAGE OPTIMIZATION IN GENERATION SYSTEMS,
Natal Univ., Durban(South Africa). Dept. of Civil Engineering.
J. S. Windsor.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12946, p 99-109, May 1977. 4 fig, 8 ref.

Descriptors: *Pumped storage, *Powerplants, *Optimization, *Electric power production, Economic efficiency, Computer programs, Water resources, Equations, Mathematical models, Operations research, Planning.
Identifiers: Cost minimization, Systems engineering, Economic analysis, *Mixed integer programming.

Presented is a methodology which has particular reference to the integration of pumped-storage schemes into expanding electric-power systems. The model is based on an interpretation of the transshipment problem, and employs mixed integer programming to determine the minimum cost strategy for future investments and operating costs. The advantage of this approach is that it explicitly recognizes the system as consisting of a set of interacting subsystems which are coupled in space and time and which are operated under a single management unit. It also accounts for the economies of scale associated with the cost of building and operating the electric power facilities.(Bell-Cornell)
W77-07525

PUBLIC PARTICIPATION IN WATER RESOURCE DEVELOPMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydr. lab.
For primary bibliographic entry see Field 6B.
W77-07526

GAINS FROM JOINT OPERATION OF MULTIPLE RESERVOIR SYSTEMS,
Johns Hopkins Univ., Baltimore, Mo. Dept. of Geography and Environmental Engineering.
R. M. Hirsch, J. L. Cohon, and C. S. ReVelle.
Water Resources Research, Vol. 13, No. 2, p 239-245, April 1977. 5 fig, 2 tab, 9 ref, 1 appen.

Descriptors: *Water resources, *Reservoir operation, *Safe yield, Water supply, Costs, Design, Simulation analysis, Methodology, Optimization, Flow, Stochastic processes, Operations research, Equations, Mathematical models.
Identifiers: *Synergism, *Joint operation, *Operating rule, Cost minimization, LaGrange multiplier, Sizing.

Synergistic gains are defined as the gains in benefits due to joint operation of a system of reservoirs in excess of the benefits from optmal individual operation. These gains are a result of both the deterministic (regional) and the stochastic diversity of flows into each of the reservoirs. They are captured by the use of flexible reservoir operating rules which base release decisions for a given reservoir on the state of the entire system not just on the state of that reservoir. Discussed are safe yield of independently operated reservoirs and of a system of jointly operated reservoirs using simulation. One possible operating rule is formulated and is demonstrated to be highly effective in capturing synergistic gains. A hypothetical design problem of sizing three water supply reservoirs in parallel at least cost is solved by three methods. The first method, using LaGrange multipliers, assumes that no synergistic gains are achievable. The second and third methods recognize the existence of such gains. The method recommended here incorporates the operating rule into the design process and makes use of the observation that the system yield is a function of system capacity. (Bell-Cornell)
W77-07533

THE ECONOMIC BASIS OF RESOURCE INFORMATION SYSTEMS: THE CASE OF STREAMFLOW DATA NETWORK DESIGN,
Geological Survey, Reston, Va. Geologic Div.
For primary bibliographic entry see Field 7A.
W77-07534

RELIABILITY-CONSTRAINED DYNAMIC PROGRAMING AND RANDOMIZED RELEASE RULES IN RESERVOIR MANAGEMENT,
Worcester Polytechnic Inst., Mass. Dept. Civil Engineering.
L. A. Rossman.
Water Resources Research, Vol. 13, No. 2, p 247-255, April 1977. 2 fig, 5 tab, 20 ref.

Descriptors: *Reservoir operation, *Reservoir releases, *Stochastic processes, *Dynamic programming, Management, Reliability, Constraints, Optimization, Benefits, Methodology, Water policy, Reservoir storage, Annual, Probability, Equations, Model studies, Systems analysis.
Identifiers: Benefit maximization, Lagrangian duality theory, Release rules, Branch and bound procedure, Chance-constrained dynamic programming, Duality gaps.

A stochastic dynamic programming model for determining reservoir release rules which maximize expected net benefits subject to reliability constraints on system performance is presented within the framework of Lagrangian duality theory. The approach characterizes optimal release rules under discounting of benefits and being nonstationary. It also indicates when there exists a randomized rule which dominates the optimal deterministic rule. The methodology for obtaining these rules uses dual optimization to provide bounds on the optimal solution and a branch and bound procedure to resolve any duality gap which may occur if the bounds are not equal. The model is applied to a group of hypothetical

problems for which nonoptimal policies had previously been found by using chance-constrained dynamic programming. The approach presented is applicable to problems with several reliability constraints which limit the expected number of occurrences of chance events over the life of the system. (Bell-Cornell)
W77-07535

RESERVOIR OPERATION UNDER CONFLICTING OBJECTIVES,
Politecnico di Milano (Italy). Instituto di Elettrotecnica ed Elettronica.
G. Fronza, A. Karlin, and S. Rinaldi.
Water Resources Research, Vol. 13, No. 2, p 296-302, April 1977. 5 fig, 4 tab, 27 ref.

Descriptors: *Reservoir operation, *Multiple-purpose reservoirs, *Optimization, *Decision making, Simulation analysis, Lakes, Algorithms, Monthly, Economics, Equations, Mathematical models, Systems analysis.
Identifiers: *Game theory, Conflicting objectives, Operating rules, Benefit maximization.

The problem of determining the optimal operation of a monthly regulated two-purpose reservoir is discussed. A basic assumption is made about the decision-making structure of the system in the sense that the operation is not assumed to result from a supervisor's choice but from the users' trade-off. The solution to the problem is found using a game theory approach in both the noncooperative and the cooperative situations. In both cases, under reasonble additional hypotheses about the economic context of the system it is possible to find a solution to the game. Such a solution can be found by means of an efficient search algorithm to be run easily on a computer. Discussed first are the decision variables, the assumptions about the economy, and the decision-making structure of the system. Considered next is the problem solution; the shapes of the feasible regions of the optimization problems presented are examined, and both the noncooperative case and the cooperative case are considered. Summarized are the results of a simulation carried out with data taken from the Lake Maggiore system in northern Italy. A basic criticism is made of use of the game theory approach to solve the problem of operating a reservoir in the presence of two decision makers. The game theory postulates a 'rational behavior' of the players as well as the existence of an accepted or imposed bargain rule. (Bell-Cornell)
W77-07536

CAPACITY EXPANSION AND OPERATIONAL PLANNING FOR REGIONAL WATER-RESOURCE SYSTEMS,
General Motors Corp., Cleveland, Ohio. Fisher Body.
For primary bibliographic entry see Field 6B.
W77-07538

SATURATED AND UNSATURATED FLOW TO PARALLEL DRAINS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs, and Y-K. Tang.
Journal of the Irrigation and Drainage Division, Proceedings of the Society of American Civil Engineers, Vol. 102, No. IR2, Proceedings paper No. 12199, p 221-238, June 1976. 14 fig, 19 ref.

Descriptors: *Drains, *Drainage, *Unsaturated flow, *Groundwater, Porosity, Equations, Numerical analysis, Effects, Design, Drawdown, *Saturated flow.
Identifiers: Field investigations, Transient flow, Richards equation, Boussinesq equation.

Richards equation for transient two-dimensional flow during drainage was solved using numerical methods and the solutions compared to solutions of the more approximate Boussinesq equation. The effect of field variability of the soil properties on solutions to the Richards equation was also examined. For the cases studied, the hydraulic head distributions predicted by the Richards equation were in general agreement with the D-F assumptions except for times near t = 0. Convergence near drainage ditches is more critical immediately after drainage begins than for latter times. It results in a surface of seepage for ditches and water standing over the drain for drain tubes. When convergence near the drain is accounted for, solutions to the Boussinesq equation can be used to adequately predict drawdown for design purposes. Unless enough measurements are made to define field-effective values of the unsaturated soil-water properties, there is little to be gained by solving the Richards equation rather than using simpler approximate methods for drawdown prediction. (Bell-Cornell)
W77-07552

SOLUTIONS TO GREEN-AMPT INFILTRATION EQUATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R-M. Li, M. A. Stevens, and D. B. Simons.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. IR2, Proceedings paper No. 12196, p 239-248, June 1976. 1 fig, 1 tab, 14 ref.

Descriptors: *Irrigation, *Surface waters, *Approximation method, Hydrology, Flow, *Infiltration, Mathematics, Nonlinear differential equations, Darcys Law.
Identifiers: Nonlinear differential equations, Errors.

The simple method of solving the Green-Ampt one-dimensional infiltration equations developed from Darcy's law are proposed for practical applications. The explicit solution is an approximation obtained by employing a power series expansion of the logarithmic term. The maximum error resulting from applying this simple explicit solution is 8%. The implicit 'exact' solution is obtained by refining the explicit solution using the second-order Newton method. The maximum error resulting from employing the implicit solution is 0.003%. These new methods have advantages over other existing solutions in that they are derived from the theory of mathematics and the errors due to approximation can be evaluated theoretically. Moreover, the two methods are simple and easy to use either with a desk calculator or in a digital computer, and they are applicable without limitation on ranges. (Bell-Cornell)
W77-07553

4B. Groundwater Management

NITRATE IN GROUND WATER AND ITS RELATION TO FERTILIZATION, (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
For primary bibliographic entry see Field 5B.
W77-07112

BIBLIOGRAPHY AND INDEX OF NORTH DAKOTA WATER RESOURCES 1878-1970,
North Dakota Univ., Grand Forks.
For primary bibliographic entry see Field 10C.
W77-07140

NITROGEN CONTAMINATION SOURCES IN SHALLOW GROUND WATER, LAS VEGAS AREA, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 5B.
W77-07141

TYPE CURVES FOR ANALYSIS OF PUMP TESTS IN LEAKY STRIP AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2F.
W77-07145

FINITE-ELEMENT ANALYSIS OF GROUNDWATER FLOW IN MULTIAQUIFER SYSTEMS, I. THE BEHAVIOR OF HYDROLOGICAL PROPERTIES IN AN AQUITARD WHILE BEING PUMPED,
Kyoto Univ. (Japan). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W77-07148

INTERCONNECTION OF SURFACE AND UNDERGROUND WATER RESOURCES IN SOUTHEAST DURHAM,
Teesside Polytechnic, Middlesborough (England). Dept. of Civil and Structural Engineering.
T. Cairney, and L. Hamill.
Journal of Hydrology, Vol. 33, No. 1/2, p 73-86, March 1977. 7 fig, 2 tab, 5 ref, 1 append.

Descriptors: *Rivers, *Aquifers, *Groundwater recharge, Flow, Streamflow, Base flow, Groundwater, Surface waters, Rainfall, Runoff, Hydrographs, Watersheds(Basins), Mine water, Coal mines, Recharge, Water levels, On-site investigations, Foreign research, Foreign countries, Hydrology.
Identifiers: *England, *River Skerne.

The River Skerne and the Underlying Magnesian Limestone have been regarded as essentially separate water resources. The present study indicated that this view is incorrect and that groundwater exploitation from the Magnesian Limestone is progressively inducing River Skerne flows to recharge the aquifer. (Sims-ISWS)
W77-07149

SPECIFIC YIELD DETERMINATIONS FROM A CONSOLIDATED SANDSTONE AQUIFER,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 2F.
W77-07153

APPLICATION OF NITROGEN-ISOTOPE STUDIES TO HYDROLOGY AND HYDROGEOLOGY--ANALYSIS OF THE PECULIAR CASE OF THE MELARCHEZ BASIN (SEINE-ET-MARNE, FRANCE) (APPLICATION DE L'ETUDE ISOTOPIQUE DE L'AZOTE EN HYDROLOGIE ET EN HYDROGEOLOGIE--ANALYSE DES RESULTATS OBTENUS SUR UN EXEMPLE PRECIS: LE BASSIN DE MELARCHEZ (SEINE-ET-MARNE, FRANCE)),
Centre National de la Recherche Scientifique, Paris (France). Laboratoire de Geologie Dynamique.
For primary bibliographic entry see Field 5B.
W77-07154

A LIGHT-WEIGHT AND CHEAP DEPTH SAMPLER,
Teesside Polytechnic, Middlesborough (England).
For primary bibliographic entry see Field 5A.
W77-07155

CALCULATION OF THE LEAKY AQUIFER FUNCTION,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-07156

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LEACHING CHARACTERISTICS OF POLLUTED DREDGINGS,
Hayward Baker Co., Odenton, Md.
For primary bibliographic entry see Field 5B.
W77-07158

LOCATION OF FREE SURFACE IN POROUS MEDIA,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W77-07162

BRACE RESEARCH INSTITUTE, ANNUAL REPORT, (1976),
Macdonald Coll. Montreal (Quebec). Brace Research Inst.
For primary bibliographic entry see Field 3A.
W77-07242

CONSUMPTIVE USE OF GROUND WATER,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07257

ARTESIAN WELLS AND STORAGE RESERVOIRS, AND WORKS CONNECTED THEREWITH.
For primary bibliographic entry see Field 6E.
W77-07263

APPROPRIATION OF WATER--PERMITS, CERTIFICATES AND LICENSES--SURVEY.
For primary bibliographic entry see Field 6E.
W77-07265

ENTEROVIRUS AND BACTERIOPHAGE INACTIVATION IN SUBSURFACE WATERS AND TRANSLOCATION IN SOIL,
New Mexico State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W77-07283

THE CHIEF DRILLER'S REPORT ON JCCIP,
Christian Organization for Relief and Rehabilitation, New York.
For primary bibliographic entry see Field 8C.
W77-07288

GEOLOGISTS CLAIM HEALTH CAN BE TRACED TO ROCKS,
For primary bibliographic entry see Field 5B.
W77-07290

DEEP WELLS FOR DEWATERING OFFER REAL ADVANTAGES, PART I.
For primary bibliographic entry see Field 8B.
W77-07294

DEEP WELL INJECTION: SWEEPING THE PROBLEM UNDER THE CARPET,
For primary bibliographic entry see Field 5G.
W77-07295

GEOTHERMAL POWER, THE 'SLEEPER' IN THE ENERGY RACE,
Magma-Thermal Power Project, Santa Rosa, Calif.
For primary bibliographic entry see Field 3E.
W77-07296

ELECTRIC POWER GENERATION FROM GEOTHERMAL HOT WATER DEPOSITS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 8C.
W77-07300

GEOTHERMAL ENERGY: NEEDED, EFFECTIVE HEAT TRANSFER EQUIPMENT,
International Society for Geothermal Engineering, Whittier, Calif.
For primary bibliographic entry see Field 8G.
W77-07301

GEOTHERMAL SYSTEMS AND POWER DEVELOPMENT,
Department of Scientific and Industrial Research, Auckland (New Zealand).
A. J. Ellis.
American Scientist, Vol. 190, No. 5, p 510-521, September, 1975. 6 fig, 2 tab, 43 ref.

Descriptors: *Geothermal studies, *Thermal power, *Electric power generation, Geysers, Hot springs, Convection, Steam, Dissolved solids, Brines, Environmental effects, Brine disposal, Remote sensing.
Identifiers: Crustal plate divergence, Crustal plate subduction.

Although hot springs are found throughout the world, geothermal systems with water temperatures above 100 degrees C within 1-2 km of the surface are limited to scattered areas, generally areas of crustal plate divergence or subduction. Geothermal water and steam vary greatly throughout the world with respect to temperature and proportion of dissolved solids and gases. Aerial infrared surveys, geochemical analysis, and electrical resistivity surveys are useful techniques for assessing and delineating geothermal fields, while test drilling remains the only real check of actual production capabilities. Only a few large geothermal power stations exist today, most of which operate in fields with temperatures exceeding 220 degrees C. Relative inefficiency of geothermal energy conversion and problems with disposal of spent effluent brines make it unlikely that developed countries will make extensive use of this resource in the future, although developing countries in the Pacific Basin and in Latin America will probably find it invaluable. Future applications of downhole heat exchange equipment will alleviate much of the disposal problem. A few unusual and highly efficient industrial uses of geothermal sources in New Zealand and Iceland combine power generation with direct steam or hot water utilization of the waste fraction. (Eberle-NWWA)
W77-07302

PHYSICAL MODELING OF COMBINED FORCED AND NATURAL CONVECTION IN WET GEOTHERMAL FORMATIONS,
California Univ., Berkeley. Lawrence Berkeley Lab.
V. E. Schrock, and A. D. K. Laird.
ASME Journal of Heat Transfer, Vol. 98, No. 2, p 213-220, May, 1976. 12 fig, 17 ref, append.

Descriptors: *Geothermal studies, *Heat flow, *Convection, Water circulation, Water temperature, Energy transfer, Thermal water, Thermal power, Porous media, Injection, Groundwater recharge, *Model studies.
Identifiers: *Wet geothermal systems.

Wet geothermal formations or reservoirs are of great current interest as a new energy source. Because of very high concentrations of dissolved solids in most geothermal waters, reinjection of geothermal water after energy has been extracted will be practiced in many cases. Optimum locations of producing and injection wells can only be determined with a knowledge of heat and mass flow within the reservoir. In this study, experiments were performed on the combined effects of forced and natural convection in a liquid-saturated porous medium in a system intended to simulate a wet geothermal system. Flow patterns inferred by temperature field measurements reveal a natural convection effect that develops slowly and is most pronounced when the source flow is low and the temperature difference is large. Results will be useful as a first step toward developing the capability to physically model wet geothermal systems. (Eberle-NWWA)
W77-07303

HYDROGEOLOGICAL APPLICATIONS OF EARTH RESOURCES TECHNOLOGY SATELLITE LANDSAT 1 IMAGERY,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7B.
W77-07339

UTILIZATION OF THE RESULTS FROM REPRESENTATIVE AND EXPERIMENTAL BASINS WITH A VIEW TO THE MANAGEMENT OF WATER RESOURCES,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-07355

EFFECTS OF MAN'S ACTIVITIES ON GROUNDWATER QUALITY,
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
For primary bibliographic entry see Field 5B.
W77-07359

ANTHROPOGENICALLY REDUCED GROUND WATERS,
Coblenz Federal Inst. of Hydrology (West Germany).
For primary bibliographic entry see Field 5B.
W77-07360

INORGANIC CONTAMINANTS IN RURAL DRINKING WATERS,
South Carolina State Coll., Orangeburg. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-07372

A STUDY OF ENVIRONMENT SANITATION ON THE WELLS IN JUNGNEUNG-DONG AREA, SEOUL, (IN KOREAN),
Korea Univ., Seoul. Coll. of Medicine.
For primary bibliographic entry see Field 5B.
W77-07475

ASSESSMENT OF GEOTHERMAL RESOURCES OF THE UNITED STATES--1975.
Geological Survey, El Paso, Tex.; and Geologic Survey, Albany, N.Y. Water Resources Div.
Available from U S Geological Survey, Reston VA 22092. Circular 726, 1975. 155 p, 16 fig, 28 tab, 6 ref, append. D. F. White and D. L. Williams, Editors.

Descriptors: *Geothermal studies, *Thermal springs, *Steam, *Energy transfer, *Electric power, Convection, Hydrogeology, Heat flow, Thermal properties, Evaluation, Supply, *United States.
Identifiers: *Geothermal energy, *Geothermal resources(USA).

This assessment of geothermal resources of the United States consists of two major parts: (1) estimates of total heat in the ground to a depth of 1 km and (2) estimates of the part of this total heat that is recoverable with present technology, regardless of price. No attempt has been made to consider most aspects of the legal, environmental and institutional limitations in exploiting these resouces. In general, the average heat content of rocks is considerably higher in the Western United

States than in the East. This also helps to explain why the most favorable hydrothermal convection systems and the hot young igneous systems occur in the West. Resources of the most attractive identified convection systems (excluding national parks) with predicted reservoir temperatures above 150 deg C have an estimated electrical production potential of about 8,000 megawatt century, or about 26,000 megawatt for 30 years. Assumptions in this conversion are: (1) one-half of the volume of the heat reservoirs is porous and permeable, (2) one-half of the heat of the porous, permeable parts is recoverable in fluids at the wellheads, and (3) the conversion efficiency of heat in wellhead fluids to electricity ranges from about 8 to 20 percent, depending on temperature and kind of fluid (hot water or steam). The estimated overall efficiency of conversion of heat in the ground to electrical energy generally ranges from less than 2 to 5 percent, depending on type of system and reservoir temperature. (See also W77-07477) (Woodard-USGS)
W77-07476

GEOTHERMAL RESOURCES, A NEW LOOK,
A. L. Hammond.
Science, Vol. 190, No. 4212, p 370, October 24, 1975.

Descriptors: *Thermal power, *Electric power production, *Geothermal studies, Thermal water.
Identifiers: Magma chambers, Geopressured zones.

A recent assessment by the USGS (Circular 726) (See W77-07476) underlines how limited current use of geothermal energy potential is in this country. The report provides conservative estimates to the effect that an electric generating capacity of 12000 megawatts, 15 times the current U.S. output from geothermal sources, could be achieved at present energy prices and with current technology. Nearly 10 times that resource either remains to be discovered or awaits improved technology for its exploitation. Main interest at present is in geothermal deposits in which heat is transferred by hydrothermal convection. As with mineral resources, much geothermal heat seems to concentrate in a few large deposits, with some particularly outstanding areas located in California, New Mexico, and the Bruneau-Grandview area of Idaho. Geologically recent magma chambers and the geopressured zone of the Texas-Louisiana gulf area hold promise for the future as drilling and well technology advance with respect to tapping high temperature and high pressure sources, and as energy prices increase. (Eberle-NWWA)
W77-07477

PRELIMINARY MAPS SHOWING GROUNDWATER RESOURCES IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07478

ANALOG-MODEL ANALYSIS OF REGIONAL THREE-DIMENSIONAL FLOW IN THE GROUND-WATER RESERVOIR OF LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-07479

MAJOR AQUIFERS IN DEUEL AND HAMLIN COUNTIES, SOUTH DAKOTA,
Geological Survey, Vermillion, S. Dak. Water Resources Div.
J. Kume.
South Dakota Geological Survey, Vermillion, Information Pamphlet No 11, 1976. 4 p, 5 fig.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water quality, Water wells, Water yield, Pumping, Water utilization, Aquifer systems, *South Dakota.
Identifiers: Deuel and Hamlin Counties(S Dak).

Four major glacial sand and gravel outwash aquifers underlie about 50 square miles, are generally less than 20 feet and may yield from 50 to 150 gallons per minute (gpm) to domestic, stock, and public-supply wells. The water in the aquifer is fresh and a calcium bicarbonate type. The Big Sioux aquifer underlies about 180 square miles, averages about 30 feet in thickness, and may yield as much as 1,000 gpm to domestic, stock, irrigation, and public-supply wells. The water in the aquifer is fresh and varies from a calcium bicarbonate to a calcium sulfate type in different areas. The Prairie Coteau aquifer occurs throughout most of Deuel and Hamlin Counties. The combined thicknesses of sand and gravel beds encountered in test holes ranged from 3 to 144 feet. This aquifer may yield as much as 250 gpm to domestic, stock, and irrigation-supply wells. The water in the aquifer is slightly saline and varies from a calcium sulfate to a calcium bicarbonate type in different areas. The Altamont aquifer underlines about 800 square miles, averages about 35 feet in thickness, and may yield as much as 500 gpm to stock wells. The water in this aquifer is slightly saline and varies from a sodium sulfate to a calcium sulfate type in different areas. The Dakota aquifer, the major bedrock aquifer, is composed of fine- to medium-grained sandstone which is from 60 feet to as much as 113 feet thick. The water is of poor quality for domestic use and certain other uses. It is moderately saline and of a sodium sulfate type. (Woodard-USGS)
W77-07483

GROUND-WATER LEVELS IN MASSACHUSETTS, 1936-74,
Geological Survey, Boston, Mass. Water Resources Div.
A. Maevsky.
Massachusetts Dept. of Public Works, Boston, Hydrologic-Data Report No 17, 1976. 107 p, 2 figs, 2 tab.

Descriptors: *Observation wells, *Water levels, *Groundwater, *Water temperature, *Massachusetts, Well data, Sites, Aquifers, Water level fluctuations, Hydrographs.

Water-level data collected from 87 observation wells in Massachusetts between 1936 and 1974 are presented. The data are in tabular and graphic forms. Also included are locations and descriptions of the wells and ground-water temperatures. (Woodard-USGS)
W77-07485

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1973-77,
Geological Survey, Lakewood, Colo. Water Resources Div.
T. J. Major, R. G. Borman, and K. D. Vaught.
Open-file report 77-160, February 1977. 30 p, 2 fig, 1 tab.

Descriptors: *Water level fluctuations, *Water wells, *Irrigation wells, *Colorado, Basic data collections, Water levels, Well data, Aquifers, Water utilization, Great Plains.
Identifiers: *Northern high plains(Colo).

Water-level measurements were made in more than 600 wells during January 1977 in the northern High Plains of Colorado which includes about 9,500 square miles. Most of these wells were irrigation wells, but several stock and government-owned wells were also measured, especially in areas where there is little irrigation. Changes in water levels from January 1976 to January 1977 ranged from a rise of about 12 feet (3.7 meters) to a decline of about 10 feet (3 meters), both of which occurred in Kit Carson County. Measurements for the four preceding winters also are included to serve as references illustrating declining or rising water levels. (Woodard-USGS)
W77-07486

CHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07487

CONVECTIVE HEAT FLOW FROM HOT SPRINGS IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07488

GEOCHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07489

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07491

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07492

MANAGEMENT MODEL FOR GROUND WATER DEVELOPMENT,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
R. Willis, and B. A. Newman.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12953, p 159-171, May 1977. 1 fig, 3 tab, 29 ref.

Descriptors: *Groundwater resources, *Aquifers, *Mathematical models, *Water management(Applied), *Optimization, Water supply, Economic efficiency, Water demand, Long-term planning, Finite element analysis, Flow, Control, Wells, Pumping, Equations, Systems analysis, Linear programming, Algorithms, Water resources development.
Identifiers: Control theory, Management systems, Cost minimization.

A mathematical model for the optimal dynamic management of regional groundwater supply resources is presented. The model, predicated upon a Galerkin finite element formulation of flow in heterogeneous anisotropic porous media, allows management decisions to be made regarding; (1) the possible well development sites within the

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ground water basin; and (2) the optimal pumping rates needed to meet an exogenous water demand in each planning period. The planning model minimizes the total discounted operational costs over the planning horizon. The algorithm solves a succession of linear programming problems obtained by linearizing the concave objective function using a generalized Taylor series expansion about an initial feasible decision vector. The management problem, structured as a problem in optimal control, is solved using Tui's concave programming algorithm. Results indicate the effectiveness of the model for the planning and development of ground-water resources. (Bell-Cornell)
W77-07529

WATER QUALITY AND AQUITARD PERMEABILITY,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-07551

SATURATED AND UNSATURATED FLOW TO PARALLEL DRAINS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W77-07552

THE CHANGES IN INORGANIC NITROGEN CONCENTRATION OF DRINKING WATER FROM WELLS OVER A TWO YEAR PERIOD IN ANI-MACHI, IBARAKI PREFECTURE, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W77-07570

4C. Effects On Water Of Man's Non-Water Activities

OBSERVATIONS ON A PEAT BOG'S ABILITY TO WITHSTAND INCREASING PUBLIC PRESSURE,
University of Wales Inst. of Science and Technology, Cardiff.
For primary bibliographic entry see Field 5C.
W77-07139

FIRE EFFECTS ON WATER SUPPLY, FLOODS, AND SEDIMENTATION,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
H. W. Anderson.
In: Proceedings Conference on Fire Ecology of the Pacific Northwest, Portland, Oregon, October 16-17, 1974, Oregon State U., Univ. Washington. Tall Timbers No. 15, p 249-260, 1976. 30 ref.

Descriptors: *Water supply, Streamflow, *Water quality, Sedimentation, Suspended sediment, Erosion, Floods, *Forest fires, *Burning, Mountain forests, Watersheds(Basins), Wood wastes, Soil physical properties, Forest management, Aquatic habitats, Stream chemistry, Ion transport, Nutrients, Forest ecology, Lumbering, *Pacific Northwest US.
Identifiers: *Fire hazard reduction, *Prescribed burning, Wildfires, Fuel breaks, Experimental forests, Multivariate analysis.

In the northwestern United States, forest fires and slash burning after logging have had striking hydrologic effects on timbered watersheds. Water quality has been altered, with turbidity increased by 4 to 67 times-- more than 80 ppm; summertime stream temperature raised by 13 to 16 degrees F., and stream oxygen content reduced to a degree deleterious to fish. Streamflow and flood water have increased after forest fires, with increases in annual flow ranging from 3.5 to 9 inches, and annual flood flows increases ranging from 10 to 20 percent. With repeated fires, detectable flow increases have persisted for as long as 17 years. Effects of fires on chemical water quality have been small except where surface runoff is involved; the acidic nature of forest soils has typically resulted in effectively buffering percolating chemicals released by burning. Post-fire use or treatment of burned areas may worsen or mitigate the hydrologic effects of burning. (Forest Service)
W77-07318

UTILIZATION OF THE RESULTS FROM REPRESENTATIVE AND EXPERIMENTAL BASINS WITH A VIEW TO THE MANAGEMENT OF WATER RESOURCES,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-07355

EFFECTS OF MAN'S ACTIVITIES ON GROUNDWATER QUALITY,
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
For primary bibliographic entry see Field 5B.
W77-07359

ANTHROPOGENICALLY REDUCED GROUNDWATERS,
Coblenz Federal Inst. of Hydrology (West Germany).
For primary bibliographic entry see Field 5B.
W77-07360

SPATIAL AND TEMPORAL CHANGES IN THE PRIMARY PRODUCTIVITY OF LAKE TAHOE, CALIFORNIA-NEVADA BETWEEN 1959 AND 1971,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W77-07443

4D. Watershed Protection

SIMULATION OF A SERIES OF DAILY AREAL MEAN RAINFALLS FOR A BASIN USING RAINFALL OBSERVATIONS AT A REFERENCE STATION LOCATED OUTSIDE THE BASIN,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
For primary bibliographic entry see Field 2B.
W77-07356

MANNING N AND THE OVERLAND FLOW EQUATION,
Agricultural Research Service, Stillwater, Okla.
For primary bibliographic entry see Field 2E.
W77-07371

RECONNAISSANCE OF SEDIMENT TRANSPORT AND CHANNEL MORPHOLOGY IN THE LOWER RIO BERMEJO BASIN, ARGENTINA--WITH A SECTION ON RECONNAISSANCE OF THE LOWER RIO PILCOMAYO BASIN, ARGENTINA AND PARAGUAY,
Geological Survey, Harrisburg, Pa. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-07490

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

THE UTILIZATION OF DISSOLVED FREE AMINO ACIDS BY ESTUARINE MICROORGANISMS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07117

AN INDUSTRIAL VIEW OF BIOLOGICAL MONITORING,
FMC Corp., Philadelphia, Pa.
E. C. Ladd.
In: Biological Monitoring of Water and Effluent Quality, ASTM STP 607, J. Cairns, Jr., K. L. Dickson and G. F. Westlake, Eds., American Society for Testing and Materials, 1977, p 24-29, 4 ref.

Descriptors: *Pollutant identification, *Bioindicators, *Monitoring, *Water quality, *Effluents, *Industrial wastes, *Standards, *Waste treatment, Methodology, Regulation, Water quality control, Waste disposal.
Identifiers: *Biological monitoring, Industrial participation.

Biological monitoring is required, along with chemical and physical measurements, for complete assessment of the nature of industrial wastewaters and their impact on the quality of receiving waters. Various approaches to biological monitoring are discussed along with several examples of specific concerns of industry. The need and opportunities for industrial participation in development of biological methods are emphasized. (Katz)
W77-07126

THE DYNAMICS OF METALS IN THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA. II. ENVIRONMENTAL EFFECTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Medicine.
For primary bibliographic entry see Field 5C.
W77-07129

THE EVALUATION OF TOXIC EFFECTS OF CHEMICALS IN FRESH WATER BY USING FROG EMBRYOS AND LARVAE,
California Univ., Irvine. Dept. of Anatomy; and California Univ., Irvine. Dept. of Developmental and Cell Biology.
For primary bibliographic entry see Field 5C.
W77-07132

EXPERIMENTAL SUBSTANTIATION OF MAXIMUM PERMISSIBLE PROPACHLOR (RAMROD) CONCENTRATIONS IN WATER, (IN RUSSIAN),
Academy of Medicine, Sofia (Bulgaria). Center for Hygiene.
A. Strateva.
Gig Sanit 4, p 85-87, 1976.

Descriptors: *Pollutant identification, Reservoirs, Water pollution effects, *Organoleptic properties, Water quality standards, Potable water, Water supply, Pesticides, *Dystrophy, Rodents, Metabolism, *Toxicity, *Pesticide toxicity, Testing.
Identifiers: *Ramrod, *Propachlor.

Negative effects of Ramrod on organoleptic properties of water and the sanitary condition of water reservoirs in threshold and subthreshold

concentrations, respectively, were determined. Orally administered Ramrod in acute tests showed toxic effects on mice, rats and rabbits. The LD50 for rats was 950(860-1050) mg/kg, for rabbits 392 (272-565) mg/kg and for mice 290 (240-350 mg/kg. Long-term tests on rats showed low cumulative and high adaptive effects with characteristic clinical (weight loss, changes in peripheral blood, redox processes and protein metabolism) and pathomorphologic (dystrophic changes in liver and kidneys) pictures. The threshold and subthreshold doses for warm-blooded animals were established at 5 mg/kg and 0.5 mg/kg, respectively, and the extrapolated subthreshold dose for humans at 0.05 mg/kg. With a reliability factor of 10, the daily permissible dose for humans was established at 0.05 mg/kg. Permissible Ramrod concentrations for water reservoirs are suggested to be 1 mg/l for drinking water and fish-farming and 20k mg/l for irrigation.--Copyright 1976, Biological Abstracts, Inc.
W77-07133

QUEST FOR AN INDEX OF COMMUNITY STRUCTURE SENSITIVE TO WATER POLLUTION,
Oxford Polytechnic (England). Dept. of Biology.
S. E. K. Cook.
Environmental Pollution, vol. 11, p. 269-288, 1976. 3 fig., 8 tab., 26 ref.

Descriptors: *Pollutant identification, *Bioindicators, *Reviews, *Reliability, *Water quality, Water pollution, Water pollution effects, Biological communities, Dominant organisms, Water chemistry, Sampling, Statistics, Regression, Analysis, Productivity, Monitoring.
Identifiers: Shannon-Wiener Index, Chandler Score, Berger and Parker Dominance Index.

A review is presented of indices summarizing benthic macroinvertebrate data and uses of samples from an unpolluted lentic stream to test their sensitivity to various environmental parameters. The Shannon-Wiener index is evaluated against the qualitative Chandler score. Values of both indices and a modification of the Chandler score were regressed with the following environmental variables: temperature, total alkalinity, conductivity, per cent oxygen saturation, dissolved oxygen content, biochemical oxygen demand and coliform count. The Shannon-Wiener index is primarily sensitive to total alkalinity which may be an indirect measure of stream productivity. The dominance index of Berger and Parker (1970) is highly correlated with the Shannon-Wiener index and is very much simpler to use. The Chandler modification is well correlated with the coliform count and BOD, parameters which are associated with pollution. The Shannon-Wiener index emerged as a very imprecise, if not dubious, pollution index. The modification of the Chandler score gives the most reliable continuous assessment. (Katz)
W77-07136

A LIGHT-WEIGHT AND CHEAP DEPTH SAMPLER,
Teesside Polytechnic, Middlesborough (England).
R. C. Frost, T. F. Bernascone, and T. Cairney.
Journal of Hydrology, Vol. 33, No. 1/2, p 173-178, March 1977. 4 fig, 4 ref.

Descriptors: *Pollutant identification, *Water sampling, Equipment, *Coal mines, Mining, *Sampling, *Instrumentation, Dissolved solids, Iron, Dissolved oxygen, Water quality, Foreign research, Groundwater, Shafts(Excavations), Depth, Wells.

A need for water samples from considerable depths in flooded collieries was met by a specially designed lightweight and cheap sampling system which proved entirely satisfactory in operation. Field tests have proved the efficiency of the system design. It has proved possible to repeat samples without difficulty, and many depth profiles of water composition have been obtained. Although the basic aim was to overcome the lack of funds, recent tests with commercially available depth samplers have shown that the specially designed system is more convenient and accurate in operation. (Sims-ISWS)
W77-07155

STOCHASTIC PROPERTIES OF DAILY TEMPERATURE IN RIVERS,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5B.
W77-07159

A NEW METHOD FOR PHYSICAL LIMNOLOGY--TRITIUM-HELIUM-3 AGES--RESULTS FOR LAKE ERIE, HURON, AND ONTARIO,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2H.
W77-07168

NONPOINT SOURCE EFFECTS ON WATER QUALITY,
Florida Technological Univ., Orlando.
For primary bibliographic entry see Field 5B.
W77-07173

DISSOLVED HELIUM IN LAKES: URANIUM PROSPECTING IN THE PRECAMBRIAN TERRAIN OF CENTRAL LABRADOR,
McMaster Univ., Hamilton (Ontario). Dept. of Physics.
W. B. Clarke, Z. Top, A. P. Beavan, and S. S. Gandhi.
Economic Geology, Vol. 72, No. 2, p 233-242, March-April 1977. 4 fig, 3 tab, 16 ref.

Descriptors: *Pollutant identification, *Helium, *Radioisotopes, *Uranium radioisotopes, *Exploration, Tracers, Geology, Tritium, Lakes, Sampling, Data collections, Mass spectrometry, Laboratory tests, Correlation analysis, Mineralogy, Isotope studies, *Canada.
Identifiers: *Uranium prospecting, *Labrador, *Neon, *Dissolved helium.

Measurements of dissolved helium, 3He/4He, and neon were made in 60 water samples collected from 56 lakes and ponds in the Kaipokok region in Labrador. Tritium was measured in 8 water samples. The aim of the survey was to search for excess 4He from decay of uranium and its daughter products. Excess 4He varied from about 0% to 65% relative to the equilibrium solubility concentration at the temperature of the sample. Delta (3He), the helium isotope ratio anomaly relative to atmospheric helium, varied from +11% to -25%. Although the effect of tritium decay in the water prior to sampling must be considered, there is a good correlation between the lakes which have delta (3He) -2% and lakes with excess radiogenic 4He greater than 4%. The helium results when plotted on a map of the area show a remarkable fit with the locations of known uranium mineralization. (Sims-ISWS)
W77-07174

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS I. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIERS FOR SOME MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-07181

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS-II. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIER COMPONENTS FOR MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-07182

RAPID DETERMINATION OF TOTAL ORGANIC CARBON AND ITS APPLICATION TO WATER RESEARCH, (IN JAPANESE),
Osaka City Inst. of Public Health and Environmental Sciences, (Japan).
T. Yoshikura, I. Fukunaga, K. Oda, S. Kawai, and G. Uno.
Bulletin of the Japanese Society of Scientific Fisheries Vol. 42(12), p. 1423-1429, 1976. 6 fig., 2 tab., 8 ref.

Descriptors: *Biochemical oxygen demand, *Chemical oxygen demand, *Carbon, Aquatic bacteria, Bioindicators, *Organic wastes, *Water pollution, Water chemistry, Chemical analysis, Water quality, *Methodology, *Pollutant identification, Analytical techniques.
Identifiers: *Total organic carbon, *Kjeldhal nitrogen measurements.

The quality of water polluted with organic compounds is usually expressed in terms of COD and BOD. Recently, a rapid combustion method for measuring total organic carbon (TOC) content of water was developed. Therefore, the determination TOC in the river water polluted with organic compounds was attempted and compared with other pollution parameters: BOD, COD, NH4-N, and bacterial counts with the following results. The measurement of TOC was not significantly influenced by the presence of toxic substances, biodegradability, chemical structure, molecular weight of the organic substances of their susceptibility to chemical oxidants. TOC correlated well with BOD, COD, NH4-N, Kjeldhal-N, and bacterial counts. It was concluded from these results that TOC measurement would provide rapid and accurate analysis of the extent of organic pollution in water. (Katz)
W77-07183

EGG AND LARVAL SURVIVAL OF WHITE SUCKERS (CATOSTOMUS COMMERSONI) AT LOW PH,
Cornell Univ., Ithaca. N.Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W77-07184

RESIDUES OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) UNDETECTED IN LAKE TROUT AND CHINOOK SALMON FROM THE UPPER GREAT LAKES,
Fish and Wildlife Service, Warm Springs, Ga. Southeastern Fish Control Lab.
J. B. Sills, and J. L. Allen.
The Progressive Fish-Culturist, Vol. 38, No. 4, p. 197, 1976. 1 tab., 2 ref.

Descriptors: Lampreys, Fish parasites, *Larvicide, *Pesticide, Residues, *Lake trout, *Chinook salmon, *Great Lakes, Biochemistry, *Chemical analysis, Chromatography, Pollutant identification.
Identifiers: Salvelinus namaycush, Oncorhynchus tshawytscha, Lampricide, Bioaccumulation, *TFM.

Samples of resident populations of Lake Trout and Chinook Salmon from the upper Great Lakes Region were found to have no residues of the lamprey larvicide 3-trifluoro-methyl-4-nitrophenol (TFM). The larvicide had been used in the area for 15 years. (Katz)
W77-07187

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LABORATORY APPARATUS FOR PROVIDING DIEL TEMPERATURE REGIMES FOR AQUATIC ANIMALS,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-07188

ACUTE TOXICITY OF ZINC, CADMIUM, AND CHROMIUM TO THE MARINE FISHES, YELLOW-EYE MULLET (ALDRICHETTA FORSTERI C. AND V.) AND SMALL MOUTHED HARDYHEAD (ATHERINASOMA MICROSTOMA WHITLEY),
Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group.
For primary bibliographic entry see Field 5C.
W77-07190

SURBER SAMPLING IN DEEP WATER FOR BOTTOM ORGANISMS,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 7B.
W77-07199

A HAND-OPERATED IN SITU WATER SAMPLER,
Liverpool Univ. (England). Dept. of Oceanography.
M. I. Abdullah, and R. H. Tennant.
Freshwater Biology, Vol. 6, No. 3, p. 201-202, 1976. 1 fig., 1 plate, 2 ref.

Descriptors: *Water sampling, *Equipment, Sampling, *Dissolved oxygen, On-site data collections, Testing, Reliability, Water chemistry, Methodology, Laboratory equipment, Water quality, Pollutant identification.
Identifiers: *Dissolved gases, Contamination.

A hand-operated water sampler designed specifically for dissolved gas studies in lakes, lagoons and other shallow water is described. (Katz)
W77-07200

APPARENT POTENTIATION OF THE COTTON DEFOLIANT DEF BY METHYL PARATHION IN MOSQUITOFISH,
Mississippi Univ. for Women, Columbus. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07204

EVALUATION OF TWO METHODS FOR CALCULATING FRESHWATER ZOOPLANKTON PRODUCTION, (IN RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
For primary bibliographic entry see Field 7B.
W77-07228

GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 41, No. 232, p. 52780-86, December 1, 1976.

Descriptors: *Pollutant identification, *Permits, *Testing procedures, *Water analysis, *Monitoring, Water pollution control, Legal aspects, Administrative agencies, Legislation, Regulation, State governments, Local governments, Federal government, Measurement, Evaluation, Quality control, Sampling, Data collections, Water pollution sources.
Identifiers: FWPCA Amendments of 1972, Administrative regulations, Test parameters.

Amendments to the Guidelines Establishing Test Procedures for the Analysis of Pollutants were proposed pursuant to section 304(g) of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. Such test procedures are to be used by permit applicants demonstrate that effluent discharges meet applicable pollutant discharge limitations and by the states and other enforcement activities in routine or random monitoring of effluents to verify compliance with pollution control measures. Comments to the proposed amendments were received from various federal, state and local agencies, as well as regulated major dischargers, analytical instrument manufactures and service laboratories. Based upon a review of the comments, various changes to the proposed amendments were made. Among the principal changes were: (1) a clarification of certain test parameters, (2) an addition of 44 new parameters, and (3) a deletion of certain measurement techniques. Despite certain objections from various manufactures, applications for approval of alternate test procedures will continue to be made only by National Pollution Discharge Elimination System (NPDES) permit holders with approval of such applications to be made on a case-by-case basis by the Regional Administrator. (Rieck-Florida)
W77-07252

PROPOSED TOXIC POLLUTANT EFFLUENT STANDARD FOR POLYCHLORINATED BIPHENYLS,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-07253

THE DIFFERENTIAL USE OF CHIRONOMIDAE AND CERATOPOGONIDAE (DIPTERA) IN THE MONITORING OF VARIOUS AQUATIC WASTES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Entomology.
E. C. Turner, Jr., and Walter I. Knausenberger.
Available from the National Technical Information Service, Springfield VA 22161 as PB-266 713, Price codes: A03 in paper copy, A01 in microfiche. Completion report, (1977). 46 p, 7 fig, 33 ref. OWRT A-042-VA(1).

Descriptors: *Diptera, *Midges, *Littoral, Mosquitos, *Virginia, Larvae, *Monitoring, *Bioindicators, Toxicity, Sewage effluents, Heavy metals, Sampling, *Pollutant identification.
Identifiers: Multiple-plate samplers, *Mosquito larvae, Tanytarsini, Toxicity tests, Negative phototaxis, Rapid biological monitoring, Culicoides, Aedes algypti.

Based on larval and adult determinations, 73 chironomid and 26 ceratopogonid taxa were recognized in a two-year survey of four polluted watercourses in southwestern Virginia. Comparative analysis of the midge community in two streams indicated strongly that larval midges can be used profitably to monitor water quality when the effluent is mixed heavy metal and domestic sewage. The chironomid tribe Tanytarsini and the ceratopogonid Culicoides were particularly sensitive. Community diversity d, equitability 'e,' and several methods of quantitative comparison among stations were validly applicable to the community of mides alone. A littoral sampling technique was compared with modified multiple-plate artificial substrates for the species each method collected. The littoral samples yielded significantly higher coefficients of variation, lower densities and fewer taxa than the multiple-plate substrates, but the investigation of the littoral fauna is an expedient method of assessing pollutional impact on smaller streams. An objectively quantifiable toxicity test involving the negative phototactic behavior of Aedes aegypti (Diptera:Culicidae) larvae was developed. It measured the progressive decrease in locomotory ability, i.e., enfeeblement, of the larvae in solutions of copper and zinc. Objective evidence of toxicity was obtained in one to six hours, significantly sooner than any other means of assessing toxicity in mosquito larvae.
W77-07282

THE OLIGOCHAETE COMMUNITIES OF A LOWLAND STREAM AND THEIR VALUE AS INDICATORS OF ORGANIC POLLUTION,
Bordeaux-1 Univ., Talence (France). Comparative Anatomy Lab.; and Bordeaux-1 Univ., Talence (France). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W77-07307

ATOMIC ABSORPTION MEASUREMENTS OF LEAD, CADMIUM, COPPER, IRON, AND ZINC IN SESTON OF THE BALTIC SEA,
Biologische Anstalt Helgoland (West Germany).
H.-P. Weigel.
Helgolander Wissenschaftliche Meeresuntersuchungen, Vol 28, p 206-216, 1976. 3 fig, 3 tab, 26 ref.

Descriptors: *Heavy metals, *Zinc, *Cadmium, *Lead, *Copper, *Iron, *Path of pollutants, *Absorption, *Seston, *Aquatic microorganisms, Metals, Analytical techniques, On-site data collections. Spectroscopy, Chemical analysis, Water quality, *Pollutant identification.
Identifiers: *Baltic Sea, *Bioaccumulation, *Atomic absorption analysis.

Seston samples collected from 23 stations between Finnish Bay and Kiel Bight were analyzed for lead, cadmium, copper, iron and zinc by flameless atomic absorption spectrometry. The mean values for lead and cadmium were 123 and 5.8 ppm, respectively; for zinc, 733 ppm, for copper, 61 ppm, and for iron, 3535 ppm. In contrast to trace-metal analyses of off-shore seston, the concentrations for lead and cadmium in Baltic Sea seston are very high. These results agree with analyses for dissolved metals. The concentrations of zinc, copper and iron in the particulate matter from the Baltic Sea, apart from some local influences, agree well with values published from the concentrations in off-shore seston. The distribution and variation of individual values are discussed. (Katz)
W77-07309

PCB CONTENTS IN THE MUSCLE OF MARINE ANIMALS COLLECTED IN THE SEA NEAR HAKODATE (IN JAPANESE),
Hokkaido Univ., Hakodate (Japan). Lab. of Food Hygiene.
For primary bibliographic entry see Field 5C.
W77-07315

LONG ISLAND BEACH POLLUTION: JUNE 1976,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W77-07325

OBSERVATIONS ON BACTERIOLOGICAL CONDITIONS IN THE UPPER GREAT LAKES 1968-1974,
Canada Centre for Inland Waters, Burlington (Ontario).
S. S. Rao.
Scientific Series No 64, 1976, Ottawa, Canada, 3 p, 11 fig, 20 ref, 12 tab.

Descriptors: *Great Lakes, *Lake Huron, *Lake Superior, *Bacteria, *Environmental effects, Parametric hydrology, Coliforms, Water pollution, Wastes, Pollutant identification, Data collections, Bacteriology.
Identifiers: *Georgian Bay(1968 to 1974), Bacteriological data(Great Lakes).

Results are presented of bacteriological data collected on Lake Superior in 1968, 1971 and 1973; on Lake Huron in 1968, 1969, 1970, 1971 and 1974; and on Georgian Bay in 1971 and 1974. As part of the International Joint Commission (IJC) Upper Lakes Study, information which complies with the objectives outlined in the IJC Great Lakes Water Quality Agreement has been prepared. The report describes near-shore lake-wide bacterial levels showing their temporal and spatial variations. Information is also included which gives the existing bacterial base-line levels in the main bodies of Lake Superior, Lake Huron and Georgian Bay, and indicates near-shore areas with elevated bacterial levels (potential problem areas or areas of non-compliance). (WATDOC)
W77-07340

OCCURRENCE AND DETERMINATION OF A HERBICIDE BENTHIOCARB IN RIVERS AND AGRICULTURAL DRAINAGES,
Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
M. Suzuki, Y. Yamato, and T. Akiyama.
Water Research, Vol 11, No 3, p 275-279, 1977. 4 fig, 5 tab, 8 ref.

Descriptors: *Herbicides, *Weed control, *Agricultural chemicals, *Pollutant identification, Analytical techniques, Aquatic weed control, Computers, Analysis, Chemical analysis, Gas chromatography, Water analysis, Mass spectrometry, Rice, Instrumentation, Agricultural runoff, Foreign countries, Foreign research.
Identifiers: *Japan, *Benthiocarb, *Agricultural drainages, *Benthiocarb determination, Benthiocarb residues, Photo-chemical reactions.

The occurrence and determination of a herbicide, benthiocarb, 4-chloro-benzyl N,N-diethylthiolcarbamate in rivers and agricultural drainages were investigated. Benthiocarb residues were detected in water samples when it had been applied to rice paddies, after rice seedling transplantation, in concentrations of between 10.00 and 0.11 micrograms/l. The residues entered into rivers and agricultural drainages as a result of overflows from rice paddies. However, benthiocarb residues could not be found in water samples after the termination of its application to rice paddies, suggesting that the applied benthiocarb might be degraded by microbial and physicochemical actions such as photochemical reactions occurring on the soil surface. Benthiocarb residue levels were higher in longer rivers than in agricultural drainage. The contribution of rainfall to the benthiocarb concentrations was shown. Benthiocarb in water was extracted with n-hexane and identified by a gas chromatography using a flame photometric detector (sulphur filter 394 nm) and a combined gas chromatography-mass spectrometry-computer system. The minimum detectable amount of benthiocarb in water sample by gas chromatography was 0.56 ng, and about 100 ng of benthiocarb could be identified by a gas chromatography-mass spectrometry-computer system. (Henley-ISWS)
W77-07361

THE ANALYSIS OF AMMONIA IN POLLUTED SEA WATER,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
B. L. Hampson.
Water Research, Vol 11, No 3, p 305-308, 1977. 3 fig, 1 tab, 13 ref.

Descriptors: *Ammonia, *Chemical analysis, *Pollutant identification, *Sea water, *Ammonium compounds, *Analytical techniques, Nitrogen compounds, Nitrogen, Water pollution sources, Water quality, Nitrates, Nitrites, Amino acids, Fish, Ultraviolet radiation, Colorimetry, Water analysis, Chemistry, Water pollution, Aquatic environment.
Identifiers: *Ammonium analysis, *Ammonium content, Indophenol blue reaction, Ammonium determination.

Measurement of ammonia in polluted seawater or freshwater is important, especially in fish rearing. However, existing methods for the determination of ammonia are subject to serious suppression interference by many substances, including all types of amines, nitrite, and amino acids, which may participate in the chain of reactions employed diverting it. Some methods suffer from breakdown of amino acids to ammonia. Hydrogen sulphide, often present in anoxic waters, also interferes and must be removed. The reported method overcomes the mentioned difficulties by internal standard calibration and by specific u.v. photo-activation of the required ammonia yields indophenol blue reaction at low temperature. (Henley-ISWS)
W77-07362

DYNAMICS OF O2 AND CO2 EXCHANGE, PHOTOSYNTHESIS, AND RESPIRATION IN RIVERS FROM TIME-DELAYED CORRELATIONS WITH IDEAL SUNLIGHT,
Washington Univ., Seattle. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-07364

FURTHER TRANSITION STATES OF THE BAJA CALIFORNIA UPWELLING ECOSYSTEM,
Brookhaven National Lab., Upton, N.Y. Oceanographic Sciences Div.
For primary bibliographic entry see Field 5C.
W77-07365

PHOSPHORUS AND CARBON DISTRIBUTIONS IN A POLLUTED COASTAL ENVIRONMENT,
Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W77-07368

INORGANIC CONTAMINANTS IN RURAL DRINKING WATERS,
South Carolina State Coll., Orangeburg. Dept. of Chemistry.
S. S. Sandhu, W. J. Warren, and P. Nelson.
American Water Works Association Journal, Vol 69, No 4, p 219-222, April 1977. 3 fig, 3 tab, 26 ref.

Descriptors: *Water pollution sources, *Rural areas, *Potable water, *South Carolina, Pollutants, *Pollutant identification, Path of pollutants, Water pollution sources, Wells, Water wells, Plumbing, Septic tanks, Inorganic compounds, Metals, Heavy metals, Turbidity, Sampling, On-site investigations, Laboratory tests.
Identifiers: Chesterfield County(SC).

A total of 217 potable water samples, from rural communities and farm families of Chesterfield County, South Carolina, was drawn randomly to evaluate inorganic contents and to determine whether any sources polluting the water could be identified. The findings of this survey showed that quite a few people were using substandard quality waters. Many of the open wells were infested with macroorganisms. Metallic contamination was quite common, and the levels of arsenic, iron, lead, mercury, and manganese, in some cases, were far above the mandatory limits. Low, but generally acceptable, concentrationss of nitrate, phosphate, chloride, fluoride, cadmium, copper, zinc, and sodium were found. Statistical evidence suggests that seepage from the septic tank was at least partially responsible for contamination of shallow water supply sources. The lead and cadmium appeared to come from the corrosion of the antiquated plumbing in the old houses. (Sims-ISWS)
W77-07372

CARBON DIOXIDE AND OXYGEN-NITROGEN RATIOS AS FACTORS AFFECTING SALMON SURVIVAL IN AIR-SUPER-SATURATED WATER,
Corvallis Environmental Research Lab., Oreg. Western Fish Toxicology Station.
For primary bibliographic entry see Field 5C.
W77-07415

TOLERANCE OF SELECTED FISH SPECIES TO ATMOSPHERIC GAS SUPERSATURATION,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 5C.
W77-07431

SUB-THERMOCLINE BIOMASS CONCENTRATION DETECTED BY TRANSMISSOMETER IN LAKE SUPERIOR,
For primary bibliographic entry see Field 5C.
W77-07447

PLUTONIUM IN THE LAURENTIAN GREAT LAKES: COMPARISON OF SURFACE WATERS,
For primary bibliographic entry see Field 5C.
W77-07449

PHOTOSYNTHETIC RATES IN LAKE SUPERIOR,
For primary bibliographic entry see Field 5C.
W77-07450

THE LARVAL SPIRURID NEMATODES OF FRESH-WATER CRUSTACEANS: I. THE IDENTIFICATION AND THE EXAMINATION OF THEIR PATHOGENICITY,
Niigata Univ. (Japan). Dept. of Medical Zoology.
For primary bibliographic entry see Field 5C.
W77-07458

TRIPTON SEDIMENTATION IN EUTROPHIC LAKES--SAMPLE CORRECTION FOR THE RESUSPENDED MATTER,
For primary bibliographic entry see Field 5C.
W77-07463

ALGAL SEDIMENTATION: THE CAUSE OF A DIATOM-BLUE-GREEN SUCCESSION,
For primary bibliographic entry see Field 5C.
W77-07464

EFFECT OF NUTRIENT ENRICHMENT ON THE HETEROTROPHIC UPTAKE OF ORGANIC SOLUTES BY MICROORGANISMS,
For primary bibliographic entry see Field 5C.
W77-07466

SEASONAL VARIATION IN SEDIMENT-WATER EXCHANGE OF NUTRIENT IONS IN LAKE ESROM,
For primary bibliographic entry see Field 5C.
W77-07467

AN ORGANIC CARBON BUDGET FOR AN OLIGOTROPHIC LAKE IN NEW HAMPSHIRE, U.S.A.,
For primary bibliographic entry see Field 5C.
W77-07470

POST-GLACIAL HISTORY OF MIRROR LAKE AND ITS WATERSHED IN NEW HAMPSHIRE, U.S.A.: AN INITIAL REPORT,
For primary bibliographic entry see Field 5C.
W77-07472

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MAJOR AQUIFERS IN DEUEL AND HAMLIN COUNTIES, SOUTH DAKOTA,
Geological Survey, Vermillion, S. Dak. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07483

REAERATION-COEFFICIENT MEASUREMENTS OF 10 SMALL STREAMS IN WISCONSIN USING RADIOACTIVE TRACERS--WITH A SECTION ON THE ENERGY-DISSIPATION MODEL.
Geological Survey, Madison, Wis. Water Resources Div.
R. S. Grant.
Available from the National Technical Information Service, Springfield, VA as PB-265 296/As, Price codes: A04 in Paper copy, A01 in microfiche. Water-Resources Investigations 76-96, October 1976. 50 p, 29 fig, 13 tab, 8 ref.

Descriptors: *Reaeration, *Streams, *Water pollution, *Tracers, *Radioactivity techniques, Methodology, Dissolved oxygen, Streamflow, Flow rates, Water temperature, Water pollution control, Forecasting, *Wisconsin, *Pollutant identification.

Reaeration-rate coefficients were measured for 10 small streams in Wisconsin using the radioactive-tracer method. The coefficients ranged from 2.06 to 55.2 per day (base e at 25 degrees Celsius). Stream discharges ranged from 0.3 to 37.0 cubic feet per second, most discharges being less than 10 cubic feet per second. Data also were collected for evaluation of the energy-dissipation model. The escape coefficient of 0.090 per foot at 25 degrees Celsius may be used for small streams similar to those studied. (Woodward-USGS).
W77-07496

AN INVESTIGATION OF COLLOIDAL ORGANIC PARTICLES ISOLATED FROM DIFFERENT POPULATIONS OF BIVALVES,
W. T. Lammers.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1540-1545, 1975. 4 fig., 1 tab., 13 ref.

Descriptors: *Analytical techniques, *Mollusks, *Colloids, *Tripton, Viruses, *North Carolina, Freshwater, Saline water, Density, Organic matter, *Salt marshes.
Identifiers: *Nucleic acids.

The low number of particles per unit volume make it difficult to obtain a sufficient number of organic coloids in natural water for analysis of virus and virus-like particles. This investigation attempted to determine whether detectable numbers of organic colloids are accumulated by bivalves, to characterize the particles, and to compare qualitative and quantitative changes in organic colloids from fresh and salt water. The colloids were extracted from bivalves collected from fresh water and saline marsh sites at different levels of pollution in North Carolina. The fresh water bivalves were Anodonta cataracta and Elliptio lanceolata; the lowest salinity bivalve was Polymesoda caroliniana; the mid-marsh animal was Modiolus demissus, and the outer marsh bivalve was Crassostrea virginica. Nucleic acid determinations were made of each sample before density gradient centrifugation and of selected particle bands afterwards by using the acridine orange fluorescent technique. The stained slides were viewed with a UV microscope using dark field and filtered to pass wavelengths between 460 and 530 nm. The results were quantified by measuring fluorescence and are expressed in microamps of fluorescence in a table. The virus-like particles fall into a group well separated from other known particles by density, sedimentation coefficient, and the presence of nucleic acid. Consequently relatively small colloids and virus-like particles. (Auen-Wisconsin).
W77-07498

SIMILARITIES AND DIFFERENCES IN THE CHEMICAL COMPOSITION OF WATERS FROM WEST, CENTRAL, AND EAST AFRICA,
S. A. Visser, and J. P. Villeneuve.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1416-1425, 1975. 4 tab., 51 ref.

Descriptors: Chemical properties, *Lakes, *Rivers, *Africa, Specific conductivity, *Statistical methods, Hydrogen ion concentration, Cations, Anions, Sodium, Potassium, Ammonia, Iron, Aluminum, Chlorides, Fluorides, Calcium, Magnesium, Manganese, Chlorine, Nitrates, Nitrites, Silica, Sulfates, Phosphates, Data collections, *Pollutant identification.
Identifiers: West Africa, East Africa, Central Africa, *Ranking methodologies.

Comparisons are made of data on specific conductivity, hydrogen ion concentration, cations and anions of 22 lakes and rivers in West Africa, 9 Central African lakes and rivers, and 21 East African lakes and rivers. The data is based on 520 samples collected from over 150 sites, and from earlier studies. The number of times, expressed on a percentage basis, that one of the 108 parameters had a 99% significant correlation with any other parameter, is tabulated for each region. Because of the large number of highly significant correlations those with the highest listed numerical value indicate water quality of a specific area, and can serve in the selection of useful chemical or physical indicators of water quality in the respective area. The chemical measurements, in ppm, are given for sodium, potassium, ammonia, calcium, magnesium manganese, iron, aluminum, chlorine, fluoride, nitrate, nitrite, silica, sulfate, and phosphates. (Auen-Wisconsin)
W77-07510

CALCULATION OF CALCIUM CARBONATE-CARBON DIOXIDE EQUILIBRIUM IN WATER AND MIXTURES OF WATER,
A. Lindberg, and C. Borno.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1511-1517, 1975. 5 fig., 1 tab., 14 ref.

Descriptors: *Computer programs, *Calcium carbonate, *Carbon dioxide, *Equilibrium, Measurement, Methodology, Equations, Analytical techniques, *Pollutant identification.

A preliminary computer program is outlined which is used for approximate calculations of calcium carbonate-carbon dioxide equilibrium relations in natural waters and mixtures of waters. The program also permits the calculation of equilibrium alternations when the pH value of the water is changed by the addition of acid or alkali or when the water is heated in a heat exchanger, etc. The program is in the process of development thus its details are incomplete. The development work is carried out on an HP calculator 9100 B with an extended memory 9101 A. A flow chart and equations illustrate the calculation principle. The data required are the pH value, specific conductance, temperature and the concentrations of bicarbonate, bicarbonate anions and calcium, calcium ions in the water. (Auen-Wisconsin)
W77-07513

SATELLITE OBSERVATIONS OF WATER QUALITY,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
G. P. Harris, R. P. Bukata, and J. E. Bruton.
Transportation Engineering Journal of ASCE, Proceedings of the American Society of Civil Engineers, Vol. 102, No. TE3, Proceedings paper No. 12300, p 537-554, August 1976. 16 fig, 28 ref.

Descriptors: *Water quality, Hydrography, *Biomass, *Suspended solids, Limnology, *Remote sensing, *Lake Ontario, Turbidity, *Chlorophyll, Sampling, Equations, *Pollutant identification, Data collections.
Identifiers: *Pattern recognition, Radiance data, *Landsat-1 data.

LANDSAT-1 observations of water quality indicate that hydrography, suspended solids, and chlorophyll a can be measured with MSS bands 4, 5, and 6, respectively. As a summary of both published and unpublished work performed at CCIW and McMaster University in the pattern recognition studies of the LANDSAT-1 digital data collected over the Laurentian Great Lakes, results are reviewed of the physical interpretations ascribed to data of the pattern observed in various combinations of the radiance bands while absent in others. Band-by-band limnological interpretations of the patterns observed in the digital printouts of the LANDSAT-1 apparent radiance data are given. (Bell-Cornell)
W77-07554

LIMITATIONS OF SINGLE WATER SAMPLES IN REPRESENTING MEAN WATER QUALITY 1. THOMPSON RIVER AT SHAW SPRING, BRITISH COLUMBIA,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
E. Oguss, and W. E. Erlebach.
Technical Bulletin No. 95, 1976, 22 p., 3 fig., 1 tab, 6 ref., 2 append.

Descriptors: *Water sampling, *Sampling, Average, Limiting factors, Spatial distribution, Monitoring, Water analysis, *Pollutant identification, *Canada, Water quality, Phosphorus, Nitrates, Nitrites, Iron, Fluoride, Lead, Zinc, Silica, Hydrogen ion concentration.
Identifiers: Errors, *Thompson River(BC), Shaw Spring, *British Columbia, Single water sampling, Spences Bridge Station, Nicola River.

This study was undertaken to determine the degree to which infrequent single grab samples are representative of the monthly or quarterly mean water quality of the Thompson River in the vicinity of the station at Spences Bridge. The study was designed to determine the magnitude of spatial and temporal variability in the concentrations of the following parameters: total phosphorus, nitrate plus nitrite, iron, fluoride, lead, zinc, silica and pH. These parameters were selected because they had shown marked variation in previous quarterly sampling. The results illustrate the uncertainities associated with single grab samples as indicators of quarterly mean concentrations. For example, if a single sample has a total phosphorus concentration of 0.054 mg/1, one can conclude with 95 percent confidence that the true instantaneous mean value is between 0.040 mg/1 and 0.068 mg/1 and that the true quarterly mean value is between 0.0 mg/1 and 0.127 mg/1. Furthermore, the need for caution in inferring the presence of a trend on the basis of single samples taken quarterly is apparent. The use of quarterly sampling data as a means of flagging water quality impairment or measuring trends must include a consideration of both alpha and beta errors. Errors associated with getting a high single sample when the mean concentration is in fact low (alpha error or false positive) and errors associated with getting a low single sample when the mean concentration is in fact high (beta error or false negative) could lead to erroneous conclusions. Improvements in analytical technique and sample handling cannot increase the precision with which a single sample measurement represents mean instantaneous, temporal or spatial concentrationss. (WATDOC)
W77-07563

THE CHANGES IN INORGANIC NITROGEN CONCENTRATION OF DRINKING WATER FROM WELLS OVER A TWO YEAR PERIOD IN ANI-MACHI, IBARAKI PREFECTURE, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.

For primary bibliographic entry see Field 5B.
W77-07570

IMPROVED METHOD FOR THE DETERMINATION OF ATP IN LAKEWATER, (IN GERMAN),
Eidgenoessische Anstalt Fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
L. Hofer-Siegrist.
Schweiz Z Hydrol 38(1), p 49-54,1976.

Descriptors: Pollutant identification, *Sampling, Lakes, Analytical techniques, Methodology.
Identifiers: *ATP.

An improved method for the deremi tion of ATP in lakewater is described. The process can be usefully applied in limnolog cal routine analyses by deep freezing filter residue samples in liquid N, which can then be transported to the laboratory. Possible sampling and processed errors are discussed. --Copyright 1977, Biological Abstracts, Inc.
W77-07578

HEAVY METALS (FE, MN, CD, CR, CU, PB AND ZN) IN THE PELAGIC ZONE OF LAKE CONSTANCE (OBERSEE AND UNTERSEE) AND THE GREIFENSEE, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
H. R. Hegi.
Schweiz Z Hydrol 38(1), p 35-47, 1976.

Descriptors: *Heavy metals, Iron, Copper, Cadmium, Lead, Chromium, Manganese, *Spectrophotometry, Analytical techniques, Zinc, *Pollutant identification, Lakes.
Identifiers: *Lake Constance(Switzerland), *Atomic absorption spectrometry, *Greifensee(Switzerland), Pelagic zone(Lakes).

Monthly measurements were made over a 1 yr period to determine the heavy metals Fe, Mn, Cd, Cr, Cu, Pb and Zn in the vertical profiles of Lake Constance (Obersee and Untersee) and Greifensee, by means of atomic absorption spectrometry. Fe and Mn exhibited the usual cyclical fluctuations depending on redox conditions in the hypolimnion. For Cd, Cr, Cu, Pb and Zn no concentration patterns were noted that would show their dependency on seasonal and vertical stratifications.--Copyright 1977, Biological Abstracts, Inc.
W77-07580

A COMPARISON OF SPECTROPHOTOMETRIC METHODS FOR THE DETERMINATION OF PHYTOPLANKTON PIGMENTS, (IN FRENCH),
Biological Station, Besse-en-Chandesse (France).
G. Millerioux.
Ann Stn Biol Besse-En-Chandesse 9, p 59-78, 1974.

Descriptors: *Spectrophotometry, *Phytoplankton, *Pollutant identification, Pigments, *Plant pigments, Sampling, Analytical techniques, Lakes, Methodology.
Identifiers: Lake d'Aydat(France).

The size of the sample to be filtered is a function of the density of the phytoplankton and in Lake d'Aydat (France) a sample of between 1-2 l was needed. Best results were obtained when the magnesium carbonate concentration was adjusted to a constant figure. Whatman glass fiber filters are recommended as giving the best results. Acetone (90%) is the best solvent. It is recommended that samples be treated as quickly as possible after taking; samples left more than a few days do not give consistent results.--Copyright 1977, Biological Abstracts, Inc.
W77-07581

DATA 1973/1974 REGARDING HYDROGRAPHY AND WATER QUALITY IN THE WESER ESTUARY, GERMANY, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5C.
W77-07584

BACTERIOLOGICAL AND COLIMETRIC EXAMINATION OF THE WATER SUPPLIED TO THE SLAUGHTERHOUSES SITUATED NEAR SALVADOR, BAHIA, BRAZIL, (IN PORTUGESE),
Bahia Univ., Salvador (Brazil). School of Veterinary Medicine.
E. N. Teixeira, and C. A. Cordeiro.
Bol Inst Biol Bahia 14(1), p 129-133, 1975.

Descriptors: *Aerobic bacteria, *Coliforms, Sampling, Water quality standards, South America, Water pollution, *Bacteriology, *Pollutant identification.
Identifiers: *Colimetric examinations, Slaughterhouses(Wastes), *Salvador(Brazil).

A survey was done to determine the number of viable aerobic bacteria and coliform density from water used in 5 slaughterhouses near Salvador, Bahia, Brazil. Only 11 of 250 samples analyed were within bacterimetric and colimetric standards adopted in Brazil. The average bacterimetry was 3105.45 plus or minus 250.05 and the average colimetry was 1766.65 for 1 ml and 100 ml, respectively.--Copyright 1977, Biological Abstracts, Inc.
W77-07587

STUDY OF BACTERIAL CONTAMINATION IN THE PORT MAHON HARBOR: EFFECT OF ECOLOGICAL CONDITIONS OF THE HARBOR, (IN SPANISH),
Instituto Espanol de Oceanografia, Palma de Mallorca (Spain). Coastal Lab.
B. Payeras Cifre.
Bol Inst Esp Oceanogr 203-204, p 1-24, 1975.

Descriptors: Bacteria, Water pollution, Ecology, Coliforms E. coli, Harbors, Streptococci, Phytoplankton, Dissolved oxygen, Sampling, Pollutant identification.
Identifiers: Heterotrophic(Activity), Port Mahon Harbor(Spain).

Analysis of water samples taken in April showed that Escherichia coli, Streptococcus faecalis and coliform contamination from urban wastes was highest at stations near the interior of the Port Mahon harbor (Spain). Dissolved O2 was highest at the interior mainly because of the presence of abundant phytoplankton in the springtime. Fecal contamination indices were established for the different sampling stations and the relation between fecal contaminations and heterotrophic activity were discussed. The construction of an underwater pipeline to deposit residual waters into deeper waters and improve ecologic conditions was proposed.--Copyright 1977, Biological Abstracts, Inc.
W77-07588

BACTERIOLOGIC ANALYSIS IN THE AROSA, VIGO AND PONTEVEDRA ESTUARIES, (IN SPANISH),
G. De Santiago Fierro, I. G. De La Banda, and J. M. Masso.
Bol Inst Esp Oceanogr 205, p 5-13, 1976.

Descriptors: *Bacteria, *Bacteriology, *Estuaries, Sampling, *Mollusks, *Sediments, Public health, Estuaries, Pollutant identification.
Identifiers: Arosa estuary(Spain).

Water samples collected with gauze traps, sediment and mollusks from these 3 (Spanish) inlets were subjected to a series of diagnostic tests to determine the presence of pathogenic Vibrio spp. Samples were taken near sewage outlets of local population centers and incubated on thiosulfate citrate bile salts agar. Data on colony identification and biochemical reactions were given. The results showed the absence of any pathogenic Vibrio spp.--Copyright 1977, Biological Abstracts, Inc.
W77-07589

ASSAY OF DETERGENT RESIDUES IN FRESH WATER, SEA WATER AND WASTE WATERS: METHOD OF EXTRACTION AND CONCENTRATION OF SURFACTANTS BY ADSORPTION ON LIQUID-LIQUID INTERFACE, (IN FRENCH),
Tours Univ. (France). Laboratoire de Chimie Minerale et d'Hydrologie.
F. Clanet, and J.-F. Viller.
Water Research 10(9), p 829-832, 1976.

Descriptors: Assay, *Detergents, *Surfactants, *Separation techniques, Adsorption, Interfaces, *Pollutant identification, *Oil wastes, Liquids, Sea water, *Oil pollution, Freshwater.
Identifiers: *Colorimetry, Liquid-liquid interfaces.

The surfactant adsorption properties on greases and oils are used for extraction and concentration of surfactans from waters and wastes. The recovery rate is 97 1% with vaseline oil in the conditions exposed. On this oil, surfactants may form colored complexes with ligands allowing direct colorimetric determinations. Different techniques are developed.--Copyright 1977, Biological Abstracts, Inc.
W77-07591

5B. Sources Of Pollution

INTERACTIONS OF CUPRIC ION WITH HUMIC ACID,
Missouri Univ. Columbia. Dept. of Chemistry.
J. B. Green.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 338, Price codes: A11 in paper copy, A01 in microfiche. M.A. Thesis, (1975). 225 p, 16 fig, 25 tab, 76 ref. OWRT B-115-MO(1), 14-34-0001-6095.

Descriptors: *Humic acids, Coal, Copper, Ions, *Leaching, Heavy metals, Neutralization, Coal mines, Chelates, Acids, Waste water treatment.
Identifiers: *Coal humic acids, *Cupric ion.

The properties of coal humic acids were examined with the objective of determining their suitability for removing some of the major pollutants associated with the mining and use of coal. The preparation and characterization of coal humic acids is described. Their acid-base and precipitation behavior were determined. Rates and equilibria for leaching of copper from insoluble copper salts by coal humicacids were measured. The formation constants of soluble copper humate chelates were measured. Binding of copper by insoluble coal humic acids in acidic media was investigated. Even at pH values as low as 2, copper is bound to insoluble coal humic acid in water.
W77-07104

THE EFFECT OF THE USE OF PESTICIDES AND FERTILIZERS IN THE WATER PROTECTION ZONE WITH SOURCES OF ARTIFICIAL REPLENISHMENT OF UNDERGROUND WATER RESERVES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
G. M. Pakhov, R. V. Petrov, V. V. Tsapko, and L. N. Vanyurikhina.
Gig Sanit 3, p 101-102, 1976.

Descriptors: Water pollution sources, *Insecticides, *Fertilizers, Agricultural runoff, *Path of pollutants, DDT, *Pesticide residues, Soil analysis.

LIBRARY U. OF I. URBANA-CHAMPAIGN

Identifiers: *USSR(Severskii Donets river valley), Atrazine, Mataphor, Granosan.

Tests were conducted in the water protection zone of the Severskii Donet river valley (USSR) to determine the possible pollution by insecticides and fertilizers of run off waters from farmlands entering underground streams feeding several intakes. Soil probes indicated that metaphos, DDT, granosan and atrazine remained in the upper layer of the soil and did not penetrate down to the water table. Hexachlorocyclohexane was found in surface and river waters of the intakes indicating penetration was possibly due to physical and chemical composition of the soil, amount of rainfall, geological relief, height of the water table or hydraulic connection of the Upper Cretaceous water-bearing horizon with the polluted waters of the Severskii Donets and its tributaries. Comparative data over a 10-yr period showed in increase (300-400%) in dry residues, chlorides (500%), sulfates (700-800%) and acidity (150%) in the intakes due to use of mineral fertilizers.--Copyright 1977, Biological Abstracts, Inc.
W77-07107

NITRATE IN GROUND WATER AND ITS RELATION TO FERTILIZATION, (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
J. Borneff, and B. Adade.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 157(4), p 337-355, 1973.

Descriptors: *Nitrates, *Groundwater, *Fertilization, Potable water, Water treatment, *Waste water treatment, Water wells, Water pollution, Public health.
Identifiers: *Nitrosamines, MetHb.

A high content of NO3- in drinking water is particularly hazardous to infants because of the formation of metHb. If sufficient amounts of nitrosamines are formed and become active in the digestive tract, there is a risk of cancer to all age groups. Various prophylactic measures are required. The admission of increasing amounts of NO3- into ground water must be avoided. Techniques to decrease the amount of NO3- in drinking water and appropriate instructions on domestic food preparations must be applied. For 2 yr at 14 day intervals checks were made of 3 wells in the Mainz, West Germany, basin and the upper layers of the soil in the immediate catchment areas. The highest amount of NO3- in soil was found in the vicinity of 2 of the wells situated in a wine growing area and corresponded to the fertilization period (June and July). A minimum amount was recorded in winter. The wells carried the highest amount of NO3- 6 mo. later. Amounts of NO3- in unfertilized soil of the same area followed similar principles, i.e., untreated soil also contributed NO3- to the ground water. The NO3- fluctuation in the 3rd well situated in a fruit- and vegetable-growing area was less evident, but concentrations were somewhat higher, even though the fertilization was not more intense than that in the wine growing area. The extent of vegetative cover and the porosity of the soil are decisive factors for the fertilization-dependent NO3- concentration in ground water. The leaching of naturally formed NO3- in the soil is also of considerable importance. A rigorous restriction of the use of mineral fertilizer alone cannot be successful in controlling NO3- leakage into ground water. Prophylactic measures must be extended to cover the avoidance of overfertilization, optimal cultivation of the soil, correct of sites and good construction techniques of wells. If these measures do not lower the NO3- content of drinking water to the recommended WHO standards, the water must be treated (e.g., by means of ion exchangers biological denitrification), and where this is impossible, measures must be taken domestically (e.g., special water for infant food, etc.). NO3- standards regarding the formation of nitrosamines are not yet established.--Copyright 1974, Biological Abstracts, Inc.
W77-07112

VARIATIONS IN THE LEAD, ZINC AND CALCIUM CONTENT OF DENDROBAENA RUBIDA (OLIGOCHAETA) IN A BASE METAL MINING AREA,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-07135

THE RATE OF MICROBIAL DEGRADATION OF OIL IN A BEACH GRAVEL COLUMN,
University Coll. of North Wales, Bangor. Marine Science Labs.
C. F. Gibbs, and S. J. Davis.
Microbial Ecology, vol. 3, p. 55-64, 1976. 6 fig., 1 tab., 12 ref.

Descriptors: *Microbial degradation, *Oil, *Biodegradation, Oil pollution, Laboratory tests, Percolator, Nutrient, Requirements, Water temperature, Laboratory equipment, Microorganisms, Methodology.
Identifiers: Crude oil, Continuous flow respirometer, Nutrient supplements, Oxidation rates.

An automatic, continuous flow respirometer was used to follow the bio-oxidation of a crude oil in a column of fairly coarse beach material. A number of water percolation rates were employed, with and without inorganic nutrient supplementation (nitrate and phosphate). Initially, nutrient supplementation was required to allow significant oxidation rates, but a capacity for biodegradation in the absence of continued supplementation developed slowly. The increase in oxidation rate with nutrient supplementation was in the proportion of 0.23 mg oxygen per micromole nitrate. This proportionality was similar to previous results (using different systems), as was the effect of temperature. The mean of two Q10 values was 2.7. (Katz)
W77-07138

NITROGEN CONTAMINATION SOURCES IN SHALLOW GROUND WATER, LAS VEGAS AREA, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
J. W. Hess, and R. O. Patt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 328, Price codes: A04 in paper copy, A01 in microfiche. Technical Report Series HW-32, April 1977. 60 p, 9 fig, 8 tab, 43 ref, 2 append. OWRT B-085-NEV(1). 14-31-0001-6097.

Descriptors: *Groundwater, *Nitrates, Nitrogen, Organic soils, Water quality, Groundwater mining, Mathematical models, Chemical analysis, Soil moisture, Resistivity, *Nevada, Water pollution sources.
Identifiers: *Las Vegas Valley(Nev), *Shallow groundwater.

The problem of high nitrate concentrations in shallow ground water in the Gilcrease Ranch area of Las Vegas Valley, Nevada first became apparent in 1972 when Clark County District Health Department officials reported nitrate concentrations of up to 450mg/l in domestic wells of the area. Presently high nitrate concentrations affect at least 40 homes in a 17 km2 area. Possible sources for these high nitrate levels include nitrogen organic and/or evaporite materials. High nitrate concentrations in ground water in the area are encountered in first water at 26 to 28m depth and extend to a depth of 44m. Contamination of the better quality lower aquifer zones has apparently not yet occurred. Based on geochemical, hydrologic and volumetric evidence: (1) ammonium sulfate fertilizer used on the Gilcrease Ranch probably is not a significant source of nitrate, (2) septic systems and animal corrals leachates are not prime sources of nitrate to most wells and (3) natural nitrate producing sources are the most likely source of nitrate pollution in the study area. Homes with nitrate concentrations in well waters exceeding 45 mg/l should use uncontaminated water from other sources for drinking and culinary pruposes until either a new, properly constructed well is drilled or other water service is provided. All new wells in the area should be drilled to a depth sufficient to provide water from the lower good quality aquifers and should be sealed for at least the first 60m. (See also W76-09762)
W77-07141

ANALYSIS OF FLOW AGAINST DISPERSION IN POROUS MEDIA,
Birmingham Univ. (England), Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-07150

APPLICATION OF NITROGEN-ISOTOPE STUDIES TO HYDROLOGY AND HYDROGEOLOGY--ANALYSIS OF THE PECULIAR CASE OF THE MELARCHEZ BASIN (SEINE-ET-MARNE, FRANCE) (APPLICATION DE L'ETUDE ISOTOPIQUE DE L'AZOTE EN HYDROLOGIE ET EN HYDROGEOLOGIE--ANALYSE DES RESULTATS OBTENUS SUR UN EXEMPLE PRECIS: LE BASSIN DE MELARCHEZ (SEINE-ET-MARNE, FRANCE)),
Centre National de la Recherche Scientifique, Paris (France). Laboratoire de Geologie Dynamique.
A. Mariotti, and R. Letolle.
Journal of Hydrology, Vol. 33, No. 1/2, p 157-172, March 1977. 6 fig, 2 tab, 16 ref.

Descriptors: *Water pollution sources, *Nitrates, *Watersheds(Basins), *Agricultural runoff, Agricultural watersheds, Foreign countries, Foreign research, On-site investigations, Tracers, *Path of pollutants, Nitrogen, Runoff, Farm wastes, Fertilizers, Groundwater, Surface waters, Agriculture, *Isotopic studies.
Identifiers: *France(Melarchez Basin), *Nitrogen-isotope studies.

The isotope ratio N15/N14 of nitrates were studied on a small basin near Paris, in an intensively cultivated area. The measurements were made at the basin outlet. This study allowed the distinction to be made between three potential nitrogen inputs: (1) nitrates from the local nitrogen cycle; (2) nitrates from nitrification of animal wastes; and (3) nitrates from artificial fertilizers. The isotope balance indicated that the preponderant source for nitrates was from artificial fertilizers. (Humphreys-ISWS)
W77-07154

LEACHING CHARACTERISTICS OF POLLUTED DREDGINGS,
Hayward Baker Co., Odenton, Md.
J. S. Jin, R. J. Krizek, and G. L. Roderick.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE2, Proceedings Paper 12848, p 197-215, April 1977. 2 fig, 5 tab, 11 ref. EPA 15070-GCK, R-800948.

Descriptors: Leaching, *Dredging, Water pollution, *Permeability, *Water pollution sources, Additives, Channel improvement, Soil amendments, Desilting, Leachate, Soil water, Groundwater, Subsurface drainage, Properties, Infiltration, Chemical analysis, Pollutants, Sedimentation, Waste disposal, Wastes, Landfills, Trace elements, Bottom sediments.
Identifiers: *Leaching characteristics, *Dredges, *Disposal sites, *Spoil, *Great Lakes harbors, Chemical constituents, Chemical additives.

This study was directed toward evaluating the pollution potential of leachates from seven different dredged materials and the effect of various additives on improving leachate quality, as well as sedimentation characteristics and shear strength. Based on the results of sequential series of sedimentation tests and sedimentation-leaching tests with and without additives, no significant changes in leachate quality were observed; increases in the specific ion concentrations and increases in the dissolved solids of the leachates were directly attributable to the additives used. In most cases there were increases in the solids due to flocculation, and lime was found to be effective in stabilizing the soil structure, increasing the permeability of the sediment and hastening the rate of leachate production. In an effort to assess the long-term pollution potential of such leachates with and without addition of lime, a series of repeated leaching tests were performed. The leachates from the dredged materials tested do not appear to cause any serious pollution problem. (Henley-ISWS)
W77-07158

STOCHASTIC PROPERTIES OF DAILY TEMPERATURE IN RIVERS,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
C. C. S. Song, and C-Y. Chien.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE2, Proceedings Paper 12858, p 217-231, April 1977. 6 fig, 5 tab, 9 ref, 1 append. NSF ENG 74-02036.

Descriptors: *Water temperature, *Rivers, *Regression analysis, Air temperature, Correlation analysis, *Stochastic processes, Temperature, Thermal pollution, Freezing, Probability, Model studies, Mathematical models, Statistical methods, Statistics.
Identifiers: Stochastic models, Probability theory.

Some stochastic properties of the daily range of water temperature variations in rivers, mostly located in the central part of the United States, were analyzed using data published by the U.S. Geological Survey. It was found that the water temperature variation follows quite closely the patterns of air temperature variation when the river is not subjected to freezing. Freezing tends to inhibit the water temperature variation, and the degree of daily temperature variation diminishes as the daily mean temperature approaches 0 C. As a result, the daily range of water temperature variation of a freezing river is highly correlated with daily mean water temperature. Some aspects of auto-regression and cross-regression models were reviewed and applied. An air-water temperature response coefficient was found to correlate well with a dimensionless number representing the ratio of the characteristic period of air temperature variation and the characteristic time scale of heat transfer in a river. (Sims-ISWS)
W77-07159

CONVECTIVE-DISPERSION IN PERENNIAL STREAMS,
Sargent and Lundy, Chicago, Ill.
A. Prakash.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE2, Proceedings Paper 12891, p 321-340, April 1977. 11 fig, 4 tab, 25 ref, 1 append.

Descriptors: *Convection, *Dispersion, *Water pollution sources, *Streams, Rivers, Radioactive waste disposal, Model studies, Mathematical models, Pollution, Streamflow, Channels, Mixing, Effluents, Analytical techniques, *Path of pollutants.
Identifiers: Method of images, Nonpoint sources of pollution.

Mathematical models were developed to predict the spatial distribution of concentration of radioactive effluents discharged into a perennial stream. The models include continuous, instantaneous, and finite time release of effluents from point, line, plane, and parallelepiped sources. Analytical solutions were presented for both steady-and nonsteady-state transports of effluents. The effect of finite channel dimensions was taken care of by the method of images. The sensitivity of the mixing process to the variations in the coefficients of transverse and in the vertical dispersion was illustrated by numerical examples. The practical application of each solution was demonstrated by solving specific field problems. (Sims-ISWS)
W77-07160

FAR FIELD CIRCULATION VELOCITIES IN SHALLOW LAKES,
North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 2H.
W77-07164

RED TIDE IN THE UPWELLING REGION OF BAJA CALIFORNIA,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
For primary bibliographic entry see Field 5C.
W77-07169

NONPOINT SOURCE EFFECTS ON WATER QUALITY,
Florida Technological Univ., Orlando.
M. P. Wanielista, Y. A. Yousef, and W. M. McLellon.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 441-451, March 1977. 5 fig, 10 tab, 24 ref.

Descriptors: *Water quality standards, *Water pollution sources, Pollutants, *Florida, Urban runoff, Agricultural runoff, Land use, Precipitation(Atmospheric), Wastes, Chemicals, Heavy metals, Pesticides, Fertilizers, Instrumentation, Data collections, Lakes, Streams, Watersheds(Basins), Water pollution, *Standards, *Path of pollutants.
Identifiers: *Nonpoint sources of pollution, Mass loading, Loading rates, Mass standards.

Results of a project to define the nature and extent of nonpoint source water quality responses were reported. Included were some details of a procedure to construct instrumentation that can automatically collect water samples in a way that reflects field conditions, water quality response curves related to point and nonpoint sources, and development of loading rates from nonpoint sources for urban and non-urban basins. A pollutant mass standard was proposed where appropriate, in addition to concentration standards. The work is useful as an aid to establish field measuring programs to determine the characteristics and extent of nonpoint and point source pollution. Results for two basins in central Florida were presented. A comarison of these results considered with other data indicated the necessity of site-specific studies. (Sims-ISWS)
W77-07173

DISSOLVED HELIUM IN LAKES: URANIUM PROSPECTING IN THE PRECAMBRIAN TERRAIN OF CENTRAL LABRADOR,
McMaster Univ., Hamilton (Ontario). Dept. of Physics.
For primary bibliographic entry see Field 5A.
W77-07174

TRANSPORTS IN LAKE SUPERIOR,
Minnesota Univ., Duluth. Dept. of Physics.
S. Diehl, W. Maanum, T. Jordan, and M. Sydor.
Journal of Geophysical Research, Vol. 82, No. 6, p 977-978, February 20, 1977. 5 fig, 7 ref. NASA NGL 24-005-263, EPA R005175-02.

Descriptors: *Sediment transport, *Winds, *Lake Superior, *Model studies, *Great Lakes, Mathematical models, Circulation, Water circulation, Suspended solid, Lakes, Satellites(Artificial), Remote sensing, Turbidity, Pollutants, *Path of pollutants, Water pollution, Limnology.
Identifiers: LANDSAT, Taconite tailings.

Transports for Lake Superior were obtained by using a depth-integrated model applied to a 6 x 6 km grid. The results were used to explain the movement of red clay plumes in extreme western Lake Superior. For northeasterly winds, the calculated transports and LANDSAT data on turbidity show that the plumes originating along the Wisconsin shore move toward Minnesota Point and are then taken out along the axis of the arm of the lake because of a return path produced by currents along the Minnesota and Wisconsin shores converging at Minnesota Point. The results from the model also account for the migration of taconite tailings along the Minnesota shore from Silver Bay to the Duluth water intake. (Sims-ISWS)
W77-07176

THE ECOLOGICAL CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART I: ECOLOGICAL STUDIES,
Maine State Dept. of Marine Resources, Augusta.
For primary bibliographic entry see Field 5C.
W77-07178

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART II. CHEMICAL STUDIES,
Bowdoin Coll., Brunswick, Maine. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-07179

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART III: HISTOPATHOLOGICAL STUDIES,
National Water Quality Lab., West Kingston, R. I.
For primary bibliographic entry see Field 5C.
W77-07180

RAPID DETERMINATION OF TOTAL ORGANIC CARBON AND ITS APPLICATION TO WATER RESEARCH, (IN JAPANESE),
Osaka City Inst. of Public Health and Environmental Sciences, (Japan).
For primary bibliographic entry see Field 5A.
W77-07183

THE DISTRIBUTION AND ECOLOGY OF COMMON MARINE AND ESTUARINE GASTROPODS IN THE DELAWARE BAY AREA,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5C.
W77-07185

HEAVY METAL POLLUTION IN TRONDHEIMSFJORDEN, NORWAY, AND THE RECORDED EFFECTS ON THE FAUNA AND FLORA,
Kongelige Norske Videnskabers Selskab, Trondheim. Museet.
For primary bibliographic entry see Field 5C.
W77-07194

UPTAKE, DISTRIBUTION, AND DEPURATION OF 14C-BENZENE IN NORTHERN ANCHOVY,

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ENGRAULIS MORDAX, AND STRIPED BASS, MORONE SAXATILIS,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Lab.
For primary bibliographic entry see Field 5C.
W77-07202

ENVIRONMENTAL DEPENDENCE OF MANGANESE AND ZINC IN THE SCALES OF ATLANTIC SALMON, SALMO SALAR (L) AND BROWN TROUT, SALMO TRUTTA (L),
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-07203

WATER QUALITY AND CHEMICAL MODELS,
Harvard Univ., Boston, Mass. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 5C.
W77-07246

ENTEROVIRUS AND BACTERIOPHAGE INACTIVATION IN SUBSURFACE WATERS AND TRANSLOCATION IN SOIL,
New Mexico State Univ., University Park. Dept. of Biology.
J. G. Yeager, and R. T. O'Brien.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 708, Price codes: A04 in paper copy, A01 in microfiche.
New Mexico Water Resources Research Institute, Las Cruces, Report No. 083, Partial Completion Report, January 1977, 40 p, 2 fig., 5 tab, 45 ref. OWRT A-052-NMEX(4). 14-34-0001-7066.

Descriptors: Microorganisms, Water pollution, *Viruses, *Bacteriophage, Investigations, *New Mexico, Subsurface waters, Surface waters, Septic tanks, *Translocation, Environmental sanitation, Human pathology, Public health, Soils, *Path of pollutants, Groundwater.
Identifiers: Inactivation, Rio Grande River(N Mex), Soil adsorption-elution, *Poliovirus 1, *Coxsackievirus B-1, *Enterovirus.

Inactivation of poliovirus 1, coxsackievirus B-1 and bacteriophages was studied in surface and subsurface waters and in septic tank liquor. In situ experiments were conducted in Rio Grande River water and in shallow ground water using dialysis membrane chambers with sidewalls. Laboratory inactivation studies were performed using deep Groundwater and septic tank liquor. Soil adsorption-elution characteristics of the viruses and bacteriophages were studied using the surface and subsurface waters as eluents. Results showed that the viruses and bacteriophages were inactivated at different rates in the waters tested. The rate of inactivation varied with virus and bacteriophage type and with water type. Extended survival of poliovirus 1 and coxsackievirus B-1 was demonstrated in shallow groundwater and septic tank liquor when compared to survival in deep groundwater. Inactivation of bacteriophages was generally faster than the viruses, and statistical comparison of inactivation rates showed that none of the bacteriophages studied would serve as suitable general indicators of enteric virus inactivation in the waters tested. Soil adsorption-elution studies showed that virus adsorption characteristics varied with virus, water, and soil type. The elution of the enteric viruses from soils was more efficient with septic tank liquor and deep groundwater. The results suggest that a health hazard could exist if pathogenic, enteric viruses were introduced into surface and groundwaters which are destined for domestic or other uses. The results also show that it is impossible to make valid generalizations regarding virus soil adsorption characteristics based on studies using only one virus, soil, or water type. (Stockton-NMex State)
W77-07283

GEOLOGISTS CLAIM HEALTH CAN BE TRACED TO ROCKS,
News in Engineering, Ohio State University, Columbus, Vol. 49, No. 1, p 10, 24, January, 1977.

Descriptors: *Human diseases, *Rock properties, *Diseases, *Environmental effects, *Soil chemical properties, *Weathering, Hardness(Water), Magnesium, Trace elements, Zinc, Fluorides, Public health.
Identifiers: Cancer, Bone disease, Selenium.

Statistics show that throughout the world, lifespan and disease patterns differ significantly between various geographical areas. New evidence suggests that some of this variance may be due to the rocks and soils of given areas, according to faculty members of the Ohio State University Geology Department. Correlations between level of iodine and goiter, fluoride and tooth decay, and high zinc concentrations and bone disease are among the most obvious to date. There are also statistical sugestions that human death rate is higher in areas with a deficiency of weatherable materials in the soil, and that cardiovascular disease is more prevalent in areas with soft water. Various types of cancer may also have geographical influences. These latter correlations remain very inconclusive, however, and much more research with attention to intervening variables is necessary before causal relationships can be inferred.(Eberle-NWWA)
W77-07290

ATOMIC ABSORPTION MEASUREMENTS OF LEAD, CADMIUM, COPPER, IRON, AND ZINC IN SESTON OF THE BALTIC SEA,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5A.
W77-07309

PRELIMINARY EXPERIMENT OF COBALT 60 POLLUTION OF A MARINE FOOD CHAIN: RESULTS OF A SINGLE INGESTION,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Departement de Protectione; CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Service de Recherches Toxicologiques et Ecologiques; and CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Laboritorie de Radioecologie Continental.
For primary bibliographic entry see Field 5C.
W77-07317

CIRCULATION AND SURGE MODELING IN PAMLICO SOUND, N.C.,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-07320

LONG ISLAND BEACH POLLUTION: JUNE 1976,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.
MESA Special Report, February 1977. 85 p, 24 fig, 11 tab, 38 ref, 2 append.

Descriptors: *Water pollution sources, *Flotsam, Pollutants, *Pollutant identification, Beaches, Winds, Wastes, Path of pollutants, New York.
Identifiers: *New York Bight, *Long Island, Floatable wastes.

Information is given on the nature and possible sources of floating trash and pollutants that were washed up in large quantities on most of Long Island's beaches during June 1976. The general orientation is defined and the roles played by the Federal, State and local agencies during the beach pollution event are described. The waste materials identified on the beaches are described; they include tar and grease balls, sewage-related items, garbage, trash, and charred wood. Historical surface wind data and the wind conditions during June 1976 were analyzed, surface drifter studies were examined and the U. S. Coast Guard and the Brookhaven National Laboratory surface transport models were applied to the events of June 1976. It was concluded that persistent southerly wind-driven transport was responsible for the stranding of the floatables. Southerly surface winds with about 8.0-kn velocities are not unusual for June over the Bight. The Hudson/Raritan estuarine outflow is a major source of floatables to the waters of the New York Bight. It also suggested that sewage sludge dumping has been a minor contributor to the floatables found on the beaches. It is understood that effective corrective measures cannot take place until quantitative documentation of the sources of floatables has been accomplished. (NOAA)
W77-07325

THE EFFECT OF COLLECTOR DISCHARGE WATER FROM RICE FIELDS ON THE ZOOPLANKTON OF SOME KUBAN ESTUARIES, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5C.
W77-07331

PROCEEDINGS OF THE SEVENTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
For primary bibliographic entry see Field 8D.
W77-07342

EFFECTS OF MAN'S ACTIVITIES ON GROUNDWATER QUALITY,
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
G. Matthess.
Hydrological Sciences Bulletin, Vol 21, No 4, p 617-628, December 1976. 97 ref.

Descriptors: *Groundwater, *Water pollution sources, *Pollutants, Infiltration, Groundwater movement, Path of pollutants, Water quality, Water pollution, Geochemistry, Biochemistry, Fertilizers, Agricultural chemicals, Solid wastes, Leaching, Pesticides, Salts, Geology, Pollution.

The changes in groundwater quality that result from man's activities were reveiwed. This paper considered the various geochemical reactions, the biochemical processes, and the physical processes that take place as well as the sources of pollution. Suggestion were made for future research, and practical guidance was given for avoidance of pollution of groundwater or for minimizing its effects. (Sims-ISWS)
W77-07359

ANTHROPOGENICALLY REDUCED GROUNDWATERS,
Coblenz Federal Inst. of Hydrology (West Germany).
F. Schwille.
Hydrological Sciences Bulletin, Vol 21, No 4, p 629-645, December 1976. 9 fig, 40 ref.

Descriptors: *Groundwater, *Dissolved oxygen, *Water pollution sources, *Reduction(Chemical), Oxygen, Geochemistry, Water pollution, Microbial degradation, Biodegradation, Biochemistry, Groundwater movement, Waste disposal, Path of pollutants, Water quality, Oxidation, Canals, Infiltration.

Groundwaters which have lost their original oxygen content as a consequence of reducing i.e., oxygen-consuming microbial processes, are a com-

mon phenomenon in nature. But man, too, can change oxygenocontaining waters in a variety of ways into oxygen-free groundwaters. The different ways of 'groundwater reduction' by man's activities were illustrated by way of selected examples. (Sims-ISWS)
W77-07360

OCCURRENCE AND DETERMINATION OF A HERBICIDE BENTHIOCARB IN RIVERS AND AGRICULTURAL DRAINAGES,
Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
For primary bibliographic entry see Field 5A.
W77-07361

THE ANALYSIS OF AMMONIA IN POLLUTED SEA WATER,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
For primary bibliographic entry see Field 5A.
W77-07362

PHOSPHORUS AND CARBON DISTRIBUTIONS IN A POLLUTED COASTAL ENVIRONMENT,
Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
S. R. Aston, and C. N. Hewitt.
Estuarine and Coastal Marine Science, Vol 5, No 2, p 243-254, March 1977. 4 fig, 3 tab, 19 ref.

Descriptors: *Phosphorus, *Carbon, *Distribution, *Coasts, *Pollution identification, Tidal waters, Sewage effluents, Intertidal areas, Particle size, Sediment distribution, Sampling, *Path of pollutants.
Identifiers: *England(Walton Backwaters), Particulates.

Phosphorus and organic carbon distributions were used to examine the effect of pollution from sewage effluents on a semi-enclosed tidal area. The phosphorus and organic carbon accumulating in the sediments of the area were related to the influx of particulate matter during tidal cycles, and some of the environmental factors determining the influence of marine effluent disposal on a coastal zone were assessed. (Visocky-ISWS)
W77-07368

INORGANIC CONTAMINANTS IN RURAL DRINKING WATERS,
South Carolina State Coll., Orangeburg. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-07372

STUDY ON THE HERBICIDAL PROPERTIES OF BENTHIOCARB; FACTORS AFFECTING HERBICIDAL ACTIVITY AND ITS BEHAVIOR IN SOIL, (IN JAPANESE),
Utsunomiya Univ. (Japan). Coll. of Agriculture.
N. Ichizen.
Bull Coll Agric Utsunomiya Univ 9(3), p 109-125, 1976.

Descriptors: *Herbicides, *Carbamate pesticides, *Grasses, Humus, Percolation, Water temperature, Soils, Growth stages, Water pollution, Path of pollutants, Soil types, Depth.
Identifiers: Echinochloa-crus-galli-var-oryzicola, Eleocharis-acicularis, Monochoria-vaginalis, *Benthicarb.

The susceptibility of barnyard grass (Echinochloa crus-galli P. Beauv. var. oryzicola Ohwi), monochoria (Monochoria vaginalis Presl.) slender spikerush (Eleocharis acicularis Roem. et Schult.) at several growth states to Benthiocarb (S-(4-chlorobenzyl)N,N-diethyl thiolcarbamate) and the influence of soil type, temperature, water depth and water percolation on the herbicidal effectiveness of Benthiocarb against barnyard grass were determined under submerged conditions. The younger growth stages of barnyard grass, monochoria and slender spikerush were more susceptible than older growth stages. Higher herbicidal effectiveness of Benthiocarb against barnyard grass was observed in the following order: less humus-content soil > higher humus-content, soil, less water percolation > higher water percolation, higher temperature > lower temperature. The behavior of Benthiocarb in water when treated under submerged conditions as well as movement and inactivation in soil were determined using barnyard grass. Although Benthiocarb is decomposed slightly by sunlight under submerged conditions, most of it moved gradually into the soil. Benthiocarb moved downward from surface soil by leaching. The degree of movement in soil is affected by soil type and water leakage but not by temperature. The persistence of Benthiocarb in soil was nearly equal to that of CNP (p-nitrophenyl 2,4,6-trichlorophenyllether). When soil treated by Benthiocarb and thereafter inactivated was retreated with Benthiocarb, persistence was shortened. When Benthiocarb was applied to sterile and non-sterile soil, inactivation occurred sooner in non-sterile soil. Persistence in soil was affected by soil type, amount of water percolation and temperature. Decomposition products derived from Benthiocarb in soil (S-(4-chlorobenzyl)N-ethyl thiolcarbamate, p-chlorobenzoic acid) did not affect the growth of various crops at a rate of 100 g/10 ares (the standard dosage of Benthiocarb is - 200-300 g/10 ares).--Copyright 1977, Biological Abstracts, Inc.
W77-07387

MINERALIZING MICROBIAL ACTIVITY IN LAKE FARO,
Messina Univ. (Italy). Instituto di Idrobiologia.
For primary bibliographic entry see Field 5C.
W77-07418

A NITROGEN GAS (N2) MODEL FOR THE LOWER COLUMBIA RIVER, FINAL REPORT,
Water Resources Engineers, Inc., Walnut Creek, Calif.
L. A. Roesner, and W. R. Norton.
Prepared for the Portland District, North Pacific Division, U.S. Army Corps of Engineers, Portland, Oregon, Report No. 1-350, January 1971, 88 p., 2 tab., 15 fig.

Descriptors: *Columbia River, *Nitrogen, *Supersaturation, *Model studies, *Simulation, Hydraulic models, Mathematical models, Estimating, Testing, *Theoretical analysis, Salmon, Rainbow trout, Dams, Dam sites, Path of pollutants.
Identifiers: *Chinook salmon, Steelhead trout, Lower Snake River, *Control plans.

A mathematical simulation model for dissolved nitrogen in the lower Columbia and Snake Rivers is presented. The dissolved nitrogen model may serve as a valuable tool for identifying ways to control N2 levels in the river system. (Katz)
W77-07422

UPWELLING IN A MODEL OF AN INTERMONTANE LAKE,
P. F. Hamblin.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 88-96, 1975. 5 fig., 5 ref.

Descriptors: *Thermocline, *Upwelling, *Model studies, *Mixing, Limnology, Hydraulic models, Wind velocity, Coriolis force, Seiches, Lake breezes, Lakes, *Canada.
Identifiers: *Babine Lake(British Columbia), *Intermontane lakes.

A two-layer linearized analytical model is presented to illustrate the response of an intermontane lake to a suddenly-imposed divergent wind field. Because of the importance of the biological processes occurring in the lake, attention is focussed primarily on the upwelling of the thermocline. Upwelling in such a model occurs not at the boundaries but in the center of the diverging wind, and over a broad central region, whereas the consequent downwelling is confined to the nearshore areas and hence is stronger. The thermocline does not have a single peak but is binodal. These features have been identified in a summer episode of upwelling in Babine Lake (British Columbia). As a consequence of the earth's rotation, the thermocline topography is rotated to the right of the wind stress in a large intermontane lake. The analytical model described is based on a two-layer inviscid equation of motion where the depth laws in the upper layer and the lower layer are elliptic in plan and parabolic in cross section. A discussion of the results of the model's application includes graphical descriptions of the displacement of the thermocline of the model lake from the initial state over four time periods, the celocity field in the upper layer as a funtion of non-dimensional time, and the same function for the lower layer. (Harris-Wisconsin)
W77-07469

A STUDY OF ENVIRONMENT SANITATION ON THE WELLS IN JUNGNEUNG-DONG AREA, SEOUL, (IN KOREAN),
Korea Univ., Seoul. Coll. of Medicine.
H. Kim, Y. J. Park, K. J. Shin, Y. H. Kim, and K. G. Kim.
Korean Cent J Med 29(1), p 51-56, 1975.

Descriptors: *Water wells, Public health, Asia, Water pollution, Water supply, *Human diseases, Potable water, *Pollutant identification, *Coliforms, *Environmental sanitation.
Identifiers: *Jungneung-Dong(Korea).

Clean water supply is an important factor in the prevention of water borne diseases in Korea and other developing countries. In Seoul, about 10% of inhabitants use untreated well water as the drinking water source. A sanitary survey was carried out on 16 pump wells, 15 lidless wells and 10 springs in the Jungneung-dong area at the foot of Mt. Puk-Ak. Potability was investigated. Average values of the water tested were pH=6.6, KMn04 consumption = 3.36 ppm, hardness of well water = 192.7 and hardness of spring water = 10.1 ppm, respectively. Quantitative analysis for ammonia-N revealed 75.6%, coliform group 73.17% and Cl demand 05.-1.0 ppm in 50% of samples. There was a significant relationship between the ammonia-N positive for coliform group bacilli and ammonia-N.--Copyright 1977, Biological Abstracts, Inc.
W77-07475

USE OF QUANTITATIVE CORRELATIONS BETWEEN MICROORGANISMS FOR RIVER POLLUTION EVALUATION, (IN RUSSIAN),
Ministerstvo Melioratsii i Vodnogo Khozyaistva, Vilnius (USSR).
Z. P. Ambrazene.
Zh Obshch Biol 37 (3); p. 416-426, 1976.

Descriptors: *Microorganisms, Water pollution, Rivers, *Correlation analysis, *Regoession analysis, *Organic matter, *Classification.
Identifiers: Lithuanian-SSR, USSR, Saprobic zones.

Correlation and regression analyses of the data from field studies of water from 33 rivers in the Lithuanian SSR, USSR, revealed close relationships between individual physiological groups of microorganisms participating in the decomposition of organic matter (correlation coefficient r = 0.5-0.9). There were also close correlations between physiological groups of microorganisms and the chemical and hydrobiological indices of the organic matter concentration in water (r = 0.4-0.8). A linear relationship was found between the microbial count and the organic matter concentration. An evaluation system for river pollution using 9 microbiological indices was devised. A classifica-

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tion of water pollution in 4 grades (corresponding to 4 saprobic zones) is proposed based on quantitative relationships between individual groups of microorganisms. The proposed classification facilitates assessment of the sanitary-epidemiological condition of a water body and the degree of its pollution with organic substances. --Copyright 1977, Biological Abstracts, Inc.
W77-07482

REAERATION-COEFFICIENT MEASUREMENTS OF 10 SMALL STREAMS IN WISCONSIN USING RADIOACTIVE TRACERS--WITH A SECTION ON THE ENERGY-DISSIPATION MODEL.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-07496

ROLE OF OLIGOCHAETES IN THE CIRCULATION OF WATER AND SOLUTES ACROSS THE MUD-WATER INTERFACE,
For primary bibliographic entry see Field 5C.
W77-07508

SOURCES OF NITROGEN AS A WATER POLLUTANT: INDUSTRIAL WASTE WATER,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
L. Landner.
Report IVL B 311, June 1976. 15 p. 8 tab., 16 ref.

Descriptors: *Nitrogen, *Industrial wastes, *Estimating, *Water pollution sources, Foreign countries, United States, California, Pulp wastes, Sulfite liquors, Industries, Metallurgy, Food processing industry, Chemical industry, Mineral industry, Fertilizers.
Identifiers: *Industrial nitrogen sources, *Sweden, Finland, Fertilizer industry.

The few estimates of nation-wide industrial nitrogen discharge sources described in the literature, particularly for Sweden, Finland, the United States, and California, are reviewed and discussed. Sources considered are pulp and paper mills; the fertilizer industry, with emphasis on their nitrogen outputs in Sweden. Detailed measurements indicate that the annual nitrogen discharges in Sweden from the pulp and paper mill industry are 4000 tons; the fertilizer industry 800 tons; the chemical industry 1700 tons; mining, iron and steel industries 2400 tons, totaling 10,400 tons annually from these industrial sources. Estimates for the chemical industry, the textile and leather industry, and the food processing industry are believed to be low, because those industrial effluents discharged to municipal sewage treatment plants are not accounted for. It is estimated that all nitrogen sources, including background, forest and agricultural runoff, and municipal and industrial wastes contribute 132,000 tons a year to Swedish waters. (Auen-Wisconsin)
W77-07521

OIL-OXIDIZING BACTERIA OF THE RIVER YENISEI, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-07532

LIMITATIONS OF SINGLE WATER SAMPLES IN REPRESENTING MEAN WATER QUALITY 1. THOMPSON RIVER AT SHAW SPRING, BRITISH COLUMBIA,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5A.
W77-07563

RELATION BETWEEN THE AMOUNTS OF FERTILIZATION AND LIVESTOCK WASTE ON FIELDS AND THE POLLUTION OF STREAMS FLOWING INTO LAKE KASUMIGAURA: 1. ON THE RELATION BETWEEN THE AMOUNT OF FERTILIZER APPLICATION AND THE SPECIFIC POLLUTION LOADS OF NITROGEN AND PHOSPHORUS IN MAIN STREAMS FLOWING INTO LAKE NISHIURA, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
S. Moriizumi, O. Kazuji, and A. Kikkawa.
Sci Rep Fac Afr-c Ibaraki Univ. 23, p 89-100, 1975.

Descriptors: *Nitrogen, *Phosphorus, *Fertilization, Fertilizers, *Water pollution sources, Agriculture, Wheat, Barley, *Farm wastes, Streams.
Identifiers: *Lake Kasumigaura basin(Japan), Lake Nishiura(Japan).

The character of agriculture in the basin of 14 streams flowing into Lake Kasumigaura and the correlation between fertilizer use per unit area of basin and the specific pollutional load of streams were investigated. The planted area of rice in the Nishiura lake basin is the largest of all crops and occupies 49.1% of total planted areas. In the upland field, the planted areas of wheat and barley are the largest of all crops, and those of wheat and barley in Ichinose stream and Kajinashi stream basin are larger than rice. The amount of fertilizer applied to paddy fields in the Nishiura lake basin contains 55.0% N and 39.0% P. Fertilizer use per basin area of 100 km2 for 1 yr in paddy crops was maximum in the Shintone stream basin and minimim in the Sanno stream basin. Its rate in upland field crops was maximum in the Ichinose stream basin. A negative correlation was found between fertilizer use per unit area of basin for rice crops and the specific pollutional load of streams. Specific pollutional load is low in the streams around which fertilizer use per unit area of basin is high. Pollutional load from paddy field apparently was less than total loads from other sources. The same results were obtained for upland field crops. (See also W77-07569)--Copyright 1977, Biological Abstracts, Inc.
W77-07568

RELATION BETWEEN THE AMOUNTS OF FERTILIZER AND LIVESTOCK WASTE ON FIELDS AND THE POLLUTION OF STREAMS FLOWING INTO LAKE KASUMIGAURA: II. ON THE RELATION BETWEEN LIVESTOCK WASTE PER UNIT AREA OF BASIN AND THE SPECIFIC LOAD OF POLLUTANTS IN MAIN STREAMS FLOWING INTO NISHIURA LAKE BASIN, (IN JAPANESE),
Ibaraki Univ. Mito (Japan). Faculty of Agriculture.
A. Kikkawa, K. Osaki, S. Moriizumi, and T. Yoshida.
Sci Rep Fac Agric Ibaraki Univ 23, p 101-106, 1975.

Descriptors: *Fertilizers, Fertilization, Water pollution sources, *Farm wastes, Cattle, *Nitrogen, *Phosphorus, Wheat, Streams.
Identifiers: Lake Kasumigaura basin(Japan), Lake Nishiura basin(Japan).

Livestock farming in the Kasumigaura lake basin and the relation between livestock head numbers per unit area basin and the specific pollutional load of streams were investigated. Cattle (30,000 head) and swine (2000,000 head) were kept in the Kasumigaura lake basin. In each stream the total head numbers of livestock were maximum in Sakura stream basin and minimum in Sanno stream basin. Livestock waste volume per unit area of basin in tabulated. The value was very large in Ichinose and Hishiki streams basin. A negative correlation was found between livestock waste volume per unit area of basin and the specific load of streams. Livestock waste effect on the specific load of streams was less than other water pollution sources. (See also W77-07568)--Copyright 1977, Biological Abstracts, Inc.
W77-07569

THE CHANGES IN INORGANIC NITROGEN CONCENTRATION OF DRINKING WATER FROM WELLS OVER A TWO YEAR PERIOD IN ANI-MACHI, IBARAKI PREFECTURE, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
K. Nagai, M. Muraoka, and M. Oida.
Sci Rep Fac Agric Ibaraki Univ 23, p 59-64, 1975.

Descriptors: *Potable water, *Nitrogen, Water wells, Water pollution sources, *Nitrates, Nitrites, Hydrogen ion concentration, Ammonium, Water supply, Pollutant identification.
Identifiers: *Ammonium nitrogen, Ani-Machi(Japan), Ibaraki prefecture(Japan).

Nitrate, nitrite, ammomium N and pH values of water drawn from 18 wells were determined about every 2 mo. for 2 yr. from June 1973 to Sept. 1975. The pH values of each sample were almost constant; 16 of the samples were about 6.0 to 6.4 and the other 2 were about 6.5 to 7.0. Nitrate concentrationas high (about 35 to 55 ppmN) in 3 adjoining wells; that of 2 adjoining changed little for 2 yr and that of the rest 35 ppm N) was fairly varied showing considerable decrease in warm seasons. Samples (14) were 10 to > 20 ppm N (5 of them about 20 to 40); only 1 was 5 ppm N. Half of the samples have constant concentrations and the other half showed reductions in Sept. or Oct. Ammonium and Nitrite were hardly ever found.--Copyright 1977, Biological Abstracts, Inc.
W77-07570

AN INVESTIGATION ON THE DISPOSAL OF PIG EXCRETA IN KASUMIGAURA AREA, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
S. Ishizaki, and H. Yahagi.
Sci Rep Fac Agric Ibaraki Univ 23, p 7-12, 1975.

Descriptors: *Farm wastes, Water pollution sources, Waste disposal, Lakes, Waste treatment.
Identifiers: *Japan(Kasumigaura area), *Pig excreta.

The excreta of pigs kept in Kasumigaura area, Japan, is a cause of water pollution in Kasumigaura lake. Transport, storage and treatment are discussed. Excreta are used mostly in farm field but are partly thrown away or permeate underground. Most pig farms have no connection with water pollution, and there is little possibility of pollution in pig farming in upland fields or those situated far from streams.--Copyright 1977, Biological Abstracts, Inc.
W77-07571

THE DISTRIBUTION OF RESIDUAL QUANTITIES OF DDT IN THE ORGANS AND TISSUES OF FISH OF THE KIEV RESERVOIR, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
L. R. Polishchuk, and I. N. Matvienko.
Vopr Pitan 1, p 82-83, 1976.

Descriptors: *Pesticide residues, *DDT, Reservoirs, *DDD, *DDE, Fish, Water pollution, Public health, Perch, Pike.
Identifiers: Bream, Roach, Ukrainian-SSR, Zander, *Kiev Reservoir(USSR).

Studies with fish caught in the Kiev Reservoir (Ukrainian SSR, USSR) in the spring and winter periods of 1973-1974 indicated that the content of DDT residues and its metabolites DDE and DDD was greatest in the visceral fat, somewhat less in the gonads and liver, and usually undetected in the muscle. The quantity of the residues was also af-

fected by the weight, and consequently the age of the fish. The DDT content was significantly higher in the predatory fish (pike, zander, perch) than in the nonpredatory ones (roach, beam). (The danger of contaminated food products for humans is mentioned.)--Copyright 1977, Biological Abstracts, Inc.
W77-07572

THE CILIATES OF TWO BULGARIAN TRIBUTARIES OF THE DANUBE WHICH ARE POLLUTED: THE RIVERS VIT AND OSSAM, (IN FRENCH),
Sofia Univ. (Bulgaria). Inst. of Zoology.
R. B. Detcheva.
Ann Stn Biol Besse-en-chandesse 9, p 213-218, 1974/1975.

Descriptors: *Protozoa, Water pollution, Chemical properties, Tributaries, Rivers, Europe.
Identifiers: *Bulgaria, *River Vit(Bulg), *River Ossam(Bulg).

Collections were made during spring and summer at a number of locations on each river. Of 63 spp. of ciliates found, 20 spp. were present in both rivers. The chemical parameters limiting the distribution of the species found are tabulated.--Copyright 1977, Biological Abstracts, Inc.
W77-07573

DEPOSITION OF MINERAL NITROGEN BY RAIN IN THE LAMTO SAVANNA, (IN FRENCH),
Ecole Normale Superieure, Paris (France). Laboratoire de Zoologie.
P. Villecourt.
Rev Ecol Biol Sol 12(4), p 667-680, 1975.

Descriptors: *Nitrogen, Rain, Water pollution sources, Mineralogy, Africa, *Rainfall, *Burning.
Identifiers: *Brush fires, *Ivory-Coast(Lamto Savanna), Pluviometers.

The rainfall on the Lamto Savanna (Ivory Coast) during 1972 and 1973 was collected in pluviometers. They were analyzed colorimetrically for nitric N using the Griess reaction and NH3-N using the Nessler reaction. Monthly and annual averages related to rainfall, the contents and concentrations are presented. Annual deposition of nitric N was about 2.3 kg/ha in 1972. Rainfall was 1300 mm with an average concentration of 0.18 ppm. In 1973, deposition was 1.3 kg/ha, rainfall 1250 mm, and the average concentration was 0.11 ppm. Total NH3-N determined analytically, was 6.5 kg/ha per yr; but this value is considered high. The most probable contribution should be estimated at 3 kg/ha per yr. In these depositions, it is possible to discern the result of leaching of mineral N present in the atmosphere by rain. At the beginning of the rainy season brush fires and heavy showers provide about 70% of the annual deposition of mineral N.--Copyright 1977, Biological Abstracts, Inc.
W77-07574

IN VITRO EFFECT OF ORGANIC NITROGEN AND POTASSIUM ADDITIONS ON NITROGEN MINERALIZATION AND ON EXCHANGES BETWEEN THE MUD AND WATER OF A POND, (IN FRENCH),
Lyon-1 Univ., Villeurbanne (France). Departement de Biologie Vegetale; and Lyon-1 Univ., Villeurbanne (France). Laboratoire de Biologie Animaux et d'Ecologie.
H. Beaupied.
Rev Ecol Biol Soil 12(4), p 657-666, 1975.

Descriptors: *Nitrogen, *Potassium, *Mineralogy, Muds, Ponds, Dissolved solids, *Calcium, Ureas.
Identifiers: Ammonical nitrogen.

The process of exchanges of dissolved elements between the mud and water of a pond and the mineralization of organic N, were studied in tanks in vitro. In the test lots, a migration of K and Ca from mud to water was observed. The only indication of N mineralization was an accumulation of ammonical N in mud as in water. Introduction of urea into the water resulted in a distinct increase in the ratio of K to water. Large quantities of ammoniacal N resulting from heavy mineralization may have freed K from the mud. Ca evolution was modified in comparison with the test lots. K as K2So4 added to the water was rapidly absorbed into sediment. Ca migration from mud to water was slowed down. Ammonic N accumulation was lessened. Copyright 1977, Biological Abstracts, Inc.
W77-07575

STUDIES ON THE TYPOLOGY OF BALTIC LAKES WITH DIFFERENT STATES OF EUTROPHICATION, (IN GERMAN),
D. Ventz.
Int Rev Gesamten Hydrobiol 61(2), P. 183-191, 1976.

Descriptors: *Eutrophication, Phosophorus, Cycling nutrients, Oxygen, Statistical processes, Hypolimnion, Classification, Lakes, Phosphates, Water pollution sources.
Identifiers: Typology, *Baltic lakes, Orthophosphates.

The recycling of P is considered as a process of internal eutrophication and related to the hypolimnetic 02 balance. The rate of change in orthophosphate is compared with the temperal change in 02 content by means of statistical methods. The slope and the shape of the delta P/delta O2-curves may serve as a bais for lake classification.--Copyright 1977, Biological Abstracts, Inc.
W77-07576

MODELS FOR SIMULATION OF EUTROPHICATION OF LAKES FOR LAKE CONSTANCE (BODENSEE-OBERSEE): I. DATA FROM LAKE CONSTANCE USED IN SIMULATION MODELS, (IN GERMAN),
Baden-Wuerttemberg Landesanstalt Fuer Unweltschutz (West Germany). Inst. of Seenforschungs Fischereiwesen.
For primary bibliographic entry see Field 5C.
W77-07579

STUDIES ON FUNGAL PROPAGULES IN THE WESER ESTUARY (GERMAN BIGHT): I. QUANTITATIVE DATA 1974, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5C.
W77-07583

EFFECT OF ORGANIC ACIDS ON EXPERIMENTAL MANGANESE ISOLATION FROM BOTTOM SEDIMENTS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
E. P. Nakhshina, B. I. Nabivanets, and L. A. Malinovskaya.
Gidrobiol Zh 12(3), p. 56-62, 1976.

Descriptors: *Organic acids, *Manganese, Isolation, *Bottom sediments, Hydrogen ion concentration, Water pollution.

Mn movement from bottom sediments into solution was studied, the pH value was varied and some carboxylic acids were present. Within the pH range peculiar to most natural water, an increase in the organic acid concentration favors Mn isolation from the bottom sediments and its accumulation in the water mass.--Copyright 1977, Biological Abstracts, Inc.
W77-07597

5C. Effects Of Pollution

CAGE CULTURE OF CHANNEL CATFISH IN A HEATED EFFLUENT FROM A POWER PLANT, THOMAS HILL RESERVOIR,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
T. H. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 327, Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Thesis, May 1976. 90 p, 7 fig, 13 tab, 59 ref, append. OWRT B-039-MO(7), 14-31-0001-3296.

Descriptors: *Thermal pollution, Reservoirs, *Fish farming, *Channel catfish, Heated water, Missouri, *Growth rates, Water temperature, Water pollution effects, Electric powerplants.
Identifiers: *Thomas Hill Reservoir(Mo), *Cage culture(Catfish), Lethal temperature.

Channel catfish were cultured in floating cages in an 88-acre arm of water that received a thermal effluent. Fish were subjected to an average temperature of 33 C in August and 6.1 C in January. Corresponding temperatures in the Control Arm, where fish were also cultured, were 28.9 C in July and 2.8 C in January. The optimum temperature for growth (30 C) was determined experimentally. A growth increment of 236% was obtained for 200 fish at 32.7 C, no mortality was noticed. Fish maintained in the heated water for 2 years showed a mean gain of 872 g (range 861-2, 285 g), survival was 95%. Fish were cultured over winter and showed a significant difference in growth between the two Arms, mortality was 1.5%. There appeared to be no correlation between growth and mortality and stocking densities. The economic feasibility of the cage culture of catfish is discussed. (Witt-Missouri)
W77-07101

ASPECTS OF RESERVOIR-POWER STATION INTERACTIONS: SOME EFFECTS OF HEAT ON PHYSICO-CHEMISTRY, AUFWUCHS ECOLOGY AND PLANKTON METABOLISM,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
G. K. O'Bryan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 326, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Thesis, May 1976. 163 p, 13 fig, 39 tab, 130 ref. OWRT B-039-MO(6), 14-31-0001-3296.

Descriptors: *Thermal pollution, Reservoirs, Limnology, *Periphyton, *Phytoplankton, Primary productivity, *Metabolism, Heated water, Ecology, Physicochemical properties, *Missouri, Water pollution effects, Electric powerplants.
Identifiers: *Thomas Hill Reservoir(Mo).

An investigation of 26 physico-chemical parameters, plankton metabolism, and the accrual, composition and metabolism of Aufwuchs was conducted on a reservoir that received a thermal effluent. The only observed effects attributable to the thermal effluent (other than a slight temperature increase) were a slight increase in turbidity, percent saturation of oxygen and reduced ice cover. The heated effluent had no consistent effect on plankton community metabolism, or on the accrual of Aufwuchs. The Aufwuchs study indicates that short-term studies to characterize the tropic nature of waters, or for pollution surveys, are of questionable value because of variability within the community. (Witt-Missouri)
W77-07102

THE FORMATION OF A LOCAL POPULATION OF BREAM ABRAMIS BRAMA ORIENTALIS, IN THE HEATED WATER ZONE OF KONAKOVO POWER STATION,
Vserossiiskii Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khozyaistva, Konakovo (USSR). Upper Volga Div.

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G. B. Sappo.
Journal of Ichthyology, Vol. 16(1), 1976, p. 35-45, 9 tab., 1 fig., 31 ref.

Descriptors: Freshwater fish, *Water temperature, *Fish genetics, *Fish physiology, *Fish populations, Fish types, *Thermal power, *Thermal pollution, Thermal power plants, Thermal water, *Warm-water fish, *Water pollution effects, Growth.
Identifiers: Volga River, Bream, Abramis brama, *Morphological changes, *Local population, Ivankovo Reservoir(USSR), *Warm water discharge, *Konakovo Power Station(USSR), Pharyngeal teeth, *Condition factor, Age composition.

Ecological and morphological changes are revealed in the bream, Abramis brama orientalis from various regions. The formation of a local population in the warm water zone of Ivan'kovo reservoirs is discussed. Changes in the structure of the pharyngeal teeth of bream from the zone strongly affected by the warm water discharged from Konakovo power station are recorded. Morphological and ecological features distinguishing bream from the control section allow the assumption that a separate population of this species is forming in the warm water zone. The abundance of this population amounted in 1972 to 1.3 million specimens, aged from 1 to 13 years. (Katz)
W77-07105

PHENALEN-1-ONE: OCCURRENCE IN A FUEL OIL AND TOXICITY TO MICROALGAE,
Texas Univ., Port Aransas. Marine Science Inst.
K. Winters, J. C. Batterton, and C. VanBaalen.
Environmental Science and Technology, Vol. 11(3), 1977, p. 270-272, 2 tab., 2 fig., 13 ref.

Descriptors: Oil, *Oil pollution, *Toxicity, *Algae, *Phytoplankton, *Toxicity, Bioassay, Laboratory tests, *Methodology, Water pollution effects, Spectrophotometry, Biochemistry, *Analytical techniques, Algicides, Cyanophyta, Diatoms, Chlorophyta.
Identifiers: *Microalgae, *Phenalen-1-one, No. 2 fuel oil, *Water soluble fractions, *Wavelength dependency, *Algal culture.

Phenalen-1-one (perinaphthenone) was isolated and characterized from the water soluble fraction of a No. 2 fuel oil. Phenalen-1-one had two very different effects on the growth of microalgae. With blue-green algae there was an abrupt toxicity, independent of wavelength, at 5 ppm. With two green algae toxicity was strongly wavelength dependent. In white light (Daylight fluorescent) 250 ppb was lethal; with this same lamp screened by a sharp-cut yellow filter (530 nm) growth rate was not affected until the concentration reached 10 ppm. The growth inhibition of a diatom by phenalen-1-one was also wavelength dependent, but the concentration required was some twenty fold that for green algae. (Katz)
W77-07106

SOME EFFECTS OF CHANNELIZATION ON THE FISHES AND INVERTEBRATES OF RUSH CREEK, MODOC COUNTY, CALIFORNIA,
California Univ., Davis, Div. of Wildlife and Fisheries Biology.
P. B. Moyle.
California Fish and Game, Vol. 62(3), p. 179-186, 1976. 4 tab., 11 ref.

Descriptors: *Channeling, *Biological communities, *Trout, Flood control, Running water, Dominant organisms, Freshwater fish, *Suckers, Invertebrates, *Biomass, Size, Growth rates, Electrofishing, On-site data collections, Statistics, *California, *Sculpins.
Identifiers: *Species composition, Modoc sucker, Catostomus microps, *Endemic species, Pit sculpin, Cottus pitensis, Rush Creek(Calif).

Channelized and unchannelized sections of the lower 7 km (4.3 miles) of Rush Creek, Modoc County, California were compared to determine the impact of channelization on fish populations, especially those of trout (Salmo gairdneri and S. trutta) and the rare endemic Modoc sucker (Catóstomus microps), and invertebrate populations. Fish were captured with a backpack electrofisher, which provided a representative sample by numbers of the species present, although large fish were more vulnerable to capture than small fish. Channelized sections contained fewer and smaller trout, as well as a lower biomass, than the unchannelized sections. Modoc sucker numbers and biomass were also lower in the channelized sections. Only Pit sculpin (Cottus pitensis) were consistently more numerous in the channelized sections. Overall, total fish biomass in the channelized sections was less than one-third of that in the unchannelized sections. The biomass of invertebrates in the channelized sections was found to be less than one-third of that in the unchannelized sections. The invertebrate species composition of the two areas was also different. (Katz)
W77-07109

THE EFFECT OF TEMPERATURE AND THERMAL DISTRIBUTION ON GLYCOLYSIS IN TWO ROCKFISH SPECIES (SEBASTES),
Occidental Coll., Los Angeles, Calif. Dept. of Biology.
J. Helly, Jr.
Marine Biology, Vol. 37, p. 89-95, 1976. 2 fig., 6 tab., 15 ref.

Descriptors: *Marine fish, *Fish physiology, *Metabolism, *Water temperature, Juvenile fish, Animal metabolism, Fluctuations, *Biochemistry, Chemical analysis, Laboratory tests, On-site data collection, SCUBA diving.
Identifiers: Sebastes mystinus, Sebastes serranoides, Blue rockfish, Olive rockfish, *Glucose metabolism, *Embden-Meyerhof glucose metabolism pathway, *Hexose monophosphate shunt, Tissue samples, *Thermal distribution, *Rockfish.

Studies on the effects of temperature on the activities of Embden-Meyerhof (EM) glycolysis and the hexose monophosphate shunt (HMP) in fishes have dealt mainly with exotic and/or acclimated fishes. This study reports the effects of short-term reductions in temperature on EM and HMP activity in two closely related species of temperature fishes (Sebastes spp.) and its possible relation to the thermal distribution of the species. Thermal distribution data were collected by SCUBA for S. mystinus and S. serranoides in King Harbor, Redondo Beach, California. Activities of the pathways were determined in liver-tissue studies, using glucose-14C and liquid scintillation techniques following the method of Hochachka (1968) with modifications. The data were analyzed by distribution-free methods. Tissue studies indicated HMP activity in both species at lowered temperature (5 degrees C), but only in S. serranoides at 15 degrees C. Results indicate that S. mystinus is capable of instantaneous temperature compensation, possibly related to its tendency to occupy cold waters. (Katz)
W77-07110

RESPONSES TO ODORS BY FINGERLING CUTTHROAT TROUT FROM YELLOWSTONE LAKE,
Western Illinois Univ., Macomb. Dept. of Biological Sciences.
L. A. Jahn.
The Progressive Fish-Culturist, Vol 38(4), p 207-210, 1976. 1 fig, 2 tab, 14 ref.

Descriptors: *Cutthroat trout, *Fish migrations, *Odor, Trout, Juvenile fish, Laboratory tests, *Fish physiology, Training, Statistics, *Fish behavior, *Wyoming.
Identifiers: Osmic, Anosmic, Homing ability, *Yellowstone Lake(Wyo).

Normal, osmic, and anosmic fingerling cutthroat trout were tested for response to an odorous solution of aqueous extract of fingerling cutthroat trout. No statistically significant differences were observed. Some trout were trained, with a reward and punishment system, to respond to an odorous solution of tuna extract. The food-reward trained fish responded strongly after 48 trials but ceased to respond when rendered anosmic. The results of the punishment experiment were inconclusive. (Katz)
W77-07111

RESPONSES TO CRUDE OIL CONTAMINATION BY CRICOTOPUS (CRICOTOPUS) BICINCTUS AND C. (C.) MACKENZIENSIS (DIPTERA: CHIRONOMIDAE) IN THE FORT SIMPSON AREA, NORTHWEST TERRITORIES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
D. M. Rosenberg, A. P. Wiens, and O. A. Saether.
Journal of the Fisheries Research Board of Canada, Vol 34, p 254-261, 1977. 2 fig, 3 tab, 16 ref.

Descriptors: *Oil pollution, *Diptera, *Artificial substrates, *Larvae, Oil, Water pollution effects, *Benthic fauna, Bioassay, On-site investigations, Algae, Biomass, Biological communities, Dominant organisms, Life cycles, *Canada.
Identifiers: Norman Wells crude oil, *Cricotopus bicinctus, *Cricotopus mackenziensis, Northwest territories.

Cricotopus (Cricotopus) bicinctus (Meigen) and C. (C.) mackenziensis Oliver, two common species of Chironomidae in the Fort Simpson area, N.W.T., were examined for changes resulting from experimental field exposure to Norman Wells crude oil. Larvae of both species were always present in higher numbers on oiled than unoiled artificial substrates but numbers of C. bicinctus increased more quickly than C. mackenziensis in response to the oil. C. mackenziensis larvae occurred in higher numbers than C. bicinctus larvae on unoiled artificial substrates. C. bicinctus tended to dominate C. mackenziensis on oiled artificial substrates. Size of larvae, as measured by head capsule width, was unaffected by increased food supply during periods of maximum algal biomass on oiled artificial substrates. Larvae on oiled artificial substrates apparently produced part of another generation when compared to larvae on unoiled artificial substrates. (Katz)
W77-07113

EFFECT OF MERCURY ON THE SURVIVAL, RESPIRATION, AND GROWTH OF POSTLARVAL WHITE SHRIMP, PENAEUS SETIFERUS,
Texas A and M Univ., College Station. Dept. of Biology.
F. A. Green, Jr., J. W. Anderson, S. R. Petrocelli, B. J. Presley, and R. Sims.
Marine Biology, Vol 37, p 75-81, 1976. 7 tab, 22 ref.

Descriptors: *Mercury, *Toxicity, *Shrimp, Heavy metals, Water pollution effects, Path of pollutants, *Mortality, Juvenile growth stage, Size, Respiration, *Growth rate, *Bioassay, Laboratory tests, *Respiration.
Identifiers: LC50, *Acute toxicity, Chronic exposure, Molting rate, *White shrimp, Penaeus setiferus.

The results of toxicity experiments have shown that a level of 17 ppb ionic mercury is acutely toxic (96-h LC50) to postlarval white shrimp (Penaeus setiferus). In addition, the size of the shrimp, within the range tested (7 to 35 mm) did not significantly alter the toxicity values of mercury to this species. Fifty-seven days pre-exposure to low levels of mercury (0.5 and 1.0 ppb) had no effect on the acute toxicity (96-h LC50) of mercury to the shrimp. The effect of chronic exposure to low

levels of mercury on the respiratory rate, growth, and molting rate of postlarval P. setiferus was studied, and the results showed that 60 days exposure to 0.5 and 1.0 ppb mercury did not significantly affect any of these parameters for the post larvae. (Katz)
W77-07114

KINETICS OF LAMPRICIDE (TFM, 3-TRIFLUOROMETHYL-4-NITROPHENOL) RESIDUES IN MODEL STREAM COMMUNITIES,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. W. Maki, and H. E. Johnson.
Journal of the Fisheries Research Board of Canada, Vol 34, p 276-281, 1977. 3 fig, 1 tab, 5 ref.

Descriptors: *Lampreys, *Larvicides, *Pesticide kinetics, Aquatic animals, *Absorption, *Pesticide residues, Water pollution effects, *Path of pollutants, Carbon radioisotopes, Laboratory tests, Aquatic plants, *Kinetics.
Identifiers: *Bioconcentration, Excretion, Rate of uptake, *TFM, 3-trifluoromethyl-4-nitrophenol.

The bioconcentration and elimination rates of lamprey larvicide, 14C-TFM (3-trifluoromethyl-4-nitrophenol), were determined for 20 plant and animal species during experimental lamprey control treatments in six indoor model streams. A two-component curve consisting of a rapid initial uptake rate during the first 2 h followed by a reduced linear rate for the remainder of the 24-h exposure best describes the uptake curve for all species examined. The bioconcentration factors (BCF) ranged from 1.1 to 95.5 for animal components and from 0.7 to 12.2 for the plant species. Macroinvertebrate species with soft, relatively permeable integuments accumulate significantly higher residue concentrations (mean BCF=45.0) than those species with hard chitinized or calcareous exoskeletons (mean BCF=11.9). Rates of uptake during the linear phase range from 0.36 micrograms per gram per hour for the crayfish Orconectes propinquus to 17.9 micrograms per gram per hour for the caddisfly larvae Brachycentrus americanus. Rates of loss of TFM accumulations correlate with water current and substrate associations. The mean half-life of TFM is 17.8 h for riffle species and 105.9 h for pool-dwelling species. Half-life figures vary from 7.2 h for the crayfish to 5295 h for annelid worms. The longer half-lives observed for several pool species suggest continued accumulation of 14C-labeled residues from the organic matter from the pool bottoms. (Katz)
W77-07115

ROLE OF MUSSELS MYTILUS EDULIS IN REMOVAL OF PETROLEUM PRODUCTS FROM SEAWATER (UNDER EXPERIMENTAL CONDITIONS),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
Y. V. Voyko, and Y. M. Petrov.
Hydrobiological Journal, vol. 11(2), p. 19-24, 1975. 3 fig., 3 tab., 10 ref.

Descriptors: *Oil pollution, *Mussels, *Biodegradation, Oil, *Water pollution effects, Toxicity, Path of pollutants, Laboratory tests, Bioassay, Fluorescence, Oxidation, Methodology.
Identifiers: Bioaccumulation, Bunker fuel oil, Lubricating oil.

The dynamics of behavior of petroleum products in seawater shortly after addition were investigated. The purification of the water by the filter feeder Mytilus edulis was measured. (1) Mussels contribute to removal of petroleum oils from seawater because of their capacity to filter water and excrete pseudofeces with occluded particles of the oil. In this way oil is transferred from the water to the sediments. (2) In tanks with mussels, the water was purified twice as fast as in the control. At water temperature of 3 to 10 degrees C, the oil concentration in the water apparently decreased because of partial oxidation and rise of the oil drops to the surface. (3) The green fluorescence spot on the chromatogram, which appeared 3 weeks after the start of the experiment, was probably an indication that the oxidation of the oil had started. (4) After 3 weeks only 7% of the initial amount of the petroleum oil remained in the tanks with mussels. Of this amount, about 1.4% was deposited by the aquatic organisms on the bottom of the tanks, about 5.6% remained in the surface film, and about 0.2% was still dissolved. (Katz)
W77-07116

THE UTILIZATION OF DISSOLVED FREE AMINO ACIDS BY ESTUARINE MICROORGANISMS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Biology.
C. C. Crawford, J. E. Hobbie, and K. L. Webb.
Ecology. 55(3), p 551-563, 1974.

Descriptors: Bacteria, Algae, Amino acids, Estuaries, Microorganisms, *Carbon, North Carolina, Organic compounds, Chromatography, Pollutant identification, Primary productivity, Water pollution effects, Absorption.
Identifiers: *Pamlico River estuary(NC).

The importance of bacteria in the cycling of C in the Pamlico River, North Carolina, estuary was studied by measuring the rates of intake of organic compounds. Methods allowed analysis with the Michaelis-Menten kinetics equations and both the rates of uptake of dissolved free amino acids (DFAA) and glucose as well as the percentage of C subsequently respired as CO2 were determined. In addition, the concentrations of the amino acids in the water were determined using ion exchange chromatography. Other tests included measurements of primary productivity and of the effects of the other amino acids in the water upon the uptake of 1 amino acid. There was considerable variation in the heterotrophic activity over time and distance probably caused by patchiness in distribution of plankton and dissolved compounds in the water. Although there is some competition between amino acids being taken up, the effect upon kinetics measurements is probably negligible. Mutual inhibition was found between the similar amino acid pairs glutamic acid and aspartic acid, threonine and serine, glycine and alanine and leucine and alanine. Highest V max values were found during the summer months and early fall and ranged from a high of 69.42 micro g C/l.h for alanine in Aug. to less than 0.20 micro g C/l-h for most of the substrates tested in the colder months. The V max values for glucose uptake (0.06-9.64 micro g C/l-h) indicate that this estuarine system is one of the most microbially-active environments tested. The orders of abundance and concentrations of individual amino acids were similar to those reported for other bodies of water. When the natural concentration of a substrate is known the actual velocity of uptake (vn) or flux for that substrate may be found. Flux rates were only 1%-10% of the V max values in the coldest months; the highest values were found in the warmest months. At each experimental concentration of amino acid, a certain amount was taken up, and a percentage of this amount was oxidized to CO2. This percentage was constant for a particular amino acid in spite of varying experimental times, substrate concentrations and temperatures. Failure to correct uptake data for this respiratory loss introduces significant underestimation. The production of particulate material was calculated by correcting total uptake figures for each amino acid by its characteristic respiration percentage.--Copyright 1974, Biological Abstracts, Inc.
W77-07117

COMPARISON OF ARTIFICIAL AND NATURAL SEA WATER AS CULTURE MEDIA FOR JUVENILE LOBSTERS,
California Univ., Davis. Inst. of Marine Resources.
M. L. Gallagher, and W. D. Brown.
Aquaculture, vol. 9, p. 87-90, 1976. 1 fig., 2 tab.

Descriptors: *Lobsters, *Aquiculture, *Water quality, *Growth rates, *Commercial shellfish, *Juvenile growth stage, Laboratory tests, Water temperatures, Statistics, Environmental effects, Weight, Length, Methodology, Sea water.
Identifiers: Artificial seawater, Natural seawater.

Fourth-stage and fifth-stage lobsters were placed in artificial or natural sea water and fed live adult brine shrimp for 90 days. Water quality parameters and temperature were monitored. Carapace length and body weight measurements were made at the end of the experimental periods. In trial one, growth was significantly better ($P<0.05$) in artificial sea water. In trial two, growth in artificial sea water was greater than in natural sea water, although the difference in growth was not significant. It was concluded that artificial sea water is satisfactory medium for culturing juvenile lobsters, and in some cases may result in better growth. (Katz)
W77-07118

OCCURRENCE OF TOXIC BIVALVES IN ASSOCIATION WITH THE BLOOM OF GONYAULAX SP. IN OWASE BAY,
Tokyo Univ. (Japan). Lab. of Marine Biochemistry.
Y. Hashimoto, T. Noguchi, and R. Adachi.
Bulletin of the Japanese Society of Scientific Fisheries, vol. 42(6), p. 671-676, 1976. 3 fig., 1 tab., 14 ref.

Descriptors: *Chromatography, *Toxins, *Dinoflagellates, *Commercial shellfish, Biochemistry, Public health, Red tide, Water pollution sources, Mussels, Clams, Laboratory tests, Bioassay, Chemical analysis, Marine algae, Marine microorganisms, Bays.
Identifiers: *Gonyaulax catenella, Saxitoxin, Tetrodotoxin, *Owase Bay(Japan).

The bloom of a toxic dinoflagellate, tentatively identified as Gonyaulax catenella, occurred in Hikimoto-ura, Owase Bay, on January 26, 1975 for two weeks making bivalves moderately toxic although there were no cases of poisoning. The symptoms induced in mice by intraperitoneal injection of the extracts from the dinoflagellate, mussel and short-necked clam, were very similar to those induced by saxitoxin or tetrodotoxin. The toxic principles in short-necked clams were fractionated and partially purified by using Amberlite IRC-50, activated charcoal and Sephadex G-15. Four toxic components were obtained of which two major components clearly differed from saxitoxin in chromatographic behavior. (Katz)
W77-07119

ALTERATION IN THE TOXICITY OF TISSUE LIPIDS WITH THE ADAPTATION OF FISHES TO OSMOTIC PRESSURE CHANGES IN THE ENVIRONMENT,
Moscow State Univ. (USSR). Dept. of Biophysics.
V. I. Chernyshov, and S. K. Magomedov.
Journal of Ichthyology, Vol 15(2), p 346-349, 1975. 1 fig, 13 ref.

Descriptors: *Salinity, *Lipids, *Fish physiology, Freshwater fish, Marine fish, Osmotic pressure, Lethal limits, Metabolism, Toxicity, Mortality, Biochemistry, Animal pathology, Carp.
Identifiers: Grass carp, Ctenopharyngodon idella, Caspian silverside, Atherina mochon caspia, Caspian asp, Aspius aspius taeniatus.

Stenohaline and euryhaline fish were tested for toxicity of the lipids of the liver, gills and blood at

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different stages of osmo-adaptation to salinities ranging from preferred to lethal. Osmotic stress increases the metabolic rate which increases the peroxide oxidtion of lipids and toxic products accumulate which may disrupt the active transport of ions in the gills. (Katz)
W77-07120

SEASONAL CHANGES OF INVERTEBRATE POPULATIONS IN THE POLLUTED RIVER MEDLOCK,
Salford Univ. (England). Dept. of Biology.
S. Frost, M. T. L. Chiu, and M. P. Thomas.
Environmental Pollution, Vol 11, p 223-242, 1976. 14 fig, 2 tab, 11 ref.

Descriptors: *Water pollution effects, *Biological communities, *Seasonal, Industrial effluents, Sewage effluents, Flow control, Water treatment, *Water management(Applied), Water chemistry, Recreation, On-site data collections, Sampling, Protozoa, Benthic animals, Salmon, Invertebrates.
Identifiers: Invertebrate population, *River Medlock(Eng).

The biological and chemical condition of the river is indicated by seasonal changes in invertebrate populations in relation to certain prevailing environmental factors. Used as a salmon fishery and road in the early days, the river Medlock became an industrial sewer in the nineteenth/twentieth centuries. Controlled flow and increased effluent control now ensures that environmental changes within the river will encourage biological and chemical recovery. Techniques are outlined which could be used in a monitoring program to detect conditions suitable for increasing the value of the water in relation to country park and associated developments along the banks of the river valley. (Katz)
W77-07121

USE OF QUICKLIME TO INCREASE OYSTER SEED PRODUCTION,
National Marine Fisheries Service, Highland, N.J. Sandy Hook Lab.
C. L. MacKenzie, Jr.
Aquaculture, Vol 10, p 45-51, 1977. 2 fig, 7 ref.

Descriptors: *Oysters, *Aquiculture, *Commercial shellfish, *Pesticides, *Shellfish farming, *Artificial substrates, *Calcium compounds, Juvenile growth stage, Benthos, Predation, On-site investigations, Laboratory tests.
Identifiers: *Calcium oxide, *Oyster spat, *Fouling, Quicklime, Starfish, Asterias forbesi, Oyster drills, Urosalpinx cinerea, Eupleura caudata, Oyster setting frequency.

A single application of quicklime (calcium oxide), spread at a rate of 6.75 metric tons/ha, was used to prepare dormant oyster setting beds for spat production. of 2000 ha in Long Island Sound, Connecticut, 1200 ha had sufficient shells to cover at least 75% of the bottom. However, these shells had a continuous fouling organism layer that would prevent significant oyster setting. Many beds had predator populations of sea stars (Asterias forbesi) and oyster drills (Urosalpinx cinerea and Eupleura caudata). Quicklime cleans the shells by killing fouling organisms, and also controls sea stars and embryonic oyster drills. When the supply of clean shells for annual spreading on the setting beds is limited, use of the quicklime method prepares greater quantities of shells for possible oyster set. (Katz)
W77-07122

SHELL DEFORMITY AMONG SCALLOPS (ARGOPECTEN IRRADIANS LAMARK) CULTURED IN A RECIRCULATING SEAWATER SYSTEM,
Delaware Univ., Lewes. Marine Studies Complex.
C. E. Epifanio.
Aquaculture, Vol 9, p 81-85, 1976. 3 fig, 9 ref.

Descriptors: *Mollusks, *Aquiculture, *Commercial shellfish, *Shellfish farming, *Nutrition requirements, *Marine algae, *Growth rates, Laboratory tests, Diets, Animal physiology, Productivity, *Pathology.
Identifiers: *Bay scallop, *Argopecten irradians, Recirculating seawater system, Shell deformity.

Bay scallops, Argopecten irradians, were held in a recirculating seawater system for 25 weeks and fed a diet consisting of four species of cultured algae. The rate of growth of the shellfish was less than reported for scallops from natural areas, and a gross shell deformity was noted among most of the scallops after 18 weeks of culture. The deformity may have been related to an indequate diet. (Katz)
W77-07123

A NATURAL POLLUTION EXPERIMENT: THE EFFECTS OF A SEWAGE STRIKE ON THE FAUNA OF THE THAMES ESTUARY,
King's Coll., London (England). Dept. of Zoology.
R. Sedgwick, and D. R. Arthur.
Environmental Pollution, Vol 11, p 137-160, 1976. 10 fig, 17 ref.

Descriptors: *Sewage effluents, *Water pollution effects, *Estuarine environment, Water pollution, Sewage treatment, Activated sludge, Mortality, Biological communities, Water quality, Water chemistry, Oxygen sag, On-site data collection, Weather.
Identifiers: *Thames estuary(Eng).

Arising from the withdrawal of labor by a national union, this case history of acute pollution in the Thames estuary in 1970 illustrates the complexity of interacting parameters, and of recovery from the polluted state. It deals with the chemical changes in the estuary, the effects of weather conditions on the hydrological pattern, concomitant with other physical parameters, and on the quantitative distribution of the estuarine fauna in relation to these variables. The effects of the polluting load on the fauna are then assessed by comparing the changes between it and previous years and with that immediately succeeding it. (Katz)
W77-07124

SURVIVAL AND REPRODUCTION OF GAMMARUS SPP. (AMPHIPODA) FOLLOWING SHORT-TERM EXPOSURE TO ELEVATED TEMPERATURES,
New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine.
T. C. Ginn, W. T. Waller, and G. J. Lauer.
Chesapeake Science, Vol 17(1), p 8-14, 1976. 1 fig, 8 tab, 8 ref.

Descriptors: *Amphipods, *Water temperature, *Mortality, Fish food organisms, Thermal pollution, Lethal limits, Water pollution effects, Bioassay, Cooling water, Laboratory tests, Reproduction.
Identifiers: Gammarus, *Latent mortality.

Gammarus spp. (G. daiberi and G. tigrinus) experienced no increased latent mortalities for periods up to 10 days after being exposed to an 8.3 C delta T above an ambient temperature of 25.5 C for periods up to 60 minutes. An 11.1 C delta T above an ambient temperature of 26.5 C resulted in significant reductions in survival in groups of Gammarus spp. exposed for 30 and 60 minutes. No significant mortalities were observed, however, following a 5-minute exposure to the 11.1 C delta T. At an ambient temperature of 11.7 C, gammarus spp. exposed to 16.7 C delta T's for periods up to 180 minutes displayed no increased mortalities 10 days after exposure. A sustained 17-day exposure of Gammarus spp. to a 15.6 C delta T at ambient temperatures of 11.2 to 7.1 C resulted in no increased mortalities and stimulated reproductive behavior. Subsequent reproductive activities were not affected by up to 60-minute exposures of mature Gammarus spp. to an 8.3 C delta T at an ambient temperature of 26.0 C. The same exposure also did not affect the release of young by ovigerous female Gammarus spp. An 11.0 C delta T for 30 minutes resulted, however, in almost no release of young from ovigerous females. (Katz)
W77-07125

AN INDUSTRIAL VIEW OF BIOLOGICAL MONITORING,
FMC Corp., Philadelphia, Pa.
For primary bibliographic entry see Field 5A.
W77-07126

DYNAMICS OF STORAGE OF ORGANOCHLORINE POLLUTANTS IN HERRING GULLS,
Wisconsin Univ., Madison. Dept. of Wildlife Ecology.
D. W. Anderson, and J. J. Hickey.
Environmental Pollution, Vol 10, pp 183-200, 1976. 3 fig, 5 tab, 74 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Gulls, Pesticides, Water pollution effects, Path of pollutants, *DDE, *DDT, *Polychlorinated biphenyls, Food chains, Juvenile growth stage, Seasonal, Fluctuations, Laboratory tests.
Identifiers: *Herring gulls, *Bioconcentration, Larus argentatus, Body-burden.

Several organochlorine pollutants were studied over the period of one annual cycle in caged juvenile and wild-collected adult herring gulls (Larus argentatus) from Lake Michigan. Fish, mostly alewives (Alosa pseudoharengus), comprised the major year-round food items in the wild; alewives were also fed to the caged juveniles. Fish residues averaged around 3 mg/kg of p,p'-DDE, 2 mg/kg p,p'DDT + p,p'-TDE, and 2 mg/kg apparent PCBs. Juvenile body-burdens of DDE and PCBs showed a continual buildup after fledging, then a temporary dynamic equilibrium, related only in part to annual lipid deposition. Maximum body-burdens were reached in both juveniles and adults when winter fat deposits were declining prior to the breeding season-followed by a return to dynamic equilibrium. Residues of DDT and TDE followed closely the annual pattern of lipid deposition in both juveniles and adults. Total body-burdens in both age classes were similar after the buildups to equilibrium in juveniles in their eighth month after fledging. Seasonal variations of residues of DDE and PCBs were characterized by two phases in adults and three in juveniles, which gradually assumed the adult cyclic pattern. The maximum body-burdens attained by caged juveniles fed a diet of Lake Michigan alewives were 290 mg/kg DDE, 19 mg/kg DDT + TDE, and 200 mg/kg apparent PCBs. Residues in wild adults at the same time were 300, 4, and 200 mg/kg of the same residues. Apparent PCBs and DDE were highly accumulative, although DDE levels resulted from dietary DDE, as well as conversion from DDT. (Katz)
W77-07127

SURVIVAL OF MAYFLY LARVAE UNDER MINE ACID CONDITIONS,
Ohio Univ., Athens. Dept. of Zoology and Microbiology.
S. Napier, Jr., and W. D. Hummon.
Internationale Revue Gesamten Hydrobiologie, Vol 61(5), p 677-682, 1976. 1 fig, 2 tab, 15 ref.

Descriptors: *Mine acids, *Biological communities, *Mayflies, *Food chains, Mine drainage, Water pollution, Water pollution effects, Toxicity, Mortality, Dragonflies, Predation, Larvae, Hydrogen ion concentration, Feeding rates, Fish food organisms, On-site data collection, Laboratory tests.
Identifiers: Riffle communities.

Mayfly larvae were abundant and diverse in riffle zones of three control streams in southeastern Ohio. But none were found in such zones of three streams having current or past histories of mine acid pollution, despite vegetative recovery of reclaimed land bordering two of the streams. Laboratory studies showed stepwise increases in non-predatory mortality of mayfly larvae with increased mine acidity. Dragonfly larvae predation on mayfly larvae was constant at pH 8.1-4.1, but decreased at pH 3.1 despite tolerance of dragonfly larvae to low pH conditions. Extensive acid mine pollution thus may threaten aquatic biota through removal of food sources or reduced feeding rates as well as through direct mortality. (Katz)
W77-07128

THE DYNAMICS OF METALS IN THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA. II. ENVIRONMENTAL EFFECTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Medicine.
J. M. Frazier.
Chesapeake Science, Vol 17, No 3, p 188-197, 1976. 6 fig, 3 tab, 29 ref.

Descriptors: *Metals, *Heavy metals, *Commercial shellfish, *Oysters, *Path of pollutants, *Absorption, *Growth rates, *Manganese, *Iron, *Zinc, *Copper, *Cadmium, Water pollution effects, Seasonal, Fluctuations, *Chesapeake Bay, On-site investigations, Bioassay, Biochemistry, Water chemistry.
Identifiers: *Bioaccumulation, Shell thinning.

The dynamics of Mn, Fe, Zn, Cu and Cd in the shell and soft tissues of the American oyster, Crassostrea virginica, were observed in oysters exposed in situ to a metal-contaminated environment from September, 1972 until August, 1973. Zn and Cu accumulated in soft tissues of exposed oysters reaching levels of 4100 micrograms Zn/gm and 450 micrograms Cu/gm compared to 1700 micrograms Zn/gm and 60 micrograms Cu/gm for controls (dry weight basis). The relative enhancement of metals in oyster soft tissues exposed to the contaminated environment over controls reflected the pattern of metal contamination in sediments. Although growth of the oysters, as measured by soft tissue dry weight and shell dimensions, was identical, shells of exposed oysters were significantly thinner than controls (16%). Trace metal incorporation into shell was affected with Mn deposition suppressed and Fe, Zn and Cu slightly increased. Uptake of metals by oyster soft tissues was seasonally dependent with rapid uptake occurring in the summer and fall but delayed uptake occurring in the early spring. (See also W76-01938) (Katz)
W77-07129

EFFECTS OF INCREASED WATER TEMPERATURE ON DAPHNIA PULEX,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
D. R. Craddock.
Fishery Bulletin, Vol 74(2), p 403-408, 1976. 1 fig, 5 tab, 11 ref.

Descriptors: *Daphnia, *Water temperatures, *Lethal limits, *Reproduction, Zooplankton, *Thermal pollution, Cooling waters, Water pollution effects, Laboratory tests, Columbia River, Powerplants, Bioassay.
Identifiers: Daphnia pulex, Acclimation.

Techniques were developed to study the effects of increased water temperature on certain zooplankters; specific studies were conducted on Daphnia pulex, an abundant and important zooplankter of the lower Columbia River. Study methods simulated prolonged exposure to constant high temperatures in thermal discharges and short exposures to increased temperatures in condensers of cooling systems. Effects were evaluated on the basis of survival and reproduction for periods ranging from 34 to 90 days. The time to death of 50% of the D. pulex, both mature and young, was less than 24 h at temperatures above 27 degrees C. Temperatures of 27 degrees C and below required an exposure of at least 192 h to cause 50% mortality. The young females were more tolerant of temperature increases than older females. The greatest reproduction by older females was at the control temperature (15 degrees C), whereas reproduction by the young females was low at lower temperatures. No reproduction occurred above 27 degrees C. Two groups of D. pulex (one from the Seattle, Wash., area and the other from the Columbia River) studied at increased temperatures for prolonged periods revealed similar patterns of survival and reproduction, but the Columbia River group appeared less tolerant of increased temperatures. A short exposure (15 min) to increased temperatures up to 30 degrees C had little effect on survival and reproduction. It was concluded that temperatures should not exceed 26 or 27 degrees C for prolonged periods or 30 degrees C for more than 15 min to protect D. pulex populations. (Katz)
W77-07130

PRESENT AND HISTORICAL SPAWNING GROUNDS AND NURSERIES OF AMERICAN SHAD, ALOSA SAPIDISSIMA, IN THE DELAWARE RIVER,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
M. E. Chittenden, Jr.
Fishery Bulletin, Vol 74(2), p 343-352, 1976. 1 fig, 2 tab, 42 ref.

Descriptors: *Commercial fish, *Spawning, *Water pollution effects, Anadromous fish, Fish management, Fish barriers, Dams, Fish ladders, Water pollution, Fish migration, Sampling, Fish behavior, *Delaware River.
Identifiers: American shad, Alosa sapidissima, Spawning grounds.

Spawning occurs from late May into July but mainly in a 3-wk period from late May to mid-late June and ends progressively later proceeding upstream. Light intensity seemed to regulate when spawning began each day. Fish selected shallow riffle areas in preference to pool habitat for spawning. Except for the most grossly polluted tidal water, spawning and nursery areas now extend throughout fresh water of the main Delaware and into the East and West branches. The most important spawning grounds and nurseries are now located from Port Jervis, N.Y., to Hancock, N.Y., and extend into the lower East Branch; this has probably been the case since 1910-1920. There has been a fundamental upstream shift in the chief spawning grounds and nurseries since the decline of the Delaware River shad runs, because these historically extended downstream from about Delaware Water Gap, Pa., and included tidal water. Reasons for this shift suggest intrastream homing. Only a small proportion of the historical nursery now contributes to production. Nursery and spawning areas now contribute to production of adults in proportion to their distance from Philadelphia, Pa. The extent of the spawning and nursery area since about 1910-20 has probably expanded and contracted around a core area in the upper Delaware near Hancock. Future prospects of Delaware River shad depend upon water quality in the tidal area and the proposed Tocks Island dam. Extirpation of the remnant runs is a distinct possibility. (Katz)
W77-07131

THE EVALUATION OF TOXIC EFFECTS OF CHEMICALS IN FRESH WATER BY USING FROG EMBRYOS AND LARVAE,
California Univ., Irvine. Dept. of Anatomy; and California Univ., Irvine. Dept. of Developmental and Cell Biology.
G. Greenhouse.
Environmental Pollution, Vol 11, p 303-315, 1976. 1 fig, 7 tab, 21 ref.

Descriptors: *Testing procedures, *Frogs, *Chemical wastes, Bioassay, *Methodology, Embryonic growth stage, Larvae, Water pollution effects, Toxicity, Mortality, Laboratory tests, Laboratory animals, Bioindicators.
Identifiers: Leopard frog, Rana pipiens, South African clawed toad, Xenopus laevis, Amines.

The objective was to establish a pollutant test system using embryos and larvae of frogs. Two species of frog served as test animals: Rana pipiens, the leopard frog; and Xenopus laevis, the South African clawed toad. The system was directed at assaying the effects of environmental pollutants resulting from US Air Force Operations on viability and development of the test species. Efforts focused on determination of lethal and teratogenic levels of compounds specified by the Air Force. Work performed using the above test system to screen two groups of compounds is described. Group one consisted of three amines, N-phenyl-oc-naphthylamine, octyl-phenyl-oc-naphthylamine and p,p'dioctyldiphenylamine. Only N-phenyl-oc-naphthylamine was found to have toxic effects on developing frogs. Group two consisted of hydrazine, methylhydrazine, and dimethylhydrazine. All of these latter compounds were toxic to developing frogs. (Katz)
W77-07132

EXPERIMENTAL SUBSTANTIATION OF MAXIMUM PERMISSIBLE PROPACHLOR (RAMROD) CONCENTRATIONS IN WATER, (IN RUSSIAN),
Academy of Medicine, Sofia (Bulgaria). Center for Hygiene.
For primary bibliographic entry see Field 5A.
W77-07133

EFFECTS OF PASSAGE THROUGH POWER PLANT COOLING SYSTEMS ON ESTUARINE COPEPODS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. R. Heinle.
Environmental Pollution, Vol 11, p 39-57, 1976. 3 fig, 11 tab, 20 ref.

Descriptors: *Water temperature, *Chlorination, *Mortality, *Copepods, Electric powerplants, Pumping, Turbines, Water pollution effects, Toxicity, Estuarine environment, On-site data collection, Sampling, Statistics, Chesapeake Bay, Chlorine, Methodology, *Thermal pollution.
Identifiers: Vital staining techniques.

Vital staining techniques were used to measure mortalities of copepods pumped through three electric power plants located at low-salinity estuarine sites. Elevated temperatures and pumping caused little mortality, while the use of chlorine as a biocide caused extensive mortalities. The three species of copepods sampled seemed to have different sensitivities to the perturbations examined. (Katz)
W77-07134

VARIATIONS IN THE LEAD, ZINC AND CALCIUM CONTENT OF DENDROBAENA RUBIDA (OLIGOCHAETA) IN A BASE METAL MINING AREA,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
M. P. Ireland, and R. J. Wooton.
Environmental Pollution, vol. 10, p. 201-208, 1976. 3 fig., 2 tab., 15 ref.

Descriptors: *Oligochaetes, *Soil contamination, *Lead, *Zinc, Calcium, *Mining, Seasonal, Fluctuations, Absorption, On-site data collection, Biochemistry, Benthos.
Identifiers: *Bioconcentration, *Bioaccumulation.

A study was made of the concentrations of lead, zinc and calcium in Dendrobaena rubida (Savigny)

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taken at different times of the year and at three different sites. Lead levels in earthworms reflected the levels in the soils and the highest concentrations occurred in the winter months. Zinc appeared to be unrelated to soil levels at the site where the level of zinc in the soil was high. At the sites with lower levels of zinc in the soil the lowest concentration of zinc in earthworms was found in November. Earthworm calcium values were inversely proportional to the soil levels but monthly variations were inconsistent. There was a good correlation in earthworms between lead and calcium at the sites with high levels of lead in the soil. The concentration of metal in D. rubida is discussed in relation to seasonal changes, regulation and lead/calcium antagonism. (Katz)
W77-07135

EFFECTS OF BENZENE (A TOXIC COMPONENT OF PETROLEUM) ON SPAWNING PACIFIC HERRING, CLUPEA HARENGUS PALLASI,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Lab.
J. W. Struhsaker.
Fishery Bulletin, vol. 75(1), p. 43-50, 1977. 1 fig., 4 tab., 14 ref.

Descriptors: *Herring, *Fish reproduction, *Oil pollution, Spawning, *Oil wastes, Water pollution effects, Toxicity, Mortality, Fish management, Carbon radioisotope, Laboratory tests, Fish physiology, Statistics, Marine fish.
Identifiers: Clupea harengus pallasi, Benxene, Pacific herring.

When female Pacific herring were exposed to low (parts per billion) levels of benzene for 48 h just prior to their spawning, a significant reduction occurred in survival of ovarian eggs and resultant embryos and larvae through yolk absorption. The reduction in survival of ovarian eggs was approximately 10-25%, for embryos from fertilization to hatching, 26%, and for embryos and larvae through yolk absorption, 43%. Exposure to benzene also induced premature spawning and resulted in aberrant swimming behavior and disequilibrium in adults of both sexes. The maximum accumulation of 14C-labeled benzene and/or metabolites in ovarian eggs (14 times initial concentration in water in 24-48 h; 1.4 microliters per gram from 0.1 microliters per liter) was greater than in later egg and larval stages as measured in other experiments. Conservatively estimating the total reduction in survival in these experiments to be approximately 50% through yolk absorption, it is surmized that the effect of exposing spawning herring to only one toxic component of petroleum could have a significant effect on the population. The fish in these experiments were exposed to relatively high parts per billion levels, but they were exposed for a relatively short period (48 h); it is probable that in the estuary, if chronically exposed over a longer period of time to low parts per billion levels of aromatic compounds, the populations could be seriously affected. When the spawning female herring is compared with other life history stages, we find that the spawning stage is clearly the most sensitive of those tested. If fishes prove generally to be most sensitive to petroleum components during their spawning seasons, fishery management decisions should take this factor into consideration in protecting the resources. (Katz)
W77-07137

THE RATE OF MICROBIAL DEGRADATION OF OIL IN A BEACH GRAVEL COLUMN,
University Coll. of North Wales, Bangor. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W77-07138

OBSERVATIONS ON A PEAT BOG'S ABILITY TO WITHSTAND INCREASING PUBLIC PRESSURE,
University of Wales Inst. of Science and Technology, Cardiff.
F. M. Slater, and A. D. Q. Agnew.
Biological Conservation, vol. 11, p. 21-27, 1977. 2 fig., 1 tab., 18 ref.

Descriptors: *Bogs, *Peat, *Damages, Wetlands, Management, Trafficability, Recreation, Use rates, Burning, On-site investigations, Plant populations.
Identifiers: *Trampling, Rhvnchospora alba, Wales, *Peat bogs.

By following the progress of two sets of footprints on Cors Fochno, a raised peat bog on the west coast of Wales, data were obtained to show that over 60% of the annual damage to the site occurs in a few weeks around Easter and is caused by only 40% of the annual number of visitors. The total yearly displacement caused by the trampling of 1890 visitors on the bog's surface is some 4228 cu m, each constituent print of which takes between 20 and 30 months to disappear. It is suggested that Rhynchospora alba is a plant responsive to trampling and that its increased growth might, at least in part, encourage the spread of fires on to the bog. (Katz)
W77-07139

RED TIDE IN THE UPWELLING REGION OF BAJA CALIFORNIA,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
D. Blasco.
Limnology and Oceanography, Vol. 22, No. 2, p 255-263, March 1977. 5 fig, 3 tab, NSF GX-33502, GB-18568.

Descriptors: *Red tide, *Dinoflagellates, *Upwelling, Chlorophyll, Carbon, Salinity, Temperature, Water temperature, Phytoplankton, Copepods, Aquatic life, Coasts, Currents(Water), Oceans, Oceanography, Marine biology, *Mexico, Pacific Ocean.
Identifiers: *Baja California.

Predominant organisms in a red water dinoflagellate bloom during the seasonal onset of coastal upwelling off Baja California were Gonyaulax polyedra, Ceratium furca, and Gymnodinium sp. The major part of the chlorophyll and the 14C assimilation in the area were related to the G. polyedra population. The maximum concentration of these organisms was associated with low salinity water of the surface California Current. The dinoflagellates remained in the area during the 20-day cruise, although the vertical stability coefficient was low, with no steep temperature gradient. The high concentrations of small copepods suggest them as major grazers of G. polyedra. (Sims-ISWS)
W77-07169

THE ECOLOGICAL CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART I: ECOLOGICAL STUDIES,
Maine State Dept. of Marine Resources, Augusta.
R. L. Dow, and J. W. Hurst, Jr.
Marine Pollution Bulletin, Vol. 16(11), 1975, p. 164-166, 6 ref.

Descriptors: *Maine, *Oil pollution, *Oil spills, *Mortalities, Fishkills, *Clams, Mollusks, Water pollution effects, *Commercial shellfish, Marine animals, Marine fisheries, *Aquiculture, *Toxicity, On-site investigation, Sediments, Surveys, Ecology, Estuaries.
Identifiers: *Long Cove(Maine), *Ecological studies, *Soft clam, Mya arenaria, *Commercial clam beds, Biological surveys.

An oil spill into Long Cove, Searsport, Maine, began on 16 March and lasted until at least 30 June 1971. It resulted in immediate and continuing soft clam mortalities which, based on before and after biological surveys, had by August 1974 exceeded 85% of the estimated 50 million market-size clams occupying the area. (See W77-07179 and W77-07180) (Katz)
W77-07178

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART II. CHEMICAL STUDIES,
Bowdoin Coll., Brunswick, Maine. Dept. of Chemistry.
D. W. Mayo, C. G. Cogger, and D. J. Donovan.
Marine Pollution Bulletin, Vol. 6(11), 1975, p. 166-171. 2 tab., 3 fig., 2 ref.

Descriptors: *Oil spill, *Oil pollution, Methodology, *Gas chromatography, *Analytical techniques, *Sediments, *Maine, Path of pollutants, *Clams, Animal pathology, Molluscs.
Identifiers: *Soft clams, Mya arenaria, *Gonad tumors, *Petroleum hydrocarbons, Hydrocarbon concentration, Long Cove, Maine, *Number 2 fuel oil, *JP5 jet fuel.

The oil from the March 1971 spill in Long Cove, Searsport, Maine, was identified with the aid of adjacent tank farm samples to be No. 2 fuel oil mixed with JP5 jet fuel. Sediment samples obtained from animal collection sites were analyzed by gas chromatographic procedures and were found to contain significant quantities of petroleum hydrocarbons. (See W77-07178 and W77-07180) (Katz)
W77-07179

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART III: HISTOPATHOLOGICAL STUDIES,
National Water Quality Lab., West Kingston, R. I.
M. Barry, and P. P. Yevich.
Marine Pollution Bulletin, Vol. 6(11), 1975, 171-173, 1 tab., 5 fig., 2 ref.

Descriptors: *Maine, *Oil spill, *Water pollution effects, *Toxicity, *Mortality, Animal diseases, *Animal pathology, *Oil pollution, *Clams, Commercial shellfish, Path of pollutants, Toxicity, Laboratory tests.
Identifiers: *Histopathology, *Gonadal tumours, Malignant neoplasms, Soft clams, Mya arenaria, Microscopic examination.

In July 1971 when approximately 25% of the clams in Long Cove, Searsport, Maine, had been killed by the March 1971 oil spill, collections of surviving clams for histological examination were made. These studies were continued through 1974 and revealed a high incidence of gonadal tumours in clams contaminated by the oil. The area of highest oil impact correlated with the highest per cent of tumours. The tumours were found to be malignant neoplasms. (See W77-07178 and W77-07179) (Katz)
W77-07180

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS I. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIERS FOR SOME MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
H. Tokuda, and S. Arasaki.
Bulletin of the Japanese Society of Scientific Fisheries Vol. 43(1), p. 97-102, 1977. 5 tab., 8 ref.

Descriptors: *Oil pollution, *Oil spills, *Emulsifiers, *Surfactants, Water pollution effects, Path of pollutants, *Toxicity, Mortality,

*Marine algae, *Phytoplankton, Bioassay, Biochemistry, Laboratory tests, Growth rates, Bioindicators, *Lethal limit.
Identifiers: *Skeletonema costatum, *Nitzschia closterium, *Chlamydomonas sp., Anti-alga spectrum.

The lethal concentrations of 84 commercially produced oil-spill emulsifiers for marine phytoplankton were determined by culture experiments. The samples of oil-spill emulsifiers were collected in August of 1971 (54 domestic and foreign products), 1973 (12 domestic products, 1974 (14 domestic products) and 1975 (4 foreign products). Among 3 species of phytoplankton used as test oganisms, Skeletonema costatum was the most sensitive, Nitzschia closterium moderately sensitive, and Chlamydononas sp. the least sensitive to the toxicity of oil-spill emulsifiers. The toxicity of oil-spill emulsifiers was reduced year after year due to the improvements in their components. The most recently produced oil-spill emulsifiers did not inhibit the growth of Skeletonema costatum at a concentration of 100 ppm; moreover, some of them allowed the growth of this alga even at a concentration of 10,000 ppm. (See also W77-07182) (Katz)
W77-07181

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS-II. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIER COMPONENTS FOR MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
H. Tokuda.
Bulletin of the Japanese Society of Scientific Fisheries Vol. 43(1), p. 103-106, 1977. 3 tab., 7 ref.

Descriptors: *Oil pollution, *Oil spills, *Emulsifiers, *Surfactants, Water pollution effects, Path of pollutants, Toxicity, Mortality, *Marine algae, *Phytoplankton, *Bioassay, Biochemistry, Laboratory tests.
Identifiers: *Aromatic content, Ester type surfactants, Hydrophobic groups.

The lethal concentrations of solvents (9 samples) non-ionic surfactants (16 samples) used as oil-spill emulsifiers were determined fo two species of marine phytoplankton by culture experiments. Of the test organisms used, Skeletonema costatum was ten times more sensitive than Nitzschia closterium to most of the samples. The toxicity of petroleum solvents was dependent on their aromatic content. The surfactants with hydrophobic groups such as alkyl phenol and secondary alcohol were highly toxic. The ester type surfactants were less toxic than the ether type ones. Also there is some relation between the toxicity and the HLB of non-ionic surfactants. (See also W77-07181) (Katz)
W77-07182

EGG AND LARVAL SURVIVAL OF WHITE SUCKERS (CATOSTOMUS COMMERSONI) AT LOW PH,
Cornell Univ., Ithaca. N.Y. Dept. of Natural Resources.
J. R. Trojnar.
Journal of the Fisheries Research Board of Canada, Vol. 34, p 262-266, 1977. 1 tab., 17 ref.

Descriptors: *Suckers, *Fish eggs, Conductivity, *Hydrogen ion concentration, *Embryonic growth stage, Juvenile fish, Fish physiology, *Acidic water, Mode of Action, *Water pollution effects, *Toxicity, Mortality, Laboratory tests, Bioassay, New York.
Identifiers: *White suckers, Catostomus commersoni, Prolarvae, Acid rains, Abnormalities, Acid lakes, Adirondack mountains.

White sucker (Catostomus commersoni) eggs were incubated in water of high (250 umhos/cm) and low (20 umhos/cm) conductivity with nominal pH ranging from 4.2 to 8.0. At pH 4.5 and below in water of low conductivity no eggs survived to hatching. In high conductivity water at pH 4.5, a few prolarvae hatched but were deformed and soon died. At pH 5.0 and above the total hatch was the same at either conductivity level. However, at pH 5.0 there were body deformities and abnormalities in the vascular system and none of the prolarvae survived to the swim-up stage. At both conductivity levels there was a reduction in swim-up at pH 5.3 compared with the control, but none at pH 5.8. Low pH had a delaying influence on the absorption of the yolk sac. (Katz)
W77-07184

THE DISTRIBUTION AND ECOLOGY OF COMMON MARINE AND ESTUARINE GASTROPODS IN THE DELAWARE BAY AREA,
Delaware Univ., Lewes. Marine Studies Complex.
W. Leathem, and D. Maurer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 302, Price code: A02 in paper copy. The Nautilus, Vol. 89, No. 3, p. 73-79, 1975. 47 ref.

Descriptors: *Gastropods, *Mollusks, *Invertebrates, Distribution Patterns, Aquatic life, Aquatic animals, Estuaries, Systematics, *Benthos, *Classification, Benthic fauna, Ecological distribution, *Delaware Bay, Bays.

A number of taxonomic surveys were conducted in the Delaware Bay area, primarily focusing on the benthic ecology. a synthesis is presented of results from surveys on the distribution and ecology of gastropods in the Delaware Bay region. There were 46 common species of marine and estuarine gastropods, the majority being euryhaline marine species. A few of the species had scattered occurrences in either the true estuarine or stenohaline marine ranges. (Katz)
W77-07185

PREFERRED, AVOIDED, AND LETHAL TEMPERATURES OF FISH DURING RISING TEMPERATURE CONDITIONS,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Dept. of Biology.
D. S. Cherry, K. L. Dickson, Jr., and J. R. Stauffer.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 239-246, 1977. 1 fig., 3 tab., 23 ref.

Descriptors: *Water temperatures, *Salmonids, *Thermal pollution, *Water pollution effects, Freshwater fish, Perches, Shiners, Sunfishes, Laboratory tests, Statistics, Lethal limit, *Fish behavior, *Fish physiology, *Thermal stress, Thermal water.
Identifiers: Acclimation, *Preferred temperatures, *Avoidance response.

Selected temperatures increased for 15 fish species in a laboratory gradient when acclimated to 3 degree C increments from 12 to 27 degrees C. Temperature preferences exceeded acclimation temperatures between 12 to 27 degrees C for all except the telescope shiner (Notropis telescopus), yellow perch (Perca flavescens), rainbow trout (Salmo gairdneri), brown trout (Salmo trutta), and brook trout (Salvelinus fontinalis). At 30, 33, or 36 degrees C acclimation, preferred temperatures were less than the acclimation temperature. The highest temperature preferences occurred at acclimations of 27, 30, or 33 degrees C. Final temperature preferences were usually greater than 29 degrees C for most centrarchids, above 24 degrees C for most cyprinids, and less than 19 degrees C for salmonids. Avoidance temperatures increased as acclimation temperature increased. Upper avoidances tested at high acclimation temperatures (30-36 degrees C) either equalled or exceeded the 7-day upper lethal temperature limit of the species by 1-2 degrees C, while avoidances were below this upper lethal limit when tested at the acclimation temperature closest to the species' final temperature preference. (Katz)
W77-07186

RESIDUES OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) UNDETECTED IN LAKE TROUT AND CHINOOK SALMON FROM THE UPPER GREAT LAKES,
Fish and Wildlife Service, Warm Springs, Ga. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 5A.
W77-07187

LABORATORY APPARATUS FOR PROVIDING DIEL TEMPERATURE REGIMES FOR AQUATIC ANIMALS,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
W. A. Wurtsbaugh, and G. E. Davis.
The Progressive Fish-Culturist, Vol. 38, No. 4, p. 198-199, 1976. 1 fig., 3 ref.

Descriptors: *Laboratory equipment, *Water temperature, *Fluctuations, *Diurnal, Laboratory tests, Heated water, Temperature control, Aquaria, Trout, Methodology, Thermal pollution.
Identifiers: *Diel temperature fluctuations.

An easy to use, moderate cost apparatus for the study of effects of diel temperature fluctuations on aquatic organisms was constructed with plywood headboxes, immersion heaters, solenoid valves, timers and insulated aquaria. Warm and cool water flows overlap to avoid abrupt temperature changes. (Katz)
W77-07188

HEINZ BODY HEMOLYTIC ANEMIA IN COHO SALMON (ONCORHYNCHUS KISUTCH) EXPOSED TO CHLORINATED WASTEWATER,
Municipality of Metropolitan Seattle, Wash. Water Quality Lab.
J. A. Buckley.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, p. 215-224, 3 tab., 11 fig., 46 ref.

Descriptors: *Bioassay, *Chlorine, *Chlorination, *Sewage, Domestic wastes, *Salmon, Fish diseases, Fish physiology, *Pathology, *Effluents, Methodology, Water quality, *Water pollution effects.
Identifiers: *Hematology, *Fish blood cells, *Heinz body hemolytic anemia, *Coho salmon, *Chlorinated wastewater, Total residual chlorine, Erythrocytes, Pathological erythrocytes, Hemoglobin, *Hematologic changes.

Fingerling coho salmon (Oncorhynchus kisutch) were exposed for 12 wk to various concentrations of treated wastewater containing total residual chlorine (TRCl2) with riverwater diluent under continuous flow conditions. Levels of TRCl1 averaging 0.003-0.05 mg/l resulted in mild to pronounced symptoms of hemolytic anemia, including an increase in numbers of circulating immature erythrocytes, pathological changes in erythrocytes, and a reduction in packed cell volume and hemoglobin levels. In addition, Heinz bodies were formed at the 0.012 and 0.05 mg/l TRCl1 levels. The hematologic changes were attributed to the oxidative nature of TRCl. (Katz)
W77-07189

ACUTE TOXICITY OF ZINC, CADMIUM, AND CHROMIUM TO THE MARINE FISHES, YELLOW-EYE MULLET (ALDRICHETTA FORSTERI C. AND V.) AND SMALL MOUTHED HARDYHEAD (ATHERINASOMA MICROSTOMA WHITLEY),
Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group.
D. S. Negilski.
Australian Journal of Marine and Freshwater Research, Vol. 27 (1976), p. 137-149, 3 tab., 31 ref.

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Descriptors: *Metals, *Toxicity, Mortality, *Bioassay, Laboratory tests, *Marine fish, *Zinc, *Cadmium, *Chromium, *Juvenile fish, Estuarine fish, Fish, Water pollution effects, Industrial wastes, *Water temperature, *Australia.
Identifiers: LC50, Yellow-eye mullet, Smallmouth hardyhead, *Zinc chloride, *Cadmium chloride, *Incipient lethal level, Static bioassay, Continuous flow bioassay.

In static tests with juvenile mullet, the acute incipient lethal level for zinc was 9 mg/l, the 168-h LC50 value for cadmium was 16 mg/l, and the 96-h LC50 values for tri- and hexavalent chromium were 53 and 24 mg/l respectively; in similar tests with pre-adult hardyhead, the acute incipient lethal level for zinc was 33 mg/l and the 168-h LC50 value for cadmium was 21 mg/l. In continuous-flow tests with mullet the acute incipient lethal level for zinc was 12 mg/l, but incipient lethal levels were not attained for cadmium or chromium; however, the 120-h LC50 value for cadmium and the 96-h LC50 value for hexavalent chromium were 14 and 31 mg/l respectively. In similar tests with hardyhead, incipient lethal levels for zinc and chromium were 37 and 36 mg/l respectively. An acute incipient lethal level for cadmium was not attained, but the 168-h LC50 value was 15 mg/l. Generally, mullet and hardyhead were more sensitive to the acute effects of cadmium, chromium and zinc than other marine and estuarine fishes for which toxicological information is available. Increased temperature also appeared to increase the sensitivity of mullet to the lethal effects of zinc. (Katz)
W77-07190

EVALUATION OF TOXICITY TO THE EARLY ONTOGENY OF FISHES OF SUBSTANCES DISCHARGED INTO A BODY OF WATER,
Moscow State Univ. (USSR). Lab. of Water Toxicology.
O. P. Danil'chenko, and N. S. Stroganov.
Journal of Ichthyology, Vol. 15(2), p. 311-319, 1975. 4 fig., 6 tab., 11 ref.

Descriptors: *Chemicals, Chemical wastes, *Water pollution effects, Water quality, *Toxicity, Mortality, Freshwater fish, Juvenile fish, Fry, Fish eggs, Embryonic growth states, *Fish physiology, Laboratory tests, *Bioassay, Biochemistry, *Zinc, *Lead, Metals.
Identifiers: Antiseptics, Development, *Salicylanilide, *Tetraethyl lead chloride, *Sodium pentachlorophenol.

The effect of a number of antiseptics on the embryonic and early post-embryonic development of the following freshwater teleost fishes is investigated: the pike Esox lucius, the perch Perca fluviatilis, the ruffe Acerina cernua, the roach Rutilus rutilus, the minnow Phoxinus phoxinus, the gudgeon Gobio gobio, the leach Misgurnus fossilis and the spiny loach Cobitis taenia. The degree of toxicity of the substances is assessed from their influence on the early development of these fishes. (Katz)
W77-07191

INSTREAM FLOW REGIMENS FOR FISH, WILDLIFE, RECREATION AND RELATED ENVIRONMENTAL RESOURCES,
Fish and Wildlife Service, Billings, Mont.
D. L. Tennant.
Fisheries, vol. 1, no. 4, p. 6-10, 1976. 6 fig., 2 tab., 5 ref.

Descriptors: *Methodology, Aquatic life, Flow, *Average flow, *Streamflow, Bioassay, Biomass, Water quality, Fisheries, Testing, *Stream fisheries, Environmental effects, *Water management(Applied), *Water allocation(Policy), Water distribution(Applied).
Identifiers: *Instream flow regimens.

A quick, easy methodology was described for determining flows to protect the aquatic resources in both warm water and cold water streams, based on their average flow. Detailed field studies were conducted on 11 streams in 3 states between 1964-1974, testing the 'Montana Method.' This work involved physical, chemical, and biological analysis of 38 different flows at 58 crosssections on 196 stream-miles, affecting both cold and warm water fisheries. The studies revealed that the condition of the aquatic habitat was similar on most of the streams carrying the same portion of the average flow. Ten percent of the average flow was a minimum instantaneous flow recommended to sustain short-term survival habitat for most aquatic life forms. Thirty percent was recommended as a basic flow to sustain good survival conditons for most aquatic life forms and general recreation. 60% provided excellent habitat for most life forms during their primary periods of growth and for the majority of recreational uses. (Katz)
W77-07192

DIPHENAMID REMOVAL FROM WATER AND METABOLISM BY AQUATIC PLANTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.
S. W. Bingham, and R. L. Shaver.
Pesticide Biochemistry and Physiology, vol. 7, p. 8-15, 1977. 9 fig., 23 ref.

Descriptors: *Organic compounds, *Biochemistry, *Algae, *Pesticides, *Metabolism, *Plant physiology, *Aquatic plants, Pondweeds, Water hyacinth, Path of pollutants, Mode of action, Analytical techniques, Water quality.
Identifiers: *Diphenamid, Parrotfeather, White algae, Bioaccumulation, Myriophyllum brasilience, Eichornis crossiper, Ulothrix sp., Oedogonium sp., Glococystis sp., Scenedesmus sp., Potamogeton diversifolius.

Several aquatic plants were effective for removal of N,N-dimethyl-2, 2-diphenyl-acetamide ((14C-) diphenamid) from water and degradation to various metabolites. Parrotfeather (Myriophyllum brasilience L.) and water hyacinth (Eichornis crossiper L.) removed large quantities of diphenamid from water while algae (Ulothrix sp., Oedogonium sp., Glococystis sp., and Scenedesmus sp. mixed culture) and waterthread pondweed (Potamogeton diversifolius Raf.) were less effective in reducing diphenamid concentration in the water. A somewhat stable metabolite in algae, water hyacinth , and parrotfeather was N-methyl-2,2-diphenyl-acetamide. Algae and water hyacinth degraded diphenamid further to unknown products. One of these compounds moved more slowly than N-methyl-2,2-diphenylacetamide on thin-layer chromatography using benzene, n-heptane saturated with water and methanol solvent. While most solvents did not resolve 2,2-diphenylacetic acid from the base, petroleum ether, ethyl ether, and formic acid (50:50:2, v/v/v) was found to move 2,2-diphenylacetic acid further than diphenamid or N-methyl-2,2-diphenylacetamide on thin-layer chromatography. (Katz)
W77-07193

HEAVY METAL POLLUTION IN TRONDHEIMSFJORDEN, NORWAY, AND THE RECORDED EFFECTS ON THE FAUNA AND FLORA,
Kongelige Norske Videnskabers Selskab, Trondheim. Museet.
E. Lande.
Environmental Pollution, vol. 12, p. 187-198, 1976. 1 fig., 3 tab., 17 ref.

Descriptors: *Metals, *Sampling, *Wildlife, *Invertebrates, *Algae, *Birds, *Path of pollutants, Environmental effects, Bioassay, *Cadmium, *Copper, *Iron, *Nickel, *Chromium, *Silver, *Zinc, *Mercury, Analytical techniques, Water pollution sources, Water quality.
Identifiers: *Tissue analysis, *Bioaccumulation.

The extent of heavy metal pollution in Trondheimsfjorden was investigated throughout the period of 1972-73. Samples of invertebrates and seaweeds from the intertidal zone were collected for analysis, and parts of some pelagic and bottom-dwelling fishes were also sampled. Seabirds were collected in the fjord and from adjacent areas. Subsamples from the kidneys, liver, pectoral musculature and eggs (white and yolk) of these birds were analysed. All samples were analysed for cadmium, copper, iron, nickel, chromium, silver, zinc and mercury. Heavy metal pollution was found in two distinct areas of the fjord. The qualitative and quantitative changes in the faunal assemblages of these two areas were described. (Katz)
W77-07194

OFFSHORE OIL AND FISHERY RESOURCES,
New York State Dept. of Environmental Conservation, Delmar. Div. of Marine and Coastal Resources.
A. C. Jensen.
New York Fish and Game Journal, vol. 23, no. 2, p. 138-148, 1976. 1 fig., 2 tab., 27 ref.

Descriptors: *Commercial fishing, *Commercial shellfish, *Shellfish, *Environmental effects, *Oil wastes, Natural resources, *New York, *Oil industry, *Drilling, *Risks, *Fishkill, Marine fisheries, Fisheries, Clams, Oysters, Water pollution effects.
Identifiers: *Offshore oil, Risk potential.

The prospect of petroleum reserves off New York and adjacent states has focused a detailed look at the living marine resources of the area as they might be affected by drilling for the petroleum and by possible oil spills. The volume and value of the harvested portions of the resources and their socio-economic impact are discussed. The information is presented as an aid to the decision-makers who must evaluate the known fishery resources against the unknown petroleum resources. (Katz)
W77-07195

THE RELATIONSHIP BETWEEN CUPRIC ION ACTIVITY AND THE TOXICITY OF COPPER TO PHYTOPLANKTON,
Woods Hole Oceanographic Institution, Mass.
W. Sunda, and R. R. L. Guillard.
Journal of Marine Research, vol. 34, no. 4, p. 511-529, 1976. 2 tab., 8 fig., 25 ref.

Descriptors: *Hydrogen ion concentration, *Diatoms, *Copper, *Growth rate, *Inhibitors, *Chelation, *Algae, *Water chemistry, *Phytoplankton, *Toxicity, *Nutrient requirements, *Ions, Laboratory tests, Primary productivity, Estuaries.
Identifiers: Thalassiosira, Nannochloris.

Culture experiments with the estuarine diatom Thalassiosira pseudonana in highly chelated seawater media demonstrate that growth rate inhibition and copper content of cells are related to cupric ion activity and not to total copper concentration. Cupric ion activity was altered independently of total copper concentration by varying the chelator concentration and the pH. Cellular copper content of 3 to 4 day old cultures followed a hyperbolic relation with cupric ion activity. Copper inhibited growth rate at activities above 3 x 10 to the 11th power M and growth ceased at values above 5 x 10 to the 9th power M. The relation between growth rate inhibition and cupric ion activity was not a simple hyperbolic function. In experiments with the green alga, Nannochloris atomus, growth rate inhibition also was related to cupric ion activity with partial growth rate inhibition occurring in the activity range 4 x 10 to the 11th power to 2 x 10 to the 9th power M. Calculated estimates of cupric ion activity in seawater indicate that natural activi-

ty levels can be inhibitory to these phytoplankton depending on pH and the degree of copper complexation by natural organic ligands. (Katz)
W77-07196

RESPONSES OF THE LICHENS PELTIGERA APHTHOSA AND CETRARIA NIVALIS AND THE ALGA NOSTOC COMMUNE TO SULFUR DIOXIDE, NATURAL GAS, AND CRUDE OIL IN ARCTIC ALASKA,
Louisville Univ., Dept. of Biology.
R. M. Atlas, and E. Schofield.
Astarte, vol. 8, no. 2, p. 53-60, 1976. 7 fig., 1 tab., 17 ref.

Descriptors: *Alaska, *Arctic, *Nitrogen fixation, *Carbon dioxide, *Inhibitors, Sulfur compounds, *Oxygen, *Respiration, *Oil wastes, *Oil, *Algae, *Lichens, Carbon cycle, Photosynthesis, Environmental effects, On-site investigations, Bays.
Identifiers: *Crude oil, *Peltigera, *Cetraria, *Nostoc, Prudhoe Bay(Alas).

The sensitivity of the Arctic populations of the lichens Peltigera aphthosa and Cetraria nivalis and the alga Nostoc commune to three pollutants was determined by measuring rates of nitrogen fixation, carbon dioxide fixation and oxygen consumption. Sulfur dioxide was most inhibitory to carbon dioxide fixation, but did not inhibit oxygen consumption. Prudhoe crude oil severely inhibited both nitrogen and carbon dioxide fixation. Natural gas has a much lesser effect on the test organisms. Lichens appeared to be less sensitive to the pollutants than were the free alga. (Katz)
W77-07197

UPTAKE AND ACCUMULATION OF THE NICKEL ION BY MYTILUS EDULIS,
San Francisco Univ., Calif. Dept. of Biology.
A. R. Friedrich, and F. P. Filice.
Bulletin of Environmental Contamination and Toxicology, vol. 16, no. 6, p. 750-755, 1976. 4 fig., 11 ref.

Descriptors: *Nickel, *Mussels, *Absorption, *Heavy metals, Industrial wastes, Mollusks, Bioindicators, Bioassay, Water pollution effects, *Path of pollutants, Toxicity, Animal physiology.
Identifiers: Bivalves.

Mussels (Mytilus edulis) were exposed to nickel concentrations of 0.018, 0.030, 0.056, and 0.107 mg/l for 1, 2, 3 and 4 weeks. Uptake and accumulation were significant at the two highest concentrations. Another experiment showed significant uptake and accumulation at concentrations of 20, 40 and 80 mg Ni/l after a 96 hour exposure. Byssal threads were secreted only at 20 mg Ni/l. (Katz)
W77-07198

SUBTIDAL AND INTERTIDAL MARINE FOULING ON ARTIFICIAL SUBSTRATA IN NORTHERN PUGET SOUND, WASHINGTON,
Washington Univ., Seattle. Coll. of Fisheries.
C. H. Hanson, and J. Bell.
Fishery Bulletin, Vol. 74, No. 2, p. 387-402, 1976. 5 fig., 1 tab., 25 ref.

Descriptors: *Cooling waters, *Marine animals, *Power plants, Locating, Sites, *Biological communities, Artificial substrates, Invertebrates, Marine algae, On-site investigations, Seasonal, Depth, *Heavy metals, *Washington.
Identifiers: *Marine fouling, Fouling organisms, Copper-nickel alloy, *Puget Sound(Wash).

The design and siting of power plant cooling systems requires detailed information concerning the fouling tendencies of specific organisms on specific construction materials. This study, conducted in the vicinity of Kiket Island, northern Puet Sound, Wash., attempts to provide some of this information. The sessile community characteristics of five materials exposed at three depths and two locations in the subtidal zone, and of one material in the intertidal zone are described. The degree of biofouling was least for copper-nickel alloy and progressively greater for Plexiglas, wood, steel, and concrete. Media decay and biological accumulation was greatest at the near-surface level, decreasing in intensity with increasing depth. The maximum rate of colonization occurred during the late spring (April-June) and early fall (mid-August-October). The present study, an analysis of biofouling, indicates that if the proposed power plant were to be built at Kiket Island, its cooling system intake should be sited in water deeper than 6 m and should have a safe and adequate fouling control scheme. (Katz)
W77-07201

UPTAKE, DISTRIBUTION, AND DEPURATION OF 14C-BENZENE IN NORTHERN ANCHOVY, ENGRAULIS MORDAX, AND STRIPED BASS, MORONE SAXATILIS,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Lab.
S. Korn, N. Hirsch, and J. W. Struhsaker.
Fishery Bulletin, Vol. 74, No. 3, p. 545-552, 1976. 2 fig., 4 tab., 13 ref.

Descriptors: *Marine fish, *Oil pollution, *Path of pollutants, Commercial fish, *Bass, Juvenile fish, Oily water, Water pollution effects, Toxicity, *Absorption, Laboratory tests, Carbon radioisotopes, Fish physiology.
Identifiers: *Benzene, *Northern anchovy, Engraulis mordax, Morone saxatilis, Sub-lethal concentrations, *Bioaccumulation, Tissue samples, Depuration, *Striped bass.

The uptake, distribution, and depuration of water-soluble, monocyclic hydrocarbon contained in petroleum and refined products was studied in two species of marine fish. Mature northern anchovy, Engraulis mordax, and juvenile striped bass, Morone saxatilis, were exposed to sublethal concentrations of 14C-benzene for 48 h. Residues in tissues exhibiting a high lipid content or representing apparent major metabolic sites were measured during the exposure and afterwards when the fish were transferred to clean seawater. Fish exhibited a rapid uptake over a wide range of benzene concentrations in the water column. Accumulation in anchovy was considerably greater than in striped bass. Results indicate that the pathway of hydrocarbons through the liver, gallbladder, intestines, and colon is a major depuration route. Residues were depurated rapidly after cessation of exposure; in striped bass tissues most residues were undetectable by 7 days. (Katz)
W77-07202

ENVIRONMENTAL DEPENDENCE OF MANGANESE AND ZINC IN THE SCALES OF ATLANTIC SALMON, SALMO SALAR (L) AND BROWN TROUT, SALMO TRUTTA (L),
Liverpool Univ. (England). Dept. of Oceanography.
M. I. Abdullah, J. W. Banks, D. L. Miles, and K. T. O'Grady.
Freshwater Biology, Vol. 6, No. 2, p. 161-166, 1976. 3 fig., 2 tab., 11 ref.

Descriptors: *Salmonids, *Atlantic salmon, *Brown trout, *Zinc, *Manganese, *Path of pollutants, Freshwater fish, Smolts, Juvenile fish, Heavy metals, Water pollution effects, Absorption, Water chemistry, Biochemistry.
Identifiers: Fish scales.

Analysis of manganese and zinc concentrations in the scales of salmon and trout from a number of sites showed significant dependence of the levels of these metals in the scales on the levels in the environment. There is some evidence to suggest that in trout scales there is a minimum concentration of zinc above which there is a direct proportion between environmental and scale concentration. It is also possible that the response of trout to environmental zinc differs from that of salmon. (Katz)
W77-07203

APPARENT POTENTIATION OF THE COTTON DEFOLIANT DEF BY METHYL PARATHION IN MOSQUITOFISH,
Mississippi Univ. for Women, Columbus. Dept. of Biology.
D. L. Fabacher, J. D. Davis, and D. A. Fabacher.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 6, p. 716-718, 1976. 1 tab., 3 ref.

Descriptors: *Defoliants, *Insecticides, *Toxicity, *Agricultural chemicals, Water pollution, Water pollution effects, Water pollution sources, Mortality, Laboratory tests, Freshwater fish, Bioassay.
Identifiers: 24 hr. LC50, *Mosquitofish, Gambusia affinis, 48 hr. LC50, *Methyl parathion, Potentiation, Cotton defoliant.

Mosquitofish were treated with 0.5 ppm DEF (a cotton defoliant), 5 ppm methyl parathion (boll weevil insecticide) and a combination of 0.5 ppm DEF and 5 ppm methyl parathion. The observed mortalities were 0%, 8% and 89% respectively. This potentiation or greater-than-additive toxicity effect should be considered when both DEF and methyl parathion are sprayed on the cotton fields. (Katz)
W77-07204

PLANKTONIC INFUSORIA IN TWO LAKES OF THE GORKI OBLAST, (IN RUSSIAN),
Gorkii State Univ. (USSR).
M. A. Petrova, T. P. Smirnova, T. A. Ageeva, and G. V. Khalturina.
Gidrobiol Zh 12(2), p 31-36, 1976.

Descriptors: Lakes, *Biomass, Plankton, *Productivity, *Zooplankton, Water temperature.
Identifiers: *Gorki lakes region(USSR), *Planktonic, Infusoria, USSR.

Data on the number, biomass, generation time and production of plankton infusoria are presented for 2 different lakes in the Gorky Region (Russian SFSR, USSR), Lakes Velikoe and Svjatoe. Differences in species composition and the relative role of infusoria in the zooplankton biomass in both lakes (4.3 and 10.1%, respectively) are given. Biomass and production were similar in the 2 lakes. The propagation rate is high and depends on water temperature.--Copyright 1976, Biological Abstracts, Inc.
W77-07234

WATER QUALITY AND CHEMICAL MODELS,
Harvard Univ., Boston, Mass. Div. of Engineering and Applied Physics.
J. N. Butler.
Environmental Affairs, Vol. 2, No. 2, p. 382-98 (Fall 1972). 1 fig, 1 tab.

Descriptors: *Lakes, *Model studies, *Eutrophication, *Analytical techniques, Theoretical analysis, Aquatic algae, Biochemical oxygen demand, Fishkill, Lake stages, Oxygen requirements, Oxygen, Water quality, Odor-producing algae, Algal toxins, Aquatic life, Cyanophyta, Algal control, Evaluation.
Identifiers: Algal blooms.

A model is any representation of a real system which is easier to manipulate than the real system itself. The more complete and relevant one's mental model of an environmental situation is, the better the decisions will be regarding that situation. A chemical model is one which depends on a detailed understanding of the various factors which may affect a given use for water. The use discussed here is the recreational use of an urban lake. The essential quality parameters are that

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swimmers should not contract disease or be poisoned, and that visibility be sufficient to allow rescue of those likely to drown. The most serious problem faced is overfertilization (eutrophication). This can be both an aesthetic nuisance and a cause of fish kill. The key questions are: What important factors cause eutrophication. How many algal blooms be controlld. How may the extent of algal growth be predicted. Approaching these questions from a chemical viewpoint, one is able to propose solutions to correct the problems, yet keep the resource within the purpose intended. It is in this fashion that using a chemical model seems most beneficial. (Moorhouse-Florida)
W77-07246

THE DIFFERENTIAL USE OF CHIRONOMIDAE AND CERATOPOGONIDAE (DIPTERA) IN THE MONITORING OF VARIOUS AQUATIC WASTES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Entomology.
For primary bibliographic entry see Field 5A.
W77-07282

FATE OF THE ORGANOPHOSPHATE INSECTICIDE PARATHION IN THE FRESHWATER INVERTEBRATES,
Rhode Island Univ., Kingston. Dept. of Pharmacology and Toxicology.
G. P. Carlson, and G. C. Fuller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 711, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, (1976). 16 p, 2 tab, 43 ref. OWRT A-060-RI(1). 14-34-0001-6041.

Descriptors: *Invertebrates, *Insecticides, *Crayfish, *Snails, *Toxicity, *Pesticide residues, Absorption, Metabolism, Water pollution effects.
Identifiers: *Parathion, Cambarus, Paraoxon, Viviparus malleatus, Metabolites.

The goal was to determine the toxicity and fate of the organophosphate insecticide parathion in the freshwater crayfish Cambarus and snail Viviparus malleatus. The research was designed to measure the toxicity of this pesticide to these species in relation to their ability to take it up, metabolize it to the active metabolite paraoxon and inactive metabolites, principally p-nitrophenol and finally excrete the pesticide and metabolites. The results indicate there seems to be no direct danger to snail due to parathion, but the crayfish is sensitive to parathion at levels so low that they are normally exceeded in ponds adjacent to farms following agricultural spraying with parathion. The direct effect on snails due to parathion spraying is minimal and there appears to be very little accumulation of organophosphate in exposed snail tissues; thus the danger to predator species also appears small. However the consequences of crayfish elimination by organophosphate may be real and need investigation, while accumulation, although being investigated, would not be of importance with toxicity occurring at such a low dose.
W77-07285

ECOLOGICAL STUDIES OF THE BRUSSELS URBAN ECOSYSTEM: CONTRIBUTION 8. FIRST SURVEY OF THE HYDROBIOLOGY OF THE WOLUWE VALLEY IN BRUSSELS, (IN FRENCH),
Brussels Univ. (Belgium). Faculte des Sciences.
J. C. Lamaye.
Bull Soc R Bot Belg 108(2), p 295-314, 1975.

Descriptors: *Ecosystems, *Urbanization, *Eutrophication, *Cyanophyta, *Diatoms, Hydrobiology, Plankton, Ponds, Surveys, Water pollution effects.
Identifiers: *Belgium(Brussels area), *Woluwe River valley(Belgium).

The particular conditions of the Woluwe River, one of the last still flowing through E Brussels (Belgium) were analyzed. A great number of ponds, affected by urban pollution are present in this valley. The chemical conditions and the composition of the planktonic communities were observed during 1 yr in the river and in adjacent ponds. Observations of the annual biocenotic cycle show a progressive eutrophication accompanied by a reduction of the diversity of phytoplankton. Blooming a few species of Cyanophyceae and Diatomeae is characteristic of the hypertrophic ponds.--Copyright 1976, Biological Abstracts, Inc.
W77-07292

STUDY ON RESPIRATORY METABOLISM MODIFICATIONS IN ACARTIA CLAUSI (CRUSTACEA: COPEPODA) POPULATIONS AFTER PASSAGE THROUGH THE COOLING CIRCUIT OF A POWER PLANT,
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Hydrobiologie Marine; and Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
R. Gaudy.
Marine Biology, vol. 39, p. 179-190, 1977. 2 fig., 6 tab., 27 ref.

Descriptors: *Copepods, *Cooling water, *Respiration, Zooplankton, Power plants, Water temperature, *Thermal pollution, Water pollution, Effects, Animal physiology, Metabolism, Thermal stress.
Identifiers: *Acartia clausi, Respiration-temperature curves.

The respiratory metabolism of the copepod Acartia clausi was studied at different temperatures during an annual cycle. Copepods were collected from intake area, the outlet area, where the heated effluents were discharged with an average of 6C, and a small protected bay directly influenced by the flow of the heated waters. Seasonal variations in respiration intensity were observed, with a spring maximum. Specimens collected from the heated effluents exhibited comparatively reduced metabolism. Q10 varied with temperature and time of year, suggesting seasonal regulation of metabolism. Except in March, where metabolic curves differed markedly according to the origin of the sample (species from the heated effluents displaying a metabolic curve of the summer type), the principal difference in shape of the respiration-temperature curves appeared in the range of 10 to 14C, where reduced respiration was observed in specimens from the heated effluents. When A. clausi from external areas were exposed to artificial thermal stress, they displayed a respiratory metabolism pattern similar to that of specimens sampled from the heated effluents. (Katz)
W77-07305

INFLUENCE OF WETTING TENSION AND IONS UPON SETTLEMENT AND BEGINNING OF METAMORPHOSIS IN BRYOZOAN LARVAE (BOWERBANKIA GRACILIS),
Technische Universitaet, Brunswick (West Germany). Zoologisches Institut.
R. Eiben.
Marine Biology, vol. 37, p. 249-254, 1976. 6 fig., 15 ref.

Descriptors: *Larvae, *Growth stages, Life cycles, *Capillary action, *Surface tension, Surfaces, *Mode of action, *Boundaries(Surfaces), Animal physiology, Interfaces, *Salts, *Zooplankton, Chlorides, Animal physiology, Animal behavior, Water quality, Analytical techniques, Potassium compounds, Magnesium compounds, Cesium.
Identifiers: *Bowerbankia gracilis, *Tissue analysis, Wetting solids.

Settlement and metamorphosis in Bowerbankia gracilis larvae were dependent on the wettability of the substratum. The wettability of a solid was characterized by its specific contact angle, Theta. Larvae settled on solids with angles greater than 17 degrees, but not on surfaces with high wettability properties. The rate of settlement and that of metamorphosis were dependent on the degree of Theta in an all-or-none fashion. Settlement of larvae on high-wetting solids was prevented by high capillary pressure accruing at the point of contact. Metamorphosis was initiated by contractions occurring after adhesion. Application of CsCl or KCl induced such contractions and metamorphosis in free-swimming larvae. MgCl2 prevented the onset of metamorphosis but not adhesion. Two mechanisms were considered for induction of metamorphosis: (1) mechanical stimulation by shearing the cilia at the point of contact, and (2) a chemical stimulation of the cell membrane after application of K+ or Cs+. (Katz)
W77-07306

THE OLIGOCHAETE COMMUNITIES OF A LOWLAND STREAM AND THEIR VALUE AS INDICATORS OF ORGANIC POLLUTION,
Bordeaux-1 Univ., Talence (France). Comparative Anatomy Lab.; and Bordeaux-1 Univ., Talence (France). Dept. of Hydrobiology.
F. Gross.
Annales de Limnologie, vol. 12, no. 1, p. 75-87, 1976. 3 fig., 3 tab., 26 ref.

Descriptors: *Biological communities, *Bioindicators, *Agricultural runoff, *Water quality, *Pollutant identification, *Oligochaetes, *Water quality control, Benthos, Benthic fauna, Invertebrates, Water pollution effects.
Identifiers: *Tubifex, *Limnodrilus, Species diversity.

The usual methods used to determine the biological quality of running water are not very precise for the detection of mild pollution due to organic material from agriculture. Under conditions such as this, the following criteria have been used, successfully: (1) the specific diversity of oligochaete populations; (2) the percentage of oligochaetes in the benthos; (3) the importance of the association Tubifex tubifex (M.), Limnodrilus hoffmeisteri (Cl.) and L. udekamanius. (Katz)
W77-07307

EFFECTS OF COMBINATION OF TEMPERATURE AND HYDROSTATIC PRESSURE ON ASTERIAS RUBENS,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
H.-G. Neuhoff, and H. Theede.
Kieler Meeresforschungen, Vol 30, No 1, p 32-43, 1975. 4 tab, 5 fig, 30 ref.

Descriptors: *Environmental effects, Animal physiology, *Water temperature, *Hydrostatic pressure, Water pressure, Invertebrates, Enzymes, Zooplankton, Methodology, Laboratory tests, Bioassay, Water pollution effects.
Identifiers: *Asterias, *Starfish.

Small specimens of the starfish Asterias rubens (radius: 5-10 mm) tolerate higher hydrostatic pressures than larger ones (radius: 25-40 mm). Pressure tolerance of this species increases with rising temperature from 5 to 15C. Pressure induced reversible injuries are 'repaired' more quickly at higher temperatures. Irreversible damaged starfishes die more quickly at 15C than at 5C. With decreasing temperature and augmenting hydrostatic pressure the activity of the enzyme Lactate-dehydrogenase of Asterias rubens is increasingly inhibited. (Katz)
W77-07308

INVESTIGATIONS ON THE INFLUENCE OF CRUDE OIL ON SURVIVAL AND OXYGEN CONSUMPTION OF IDOTEA BALTICA AND GAMMARUS SALINUS,
Kiel Univ. (West Germany). Institut fuer Meereskunde.

A. Ponat.
Kieler Meeresforshungen, Vol 31, p 26-31, 1975. 3 fig, 1 tab, 17 ref.

Descriptors: Water pollution effects, *Oil, *Invertebrates, *Crustaceans, *Toxicity, *Respiration, Environmental effects, *Bioassay, *Salinity, Laboratory tests, Oxygen, Oil spills, Water temperature, Animal metabolism.
Identifiers: *Gammarus salinus, *Idotea baltica, *Crude oil, Venezuela crude, Libya crude, Iran crude.

The influence of crude oil from Venezuela, Libya and Iran was observed with respect to Idotea baltica and Gammarus salinus. Prior to the measurements, the animals were spread out on sand and exposed to a 0.1 mm layer of crude oil for four hours. After this period they were transferred back to seawater of 15% salinity at 15C. The mean time of survival for G. salinus varied between one and two days, with the shortest survival in Iran oil and the longest in Venezuelan oil (control value: 31 days). I. baltica showed a greater resistance with a mean survival time of 41 days for Iran oil, 48 days for Venezuelan oil and 51 days for Libya oil (control value: 56 days). At this salinity and temperature, the oxygen consumption of G. salinus was reduced by Iran crude oil to 40% of the normal value and to 70% of the normal value in Idotea. (Katz)
W77-07310

INFLUENCE OF AN OZONISATION PLANT ON THE BACTERIAL CONTENT IN WATER OF A DEMONSTRATION AQUARIUM,
Kiel Univ. (West Germany).
H. Schlesner, and G. Rheinheimer.
Kieler Meeresforschungen, Vol 30, No 2, p 117-129, 1974. 28 fig, 13 ref.

Descriptors: *Water purification, *Ozone, *Bacteria, *Aquaria, *Pollution abatement, *Oxidation, Water treatment, Oxygen, Methodology, Pesticides, Water quality control, Foaming, Aquiculture, Marine bacteria, Nitrogen compounds, Nitrites, Nitrates.
Identifiers: *Ozonation plants.

The purpose was to determine the effect of a sea water purification system on the concentration of bacteria in the aquarium of the Institut fur Meereskunde. Aquarium water differed from that of the Kiel Fjord, especially in its higher phosphate and nitrate concentrations. Saprophyte counts decreased when water was purified and ozone added. The decrease of bacteria was due to increased surface tension of bubbles producing foam which acted as a collecting agent for pollutants as well as bacteria. The amount of ozone was not enough to cause a germicidal effect. Soluble proteins and pollutants were extracted from the water and poisonous nitrite was converted to nitrate by the plant. Additional experiments indicated that a long period of time was necessary for the germicidal action of a given quantity of ozone in polluted aquarium water. The efficiency of the ozone depended on the oxidizable contents of the organic and inorganic matter. (Katz)
W77-07311

COMPARATIVE CHARACTERISTICS OF THE PARASITE FAUNA OF BREAM IN LAKES DUSIOS, OBELIJOS, SALVANTU AND GALSTAS, WHICH HAVE DIFFERENT THERMAL REGIMES, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
For primary bibliographic entry see Field 2H.
W77-07312

EXPERIMENTAL STUDY OF THE NITROGEN EXCRETION OF BASS (DICENTRARCHUS LABRAX) DURING GROWTH. I. EFFECTS OF TEMPERATURE AND WEIGHT ON THE EXCRETION OF AMMONIA AND UREA,
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
O. Guerin-Ancey.
Aquaculture, Vol 9, p 71-80, 1976. 7 fig, 1 tab, 16 ref.

Descriptors: *Bass, *Juvenile fish, *Water temperature, *Nitrogen compounds, *Ammonia, *Fish physiology, Fry, Weight, Metabolism, *Ureas, Laboratory tests.
Identifiers: Dicentrarchus labrax, Excretion of nitrogen(Bass).

The effects of temperature and body weight on ammonia and urea excretion were examined for fishes acclimated to 12, 14, 16, 18, 20, 22, and 24C. Ammonia and urea excretion rates were very high at the highest temperatures and decreased with decrease in temperature. Between 18 and 24C, ammonia excretion rates were equal while urea excretion rates increased with temperature. The excretion of age groups 0, 1 and 2 was studied; the younger the fishes, the more important were the excretion rates. (Katz)
W77-07313

UPTAKE OF DISSOLVED AMMONIUM AND NITRATE ION BY THE FRY OF COMMON CARP, CRUCIAN CARP AND LOACH FROM SURROUNDING WATER, (IN JAPANESE),
T. Ito.
Bulletin of Freshwater Fisheries Research, Vol 26(1), p 27-33, 1976. 3 fig, 3 tab, 7 ref.

Descriptors: *Ammonia, *Nitrates, *Absorption, Nitrogen compounds, Radioisotopes, Bioassay, Laboratory tests, *Carp, Juvenile fish, Fry, Proteins, Fish physiology, Water pollution effects.
Identifiers: Common carp, Crucian carp, *Loach.

Uptake of ammonium-15N and nitrate-15N from environmental water kept at 23-24.5C was estimated at various concentrations of these substances using carp fry, crucian carp fry and loach fry. 15N was analysed by optical spectrographic method after being converted into nitrogen gas in sealed tube by Dumas' method. All of the fry showed ammonium-15N absorption directly from the water. The rate of 15N-replacement increased exponentially to the concentration of ammonia in the water as well as to the time exposed to labelled ammonia for carp and crucian carp, whereas loach fry absorbed 15N in linear relation and proportially to the concentration in water. 15N was absorbed and no apparent correlation was observed between the rate of replacement and the concentration in water. When the carp fry were returned to water free from labelled ammonia after being exposed for 48 hours, relatively large amounts of 15N were excreted within the first hour, followed by a very slow rate of excretion. More than 50% of absorbed 15N was retained after 48 hours. Appreciable amounts of 15N were found in the fish killed beforehand and exposed likewise to ammonium-15N. The amount, however, was about 1/2 to 1/3 to that of the living carp. (Katz)
W77-07314

PCB CONTENTS IN THE MUSCLE OF MARINE ANIMALS COLLECTED IN THE SEA NEAR HAKODATE (IN JAPANESE),
Hokkaido Univ., Hakodate (Japan). Lab. of Food Hygiene.
M. Takagi, H. Murayama, and S. Soma.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 42(5), p 589-594, 1976. 2 fig, 2 tab, 4 ref.

Descriptors: *Polychlorinated biphenyls, *Path of pollutions, *Absorption, Water pollution, Water pollution effects, Biochemistry, Laboratory tests, On-site data collections, Marine animals, *Chlorinated hydrocarbon pesticides, Pacific Ocean, Public health.
Identifiers: Bioconcentration, Muscle tissue, Fat content.

Concentrations of polychlorinated biphenyls (PCB) were determined in the muscle of 36 species of marine animals collected in the sea near Hakodate in 1973-1975. PCB concentrations in the muscle ranged between 0.01-0.18 ppm, i.e., a maximum value of 0.18 ppm in Tribolodon hakonensis hakonensis, and a minimum value of 0.01 ppm in Osmerus dentex. The muscle PCB contents were high in proportion to the high fat contents in the species of Tribolodon, Sardinops, Trachurus and Pleurogrammus. On the contrary, PCB contents were generally low in proportion to the low fat contents in 26 species of fish. Consequently, the level of PCB concentrations in the muscle of fish in this area was found to be extremely low as compared with that in fish in other polluted areas. (Katz)
W77-07315

THE INFLUENCE OF UNDERWATER EXPLOSION ON FISH, (IN JAPANESE),
For primary bibliographic entry see Field 8H.
W77-07316

PRELIMINARY EXPERIMENT OF COBALT 60 POLLUTION OF A MARINE FOOD CHAIN: RESULTS OF A SINGLE INGESTION,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Departement de Protectione; CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Service de Recherches Toxicologiques et Ecologiques; and CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Laboritorie de Radioecologie Continental.
J.-C. Amiard, and C. Amiard-Triquet.
Water, Air and Soil Pollution, Vol 5(2), p 221-229, 1975. 5 tab, 16 ref.

Descriptors: *Cobalt radioisotopes, *Path of pollutants, *Food chains, *Food webs, *Plankton, *Mollusks, *Crabs, Water pollution, Water pollution effects, Radioactivity effects, Public health, Laboratory tests, Bioassay, Biochemistry.

A large accumulation of Cobalt 60 was observed at the level of the primary producer, Navicula sp. (Concentration factors=266-396). After one feeding on contaminated food the primary consumers (Scrobicularia plana, Mollusca, Lamelli-branchia) and secondary consumers (Carcinus maenas, Crustacea) retained a large portion of the cobalt ingested (80-90%). The literature indicates that mammals retain a smaller fraction of the Cobalt 60 ingested than do the marine organisms studied. (Katz)
W77-07317

NUTRIENT TRANSFORMATIONS IN LOUISIANA SALT MARSH SOILS,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
R. D. DeLaune, W. H. Patrick, Jr., and J. M. Brannon.
Sea Grant Publication No LSU-T-76-009, November 1976. Coastal Zone Management Series. 44 p, 19 fig, 4 tab, 59 ref.

Descriptors: *Salt marshes, *Wetlands, *Louisiana, *Nutrients, *Productivity, Soils, Nitrogen, Phosphorus, Coasts, Bays, Seasonal.
Identifiers: Spartina alterniflora, Seasonal variations, Barataria Bay(La), Coastal zone management.

Barataria Bay salt marsh exhibits high productivity. Many chemical and microbiological processes occurring in the marsh directly affect productivity. The soils are more or less permanently saturated or submerged. Seasonal changes in redox potential occur only in the upper 5 cm of the soil profile.

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Reduced forms of iron, manganese, nitrogen, and sulfur predominate. The nutrient content of Barataria Bay's organic soils are quite high on a total dry mass basis but can be rather low on a volume basis. Levels of nitrogen are low in the spring when maximum uptake of ammonium by Spartina is occurring. Supplemented nitrogen increased the yield of Spartina by 15%. Not only is productivity increased by added nitrogen, but the content of nitrogen in the plant is also increased. The addition of supplemented phosphorus had no effect on productivity. The phosphorus supply capacity of the soil is high enough to provide an adequate amount for plant growth. (NOAA)
W77-07319

THE EFFECT OF COLLECTOR DISCHARGE WATER FROM RICE FIELDS ON THE ZOOPLANKTON OF SOME KUBAN ESTUARIES, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
S. E. Panchenko, and E. S. Proskurina.
Gidrobiol Zh 9(3), p 73-78, 1973.

Descriptors: Water pollution effects, *Biomass, DDT, DDE, *Chlorinated hydrocarbon pesticides, DDD, Estuaries, *Zooplankton, *Pesticide residues, Path of Pollutants, Rice, Irrigation, *Copepods, *Crustaceans.
Identifiers: Alona-rectangula, Brachionus-angularis, Calanipeda-aquae-dulcis, Chydorus-sphaericus, Cyclops-strenuus, Daphnia-pulex, Diaphanosoma-brachyrum, Diaptomus-gracilis, Euchlanis-dilatata, Eucyclops-serrulatus, Eurytemora-velox, Keratella-quadrata, *Kuban(USSR), Moina-rectirostris, Roach, USSR, Zander.

The composition and population of 13 spp. of Rotifera, Copepoda and Cladocera (Brachionus angularis, Euchlanis dilatata, Eurytemora velox, Cyclops strenuus, Chydorus sphaericus, Moina rectirostris, Daphnia pulex, Calanipeda aquae-dulcis, Diaphanosoma brachyrum, Alona rectangula, Diatomus gracilis, Eucyclops serrulatus and Keratella quadrata) were studied from March-Sept. in different estuaries of the Kuban River (USSR) to determine the effects of the discharge from intensively irrigated rice fields in the region. Such pesticides as DDT, DDD, DDE, DDVP 2,2 dichlorovinyl dimethyl phosphate, hexachlorocyclohexane, lindane, propanide and Dipterex were used in the fields in large amounts and polluted soil and waters of the estuaries. A comparison of the seasonal dynamics of 3 estuaries showed that in the Sladkii estuary, which served as the control, there was a summer maximum increase in the zooplankton biomass; the role of C. auaedulcis and the total amount of zooplankton decreased in the Karpievskii estuary in the summer where an inflow of discharge water took place; in the Kurchanskii estuary where there were both an inflow from the rice field with pesticides and an outlet to the sea, the composition of the zooplankton was maintained with the saltwater Calanipeda predominating but the overall zooplankton biomass decreased 4-6 times. The Kuban delta region is one of the main natural procedures of valuable commercial fish such as the zander and the Azov roach; the continued disposal of discharge water into the estuaries will lead to a redistribution of dominant species and a decrease in the food base of these fish in this region.--Copyright 1976, Biological Abstracts, Inc.
W77-07331

A STUDY ON STANDING CROPS IN PHRAGMITES COMMUNIS COMMUNITIES AND THEIR ENVIRONMENTAL FACTORS, (IN KOREAN),
Mokpo Teachers' Coll. (South Korea).
C. S. Kim.
Korean J Bot 18(3), p 129-134, 1975.

Descriptors: *Standing crops, *Humus, *Chlorine, Hydrogen ion concentration, Sea water, Tidal water, Estuaries, Environmental effects.
Identifiers: Korea, *Phragmites-Communis, *Reed communities, *Youngsan River estuary(Korea).

The relationship between biomass of reed communities (P. communis) and several environmental factors as Cl, pH, humus content in soil and depth of seawater was studied. One site had 2 plots: H plot, in the shallows, was not submerged except at full tide or from heavy rainfall; M plot, at medium depth, submerged at every common tide. The other site also had 2 plots: M' plot, at medium depth, submerged about 10 h at each tide, and L plot, in deep seawater submerged at every tide at a bank along the east estuary of the Youngsan River (Korea). The maximum standing crop of the reed community occurred on June 25th: biomass at H, M, M' and L plot were, respectively, 4.65, 3.60, 0.98 and 0.67 kg dry weight/m3. Densities at H, M, M' and L plot were 67, 78, 244 and 333 plants/m2. Net production of the terrestrial parts of the reed community on the outside of the bank were as much as a sixth less than that on the inside, but the density on the outside of the bank was 4 or 5 times higher than that on the inside. The growth of reed plants was inhibited by high Cl, high pH, less humus in soil and submergence in seawater for long periods.--Copyright 1976, Biological Abstracts, Inc.
W77-07335

THE RESPONSES OF SOME ESTUARINE ORGANISMS TO SUSPENDED SOLIDS,
Lawler, Matusky and Skelly Engineers, Tappan, N.Y.
For primary bibliographic entry see Field 8D.
W77-07353

EFFECT OF THE ASWAN HIGH DAM ON THE NILE FLOOD AND ON THE ESTUARINE AND COASTAL CIRCULATION PATTERN ALONG THE MEDITERRANEAN EGYPTIAN COAST,
Alexandria Univ. (Egypt). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-07363

DYNAMICS OF O2 AND CO2 EXCHANGE, PHOTOSYNTHESIS, AND RESPIRATION IN RIVERS FROM TIME-DELAYED CORRELATIONS WITH IDEAL SUNLIGHT,
Washington Univ., Seattle. Dept. of Chemistry.
J. M. Schurr, and J. Ruchti.
Limnology and Oceanography, Vol 22, No 2, p 208-225, March 1977. 4 fig, 13 tab, 14 ref.

Descriptors: *Oxygen, *Carbon dioxide, *Rivers, *Model studies, Mathematical models, Dissolved oxygen, Photosynthesis, Photosynthetic oxygen, Gases, Transpiration, Light, Solar radiation, Correlation analysis, Analytical techniques, Hydrogen ion concentration.
Identifiers: *Switzerland.

The oxygen exchange constant, photosynthetic rate, and respiration rate for several Swiss rivers were determined, using only the continuous data record of a single oxygen electrode, the measured temperature, and an assumed ideal light intensity curve in conjunction with a simple model rate equation and a novel cross-correlation computational technique. The method can be extended to determine also total carbonate dynamics from continuous pH measurements. For the Aare at Bern in March 1974, the oxygen exchange constant was 0.38/h, the respiration rate was 0.6 mg/liter/h, and the mean photosynthetic rate was 0.28 mg/liter/h. The exchange rate for dissolved (but not hydrated or ionized) CO2 was 0.91 times that for dissolved oxygen, and the ratio of O2 molecules released to CO2 molecules consumed during photosynthesis was about 1.2. (Sims-ISWS)
W77-07364

FURTHER TRANSITION STATES OF THE BAJA CALIFORNIA UPWELLING ECOSYSTEM,
Brookhaven National Lab., Upton, N.Y. Oceanographic Sciences Div.
J. J. Walsh, T. E. Whitledge, J. C. Kelley, S. A. Huntsman, and R. D. Pillsbury.
Limnology and Oceanography, Vol 22, No 2, p 264-280, March 1977. 11 fig, 3 tab, 37 ref. NSF GB-358804, GX-33502.

Descriptors: *Red tide, *Upwelling, *Phytoplankton, *Crabs, Winds, Circulation, Water circulation, Hydrography, Nutrients, Salinity, Temperature, Water temperature, *Zooplankton, Dinoflagellates, Diatoms, Biomass, Marine biology, Marine plants, Marine microorganisms, Aquatic life, Oceans, Coasts, Oceanography, Pollutant identification.
Identifiers: *Baja California.

Measurements were made of wind, surface circulation, hydrography, nutrients, and phytoplankton and zooplankton rate processes in a time series at 27 N during April 1973. A string of current meters and a towed acoustic body were also used to assess the distribution of subsurface currents and red crabs. The seasonal onset of upwelling had already occurred. Diatoms were initially the dominant primary producers. Two perturbations of the upwelling state were observed in response to relaxation of the winds. A comparison of this study with a preceding one in March 1972 indicated that the rate of upwelling, the nutrient content, and the phytoplankton specific growth rate were about the same in both years. The total productivity and biomass of the phytoplankton were less in 1973, implying that greater grazing stress was associated with a switch from smaller dinoflagellates to larger diatoms. Local temporal variability of upwelling off Baja California is postulated to have led to the replacement of clupeids by the red crab as a facultative herbivore. (Sims-ISWS)
W77-07365

INTERACTION OF TEMPERATURE AND SALINITY ON OXYGEN CONSUMPTION OF THE ESTUARINE CRAB PANOPEUS HERBSTII,
Wake Forest Univ., Winston-Salem, N. C. Dept. of Biology.
R. V. Dimock, Jr., and K. H. Groves.
Marine Biology, Vol 33, 1975, p 301-308, 2 fig, 4 tab, 35 ref.

Descriptors: Environmental effects, Metabolism, *Temperature, *Salinity, *Crabs, *Oxygen, Estuarine environment, Water pollution effects.
Identifiers: Panopeus herbstii, Synergistic effects.

Crabs were acclimated to combinations of 10 and 23 C and 5 and 30% S. Rate of oxygen consumption was measured at 10 and 25 C in salinities of 5, 15, 30, and 40% salinity. Male crabs acclimated to 23 C and 5% S and tested at 25 C had higher rates than females at experimental salinities of 40 and 30% S. No significant differences in oxygen consumption between males and females occurred at other temperature and salinity combinations. An increase in oxygen donsumption upon exposure to low salinity was observed. Adjustments to low temperature following acclimation was also observed but some unpredictable patterns of response were seen. No single hypothesis could be suggested to accout for the temperature and salinity effects on metabolic rate. (Chilton-ORNL)
W77-07375

A CONTRIBUTION TO THE LIFE HISTORY OF THE CUNNER, TAUTOGOLABRUS ADSPERSUS, IN FISHERS ISLAND SOUND, CONNECTICUT,
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
C. B. Dew.

Chesapeake Science, Vol 17, No 2, June 1976, p 101-113, 8 tab, 3 fig, 34 ref.

Descriptors: Environmental effects, *Life history studies, *Seasonal, Growth rates, Spawning, Sexual maturity, Temperature, Behavior, *Connecticut.
Identifiers: *Cunners, Tautogolabrus adspersus, Fishers Island Sound(Conn).

Length-weight relationships and seasonal changes in condition, age and growth, spawning period, age at maturity and sex ratio, and nocturnal and winter habits of the cunner were studied. No significant differences were observed between length-weight relationships for male and female cunners with gonads and stomach contents removed. A general trend of improving condition from spring through fall was seen. Males grew faster than females with maximum readable age for both sexes being five years. Both male and female cunners matured and spawned when one year old. An overall male to female sex ratio of 2.2:1 was found. Cunners remained active until water temperatures dropped to about 8 C and remained dormant until temperatures rose to 6 or 7 C in the spring. Noctiurnal behavior was characterized by assumption of a tactile resting attitude without a camouflage color pattern and a distinct banding resulting in a camouflage effect when in a relatively unprotected position. (Chilton-ORNL)
W77-07377

SUMMER GROWTH DEPRESSION IN THE STRIPED MULLET, MUGIL CEPHALUS L.,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
J. J. Cech, Jr., and D. E. Wohlschlag.
Contributions in Marine Science, Vol 19, 1975, p 91-99, 3 tab, 1 fig, 29 ref.

Descriptors: Environmental effects, *Growth rates, Seasonal, Metabolism, Respiration, Food abundance, *Mullets, *Texas, Coasts.

Growth rates of striped mullet along the south Texas coast were studied as part of an investigation of physiological responses to seasonal temperatures throughout the year. Two periods of slow growth were found to occur, one during the colder late autumn and winter months and another during the summer. Food availability should be maximal during the summer months. The summer growth rate depression coincides with observations of pronounced summer depression of active and routine respiratory rate. This implies unknown summertime changes in food assimilation and in biochemical metabolic pathways. (Chilton-ORNL)
W77-07378

RESPONSE OF THE MARINE ANGIOSPERM PHYLLOSPADIX TORREYI TO CERTAIN ENVIRONMENTAL VARIABLES: A PRELIMINARY STUDY,
California Univ., Davis. Dept. of Botany.
F. R. Drysdale, and M. G. Barbour.
Aquatic Botany, Vol. 1, 1975, p 97-106, 1 fig, 4 tab, 19 ref.

Descriptors: Environmental effects, *Growth rates, *Marine plants, Salinity, Light, Temperature, *Growth rates.
Identifiers: Angiosperms, *Phyllospadix torreyi.

Leaf growth rate of Phyllospadix torreyi was studied under both laboratory and field conditions. It is hypothesized that spring growth rate is greater than measured winter growth rate and that the change is triggered by increasing daily incident light energy. In laboratory cultures, optimum growth occurred in sea water concentrations of 29,000 ppm, 100 1m/sq. ft light intensity for 12-h day, at water temperatures of 12-14 C. Although growth declined at lower salinities, lower light intensities, and higher temperatures, the magnitude of decline indicated a broad tolerance range for these three parameters. (Chilton-ORNL)
W77-07379

THE INFLUENCE OF TEMPERATURE ON SCOPE FOR ACTIVITY IN CUTTHROAT TROUT, SALMO CLARKI,
Utah Cooperative Fishery Unit, Logan.
W. P. Dwyer, and R. H. Kramer.
Transactions of the American Fisheries Society, Vol. 104, No. 3, July 1975, p 552-554, 1 fig, 1 tab, 9 ref.

Descriptors: *Environmental effects, *Metabolism, Oxygen, *Temperature, *Cutthroat trout.
Identifiers: Scope for activity(Fish).

Cutthroat trout 13-16 months old and weighing an average of 90 grams were acclimated at 17 C. Metabolic rate estimates were then made at temperatures of 5, 10, 15, 20, and 25 C. Active metabolism was found to be lowest at 5 C and highest at 15 C. Scope for activity ranged from 316 mg 02/kg-h at 5 C to 486 mg 02/kg-h at 24 C. Standard metabolisms were 47, 73, 111, 129 and 117 mg 02/kg-h at 5, 10, 15, 20, and 24 C, respectively. It was concluded that, all factors being equal, the greater the scope for activity, the greater resistance to fatigue and the higher the probability of survival when the limiting factor is physiologically available oxygen. (Chilton-ORNL)
W77-07380

ATTAINMENT OF THE FINAL THERMAL PREFERENDUM IN BROWN BULLHEADS ACCLIMATED TO DIFFERENT TEMPERATURES,
Yale Univ., New Haven, Conn. John B. Pierce Foundation Lab.
L. I. Crawshaw.
Compilations in Biochemistry and Physiology, Vol. 52A, 1975, p 171-173, 2 fig, 1 tab, 9 ref.

Descriptors: Environmental effects, *Temperature, *Behavior, Fish, Thermocline, *Bullheads.
Identifiers: Acclimation, Temperature selection, Brown bullheads, Thermal preferendum.

Brown bullheads were acclimated at 7, 15, 24, and 32 C. After 10-20 days in the temperature acclimation tanks, the fish were placed in a thermal gradient and allowed free selection of the ambient water temperature. Selected temperature was recorded for one to two days. After 10 hours in the gradient, the mean selected temperature of the fish acclimated to 7 and 15 C was 25 C and the temperatures selected by fish acclimated to 24 and 32 C was between 29 and 31 C. Regardless of the acclimation temperature, brown bullheads eventually selected temperatures of 29-31 C, the probable final thermal preferendum for the species. (Chilton-ORNL)
W77-07381

BACTERIOLOGY OF CHESAPEAKE BAY SURFACE WATERS,
Maryland Univ., College Park. Dept. of Microbiology.
T. M. Cook, and C. K. Goldman.
Chesapeake Science, Vol. 17, No. 1, March 1976, p 40-49, 3 fig, 4 tab, 16 ref. NSF-RANN G. I.-29906.

Descriptors: *Bacteriology, *Chesapeake Bay, Seasonal, Temperature, Bacteria, Surface waters, Populations, Water pollution effects, Monitoring, Water temperature.

Selected bacterial counts were monitored at two sites in Chesapeake Bay. During spring warm-up, rising total viable counts peaked at a water temperature of 19 C on May 30. Hydrogen sulfide producers also reached peak levels at 19 C and remained constant during early spring. The fermenter population reached maximum densities on May 5, V. parahaemolyticus remained undetectable until the water temperature reached 21 C. During autumn cooling, the total viable count of the heterotrophic bacterial population fell only slightly but the population changed in composition. A marked decrease was seen in proportion of sme fermentative organisms, hydrogen sulfide producers, and Vibrio parahaemolyticus while no change was seen in coliform densities. (Chilton-ORNL)
W77-07382

THE INFLUENCE OF TEMPERATURE AND TIME OF YEAR ON THE OXYGEN UPTAKE OF THE SEA MUSSEL MYTILUS EDULIS,
Rijksinstituut voor Visserijonderzoek, Texel (Netherlands). Dept. of Shellfish Culture.
C. G. N. de Vooys.
Marine Biology, Vol. 36, 1976, p 25-30, 3 fig, 23 ref.

Descriptors: Environmental effects, *Respiration, *Temperature, Seasonal, *Mussels, Metabolism, *Oxygen.

Cultivated sea mussels collected from cultivation beds in the western part of the Dutch Wadden Sea were studied under conditions as natural as possible. Phytoplankton density and composition used for feeding were similar to that found in coastal waters. A linear increase in oxygen uptake per unit animal weight from about 3 C to a maximum of 20-22 C was found. At higher temperatures oxygen uptake decreased. When spawning and recovery occurred, oxygen uptake was higher than in the autumn at the same water temperatures. A clearly higher oxygen uptake which was noted in summer compared with that in winter was explained by the avoidance of temperature adaptation and acceleration of gametogenesis in this study. (Chilton-ORNL)
W77-07383

THE EFFECT OF SALINITY AND CYCLIC TEMPERATURE ON LARVAL DEVELOPMENT OF THE MUD-CRAB RHITHROPANOPEUS HARRISII (BRACHYURA: XANTHIDAE) REARED IN THE LABORATORY,
Zoologisk Museum, Oslo (Norway).
M. E. Christiansen, and J. D. Costlow, Jr.
Marine Biology, Vol. 32, 1975, p 215-221, 5 fig, 6 tab, 10 ref.

Descriptors: Environmental effects, *Larval growth stage, *Temperature, *Salinity, Laboratory tests, *Crabs.
Identifiers: Mud-crab, Rhithropanopeus harrisii.

Larvae were reared from hatching to first or second stage in temperature-salinity combinations of 5, 20, and 35 % S at 20 to 25 C, 25 to 30 C, and 30 to 35 C, and 25 % S at 20 to 25 C and 30 to 35 C. All salinity-cyclic temperature combinations resulted in survival to the megalops and first stage crabs except 5 % S at 30 to 35 C. 94% survival to the megalops and 90% survival to the first crab stage occurred in 20% S at 20 to 25 C. All other combinations showed a reduction in survival to the first crab stage. Temperature significantly affected the duration of larval stages. Shortest development time was found in 20% S at 30 to 35 C and the longest time in 5% and 35 % S at 20 to 25 C. High percentages of abnormalities occurred in larvae reared in 35% S at all cycles of temperature with the highest percentage occurring at 30 to 35 C. It was concluded that larval development of $. harrisii is strongly influenced by environmental factors and not solely related to genetic differences. (Chilton-ORNL)
W77-07384

INFLUENCE OF LIGHT AND TEMPERATURE ON THE PHOTOSYNTHETIC RATE OF MARINE BENTHIC DIATOMS,
Groningen Rijksuniversiteit (Netherlands). Dept. of Systematic Botany.
F. Colijn, and G. van Buurt.

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Marine Biology, Vol. 31, 1975, p 209-214, 4 fig, 20 ref.

Descriptors: Environmental effects, *Photosynthesis, *Light, *Temperature, *Diatoms, Aquatic algae, Benthic flora.
Identifiers: Amphiprora alata.

Investigations which are reported include: (1) light saturation of the photosynthetic rate of suspensions at 6 and 12 C; (2) light saturation of the photosynthetic rate of suspensions of cultured Amphiprora alata cells at 12 C; (3) light saturation of the photosynthetic rate of intact bottom samples at 12 C; (4) relation between temperature and photosynthetic rate of mixed sediment samples. Photosynthetic rate of mixed field populations is saturated by light intensity of 10,000 lux. No photoinhibition was found at higher intensities. Cultures of A. alata exhibited strong photoinhibition at intensities of 10,000 to 60,000 lux. Photosynthetic rate was found to increase approximately 10%/degree C in a range of 4 to 20 C. Epipelic and epipsammic species showed no differences in photosynthetic pattern. (Chilton-ORNL)
W77-07385

LIFE HISTORY PATTERNS IN THE COASTAL SHINER, NOTROPIS PETERSONI, FOWLER,
University of South Florida, Tampa. Dept. of Biology.
B. C. Cowell, and C. H. Resico, Jr.

Descriptors: Environmental effects, *Temperature, *Life history studies, Period of growth, *Shiners, *Florida, *North Carolina, Growth rates.

The coastal shiner in central Florida has a protracted breeding season, rapid growth rate, and probably a one-year life cycle. At the northernmost limit of the species in North Carolina, the breeding season is shorter, growth rates are slower, and the duration of the life cycle is approximately three years. In Florida, spawning occurred in March-September, fecundity ranged from 110-694 mature ova/ female. Young-of-the-year from early spring spawning averaged 33.8 mm in length by late June and reached adult size by October. Later spawned young-of-the-year grew at similar rates and all young-of-the-year reached 59.0 mm by December. (Chilton-ORNL)
W77-07386

STUDY ON THE HERBICIDAL PROPERTIES OF BENTHIOCARB; FACTORS AFFECTING HERBICIDAL ACTIVITY AND ITS BEHAVIOR IN SOIL, (IN JAPANESE),
Utsunomiya Univ. (Japan). Coll. of Agriculture.
For primary bibliographic entry see Field 5B.
W77-07387

BREEDING BIOLOGY OF A NON-DIADROMOUS GALAXIID, GALAXIAS VULGARIS STOKELL, IN A NEW ZEALAND RIVER,
Canterbury Univ., Christchurch (New Zealand). Dept. of Zoology.
P. L. Cadwallader.
Journal of Fish Biology, Vol 8, 1976, p 157-177, 10 tab, 5 fig, 42 ref.

Descriptors: *Reproduction, Environmental effects, Temperature, *Spawning, Fish, Life history studies, Sexual maturity, Eggs, Growth rates, Fecundity.
Identifiers: *New Zealand, Galaxias vulgaris, *Galaxid.

Onset of spawning in Galaxias vulgaris appeared to be temperature-dependent. No females were found to mature in the first year but 95 to 68% of age 0 plus males were mature in consecutive years. Age 0 plus males probably play an important role in adverse conditions by significantly increasing the proportion of ripe males and ensuring fertilization of all eggs. No evidence of pair formation for the purpose of spawning was found, but spawning seemed to be communal to some extent. In mature fish, ovaries represented 23% and testes 11% of somatic weight. Size appeared to determine maturity in males and age appeared to be the determining factor in females. Egg numbers ranged from 284 to 1911 per fish with weight being the best indicator of fecundity. (Chilton-ORNL)
W77-07389

QUALITATIVE AND QUANTITATIVE STUDIES ON THE MEIOFAUNA OF A TROPICAL FRESH WATER STREAM SUBJECT TO TIDAL INFLUENCE, (IN ITALIAN),
Andhra Univ., Waltair (India). Dept. of Zoology.
A. L. N. Sarma, C. G. Swamy, K. V. R. Murthy, and K. V. Rao.
Riv Idrobiol 13(2), p 249-260, 1974.

Descriptors: Ecology, Streams, Tropic, *Bioindicators, *Organic matter, Water pollution, Tides, Brackish water, Estuaries, Aquatic life, *Diptera, *Nematodes, *Oligochaetes.

An ecological study of the meiofauna in a tropical freshwater stream showed that the organic material at certain locations contributes to the enrichment of the environment and animal life. Oligochetes, menatodes and chironomids are abundant in polluted waters and the presence of these forms of life is an indicator of the quality of the environment. The maximum density of living organisms was found at 0-5 cm depth. The numerical density of the fauna compares favorably with that ob frackish waters and of estuary systems. Coarse and sharp sand is inadequate for a prolific development of a faunistic societies. Fine or medium sand, covered with a coating of organic matter, on the other hand, supports a rich growth of life.--Copyright 1977, Biological Abstracts, Inc.
W77-07390

STUDIES ON THE EFFECT OF TEMPERATURE ON THE EGG LAYING OF THREE SPECIES OF CALANOID COPEPODS IN THE LABORATORY (ACARTIA TONSA, TEMORA LONGICORNIS, AND PSEUDOCALANUS ELONGATUS),
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
C. J. Corkett, and F. J. Zillioux.
Bulletin of Plankton Society of Japan, Vol 21, No 2, 1975, p 13-21, 1 fig, 2 tab, 22 ref.

Descriptors: Environmental effects, *Reproduction, *Temperature, *Copepods, Laboratory tests, Eggs, Hatching.
Identifiers: Acartia tonsa, Temora longicornis, Pseudocalanus elongatus.

Of the species studied, Acartia tonsa and Temora longicornis lay single eggs while Pseudocalanus elongatus is a sac-carrying copepod. Temperature was not found to significantly affect the number of eggs in a sac but the sac size (and therefore the number of eggs) appeared to be determined by the size of the female. The average number of eggs produced per female per day by T. longicornis and P. elogatus increased with increasing temperature. It was concluded that sac-carrying copepods are limited in their egg production rate because a new sac cannot be laid until the old one hatches. (Chilton-ORNL)
W77-07391

LIFE HISTORY NOTES FOR A POPULATION OF SLIMY SCULPIN (COTTUS COGNATUS) IN AN ALASKAN ARCTIC STREAM,
Aquatic Environments Ltd., Calgary (Alberta).
P. C. Craig, and J. Wells.
Journal of the Fisheries Research Board of Canada, Vol 33, 1976, p 1639-1642, 2 fig, 2 tab, 12 ref.

Descriptors: *Life history studies, Environmental effects, Temperature, Seasonal, Growth rates, Sexual maturity, Eggs, Spawning, *Sculpins, *Alaska, *Arctic.

Growth, maturity, fecundity, and food habits are described of slimy sculpin in the headwaters of the Chandalar River and the data are compared to accounts of the populations in southern latitudes. Growth was slower in the Chandalar population with the maximum age of 7 year fish seldom exceeding 100 mm in length. Sexual maturity for both sexes was reached at age 3-4 as opposed to age 1-2 for Montreal River populations. The Chandalar fecundity count for females ranging in length from 68-99 mm was 206 eggs with a standard deviation of 66.2. No significant difference was noted in sex ratio. Spawning season was in late May shortly after spring breakup. Chandalar sculpins fed almost exclusively on larvae of stream-dwelling insects. (Chilton-ORNL)
W77-07393

AQUATIC ORGANISM CONTAMINATION BY MERCURY RESIDUES IN THE COATZACOALCOS RIVER ESTUARY, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto Nacional de Energia Nuclear.
A. P. Baez, R. de Nulman, I. Rosas, and L. C. Galvez.
In: Trace Contaminants of Agriculture, Fisheries and Food in Developing Countries, Internation Atomic Energy Agency, 1976 p 73-79, 5 tab, 8 ref.

Descriptors: *Environmental effects, *Water pollution effects, Industrial wastes, *Mercury, Aquatic animals, Vegetation, Estuaries, *Mexico, Marine animals.
Identifiers: *Coatzoalcos River estuary(Mex).

Mercury residues in the biotic and abiotic elements of the estuary were measured over a two-year period. Highest levels were found in sediments and benthonic organisms. From observations of the Hg levels in the stomach contents, it was concluded that the feeding habits are responsible for the ingestion and accumulation of this metal in the tissues. In vegetation, the highest Hg levels were found in plants growing on the banks of a creek which is the primary receptor of liquid wastes from a chlor-alkali factory. (Chilton-ORNL)
W77-07394

ACCUMULATION AND DISTRIBUTION OF TRACE METALS AND RADIONUCLIDES IN MARINE ORGANISMS (PARTICULARLY TAPES DECUSSATUS L.) IN THE IZMIR BAY AREA, TURKEY,
Aegean Univ., Bornova (Turkey). Marine Biological Lab.; and Aegean Univ., Bornova (Turkey). Dept. of General Zoology.
R. Geldiay, and H. Uysal.
In: Trace Contaminants of Agriculture, Fisheries and Food in Developing Countries, Internation International Atomic Energy Agency, 1976 p 81-85, 2 tab, 1 fig, 9 ref.

Descriptors: *Environmental effects, Absorption, Distribution, *Trace elements, *Radioisotopes, Marine animals, *Metals, Bays, Cadmium, Water pollution effects.
Identifiers: *Tapes decussatus, *Turkey, *Izmir Bay(Turkey).

Concentrations of trace metals in Tapes decussatus were determined in relation to polluted and nonpolluted waters. Cadmium concentrations were higher than the other elements. Concentrations of trace elements were higher in digestive glands, mantle and siphon, gills and palps. Uptake occurred through direct contact with the environment and through the digestive gland. The speed of radioactive uptake increased very slowly after a definite level and the loss occurred slowly after a definite level. (Chilton-ORNL)
W77-07395

DEVELOPMENT OF EGGS AND EMBRYOS OF THE SURF CLAM, SPISULA SOLIDISSIMA, IN SYNTHETIC SEAWATER,
National Marine Fisheries Service, Milford, Conn. Middle Atlantic Coastal Fisheries Center; and National Marine Fisheries Service, Milford, Conn. Milford Lab.
W. D. Cable, and W. S. Landers.
Fishery Bulletin, Vol. 72, No. 1, p 247-249, 8 ref.

Descriptors: Environmental effects, *Growth stages, Embryonic growth stage, *Clams, Salinity, Temperature, Mortality.
Identifiers: Surf clams, Spisula solidissima.

Observations on the development of eggs and embryos were made in salinities of 25 and 30% at 10, 15, and 20 C. Temperatures of 20 C were the optimum for development. This temperature allowed eggs to be reared to the 5-day-old stage with almost 100% survival and no signs of larval abnormality. (Chilton-ORNL)
W77-07396

COMPARATIVE ECOPHYSIOLOGY OF GAMMARIDS (CRUSTACEA: AMPHIPODA) FROM MARINE, BRACKISH AND FRESH-WATER HABITATS, EXPOSED TO THE INFLUENCE OF SALINITY-TEMPERATURE COMBINATIONS. I. EFFECT ON SURVIVAL,
Amsterdam Univ., Netherlands, Dept. of Experimental Biology.
J. Dorgelo.
Hydrobiological Bulletin Netherlands, Vol. 8, No. 1 and 2, 1974, p 90-108, 4 tab, 4 fig, 110 ref.

Descriptors: *Environmental effects, *Temperature, *Salinity, *Crustaceans, Freshwater, Brackish water, Sea water, Mortality.
Identifiers: *Gammarids, Synergistic effects.

Survival of mature males of three gammarids from different salinity regimes, ranging from marine to limnetic conditions, was established to analyze the primary as well as the interaction effect of salinity and temperature. Salt tolerance is neither favored nor inhibited by temperature interaction in the natural salinity ranges of the species. Increasing temperature influenced survival negatively in all species. C. tigrinus was most susceptible in spring to both salinity and temperature. (Chilton-ORNL)
W77-07397

PRIMARY PRODUCTION AND BIOMASS OF ALGAE POPULATIONS IN AN OLIGOTROPHIC LAKE IN THE FRENCH MASSIF CENTRAL, (IN FRENCH),
J. Devaux, and N. Lair.
Hydrobiologia 50(3), p 209-220, 1976.

Descriptors: *Primary productivity, *Biomass, *Algae, *Oligotrophy, Lakes, Biota, Chlorophyll, Carbon, Standing crops.
Identifiers: *France(Massif-Central).

Phytoplanktonic populations were studied in Tazenat lake by 3 methods: primary production using 14C, standing crop estimation and measuring the amount of chlorophyll a. A comparison of the results obtained gives an insight into the utilization and transformation of energy by the biota of the lake.--Copyright 1977, Biological Abstracts, Inc.
W77-07398

OXYGEN CONSUMPTION, VENTILATORY FREQUENCY AND HEART RATE OF LAMPREYS (LAMPETRA FLUVIATILIS) DURING THEIR SPAWNING RUN,
Bath Univ. (England). School of Biological Sciences.
P. N. Claridge, and I. C. Potter.
Journal of Experimental Biology, Vol. 63, 1975, p 193-206, 8 fig, 28 ref.

Descriptors: Environmental effects, Respiration, Metabolism, *Oxygen requirements, *Lampreys, *Spawning.

Studies were conducted during the light phase of the photoperiod and at times which corresponded to various stages in upstream migration. Although all three parameters increased during the spawning run, significant differences between sexes were noted only in mature individuals. Regression coefficients for the logarithmic relationship between oxygen consumption and body weight of immature animals were 0.912 at 9.5 C and 0.925 at 16 C. Standard rate of oxygen comsumption and amount of oxygen taken up increased during hours of darkness. Oxygen consumption, ventilatory frequency and, to a lesser extent, heart rate, increased significantly at 9.5 C over the 100-20% range of saturation with air. Below 20% saturation with air, animals did not remain attached by their oral disc for prolonged periods and the ventilatory frequency rose to a maximum of 175 beats/min at 12.5%. Death occurred within 5-8 h after exposure to 7.5%. (Chilton-ORNL)
W77-07399

HEMATOLOGY OF JUVENILE STRIPED BASS, MORONE SAXATILIS (WALBAUM), ACCLIMATED TO DIFFERENT ENVIRONMENTAL CONDITIONS,
California State Dept. of Fish and Game, Rancho Cordova. Water Pollution Control Lab.
L. A. Courtois.
Compilations in Biochemistry and Physiology, Vol. 53A, 1976, p 1-3, 1 tab, 16 ref.

Descriptors: Environmental effects, *Temperature, *Salinity, *Stripped bass.
Identifiers: *Hematology, *Dechlorinated water.

Stripped bass were subdivided into four different groups with each being acclimated to temperature-salinity combinations as follows: (A) Warm Fresh water-dechlorinated city water, temperature 17.5 C plus or minus 0.5 C; (B) Cold fresh water-dechlorinated city water, temperature 10.8 C plus or minus 0.3 C; (C) Warm sea water-bay sea water (30ppt), temperature 17.5 C plus or minus 0.5C; (D) Cold sea water-bay sea water (30 ppt), temperature 10.5 C plus or minus 0.5 C. Results indicated salt water acclimated fish had lower blood parameters serum K and higher serum Na levels than fresh water acclimated fish at similar temperatures. Increased temperature appeared to cause reverse effects in fresh- and salt water-acclimated fish. (Chilton-ORNL)
W77-07400

RESPIRATORY RESPONSES OF GILLICHTHYS MIRABILIS TO CHANGES IN TEMPERATURE, DISSOLVED OXYGEN AND SALINITY,
California State Dept. of Fish and Game, Rancho Cordova. Water Pollution Control Lab.
L. A. Courtois.
Compilations in Biochemistry and Physiology, Vol. 53A, 1976, p 7-10, 5 fig, 21 ref.

Descriptors: Environmental effects, *Respiration, Oxygen, *Temperature, *Salinity, Fish, *Dissolved oxygen.
Identifiers: *Gillichthys mirabilis.

G. mirabilis acclimated to temperature of 28.6C displayed an increased rate of respiration compared to fish acclimated to a temperature of 11.0 C. Fish acclimated to intermediate temperatures displayed intermediate respiration rates. Decreasingly available ambient oxygen resulted in a diminished respiration. Changes in salinity did not appear to modify respiratory rates for the species. (Chilton-ORNL)
W77-07401

A BIBLIOGRAPHY OF SOVIET LITERATURE ON FRESHWATER HYDROBIOLOGY AND RELATED PROBLEMS FOR 1975: PART 21, (IN RUSSIAN),
Y. Y. Tseeb.
Gidrobiol Zh 12(3), p 111-123, 1976.

Descriptors: *Bibliographies, *Hydrobiology, Water chemistry, Toxicity, Invertebrates, Microbiology, Parasitology, Surface water, Public health, Water pollution.

Over 300 recent Soviet publications are listed under the following headings: freshwater hydrobiology, sanitation hydrobiology, water toxicology, invertebrate physiology, aquatic microbiology, surface water hydrochemistry and freshwater invertebrate parasitology. Articles from the GIDROBIOLOGICHESKII ZHURNAL (HYDROBIOLOGICAL JOURNAL) are not included.--Copyright 1977, Biological Abstracts, Inc.
W77-07402

SEASONAL CHANGES IN HEMATOLOGY OF RAINBOW TROUT, SALMO GAIRDNERI,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
J. E. Denton, and M. K. Yousef.
Compilations in Biochemistry and Physiology, Vol. 51A, 1975, p 151-153, 1 tab, 15 ref.

Descriptors: Environmental effects, *Seasonal, *Temperature, *Rainbow trout, Water temperature.
Identifiers: *Hematology, Hematocrit, *Hemoglobin, Serum protein, Mean cell volume, Mean cell hemoglobin, Mean cell hemoglobin concentration, Blood cells.

Five to seven trout varying in age from 11 to 14 months were captured each month from March 1972 to January 1973. In spite of the fact that water temperatures remained constant at 11-13 C, seasonal changes were observed in hemoglobin, hematocrit, serum protein, mean cell volume, mean cell hemoglobin, and mean cell hemoglobin concentration. Diet, metabolic adaptations and activity were suggested as probable causes of these changes and it was concluded that water temperature did not appear to be responsible for variations in hematology in rainbow trout. (Chilton-ORNL)
W77-07403

CULTURE STUDIES ON EUCHEUMA NUDUM J. AGARDH, A CARRAGEENAN PRODUCING RED ALGA FROM FLORIDA,
University of South Florida, Tampa. Dept. of Biology.
C. J. Dawes, J. W. LaClaire, and R. E. Moon.
Aquaculture, Vol. 7, 1976, p 1-9, 4 tab, 1 fig, 17 ref. NOAA Office of Sea Grant No. 04-3-158-45.

Descriptors: Environmental effects, *Laboratory tests, Cultures, *Algae, *Light, *Temperature, *Nutrients, Nitrates, *Growth rates, *Florida, *Rodophyta.
Identifiers: Synergistic effects, Carrageenan, Eucheuma nudun J. Agardh.

Optimum growth conditions for Eucheuma nudum J. Agardh were studied in the laboratory. Plant responses to light, temperature and nutrient levels were monitored. The algae was found to develop high photosynthetic rates when exposed to a combination of moderate temperatures (20-24 C) and light levels (300-600 ft-candles) and to nitrate concentrations of 10-100 times those found under natural conditions. It appeared that synergistic effects exist between various levels of light and temperature and that these factors should be considered in combination. Increased nitrate levels significantly influenced photosynthetic response. (Chilton-ORNL)
W77-07404

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MORBIDITY AND MORTALITY OF MARINE MAMMALS,
Alaska Univ., College. Inst. of Artic Biology; and Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-07405

TROPHIC RELATIONSHIPS AMONG ICE INHABITING PHOCID SEALS,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-07407

THE DISTRIBUTION, ABUNDANCE, DIVERSITY AND PRODUCTIVITY OF THE WESTERN BEAUFORT SEA BENTHOS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 6G.
W77-07410

A DESCRIPTION AND NUMERICAL ANALYSIS OF THE FACTORS AFFECTING THE PROCESSES OF PRODUCTION IN THE GULF OF ALASKA,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6G.
W77-07411

ZOOPLANKTON AND MICRONEKTON STUDIES IN THE BERING - CHUKCHI/BEAUFORT SEAS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-07412

PHYTOPLANKTON STUDIES IN THE BERING SEA,
Alaska UUniv., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-07413

BEAUFORT SEA PLANKTON STUDIES,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 6G.
W77-07414

CARBON DIOXIDE AND OXYGEN-NITROGEN RATIOS AS FACTORS AFFECTING SALMON SURVIVAL IN AIR-SUPER-SATURATED WATER,
Corvallis Environmental Research Lab., Oreg. Western Fish Toxicology Station.
A. V. Nebeker, G. R. Bouck, and D. G. Stevens.
Transactions of the American Fisheries Society, Vol. 105 (1976), p. 425-429, 2 tab., 1 fig., 14 ref.

Descriptors: *Sockeye salmon, Juvenile fish, *Mortality, Bioassay, Laboratory test, *Supersaturation, *Atmospheric gases, *Oxygen, *Nitrogen, Carbon dioxide, *Fish disease, Fish physiology, Methodology.
Identifiers: Juvenile sockeye salmon, *Oxygen-nitrogen ratios, *Gas bubble disease, Percent saturation.

Juvenile sockeye salmon (Oncorhynchus nerka) were exposed to lethal levels of air-supersaturated water (120 percent, 125 percent, 130 percent total gas saturation) containing different oxygen-nitrogen ratios and different carbon dioxide concentrations. Fish mortality was not signigicantly different at different carbon dioxide levels (1.7 to 22.0 mg/liter C02) when tested at the same total gas saturation concentrations. Total gas saturation levels are much more important than the 02/N2 ratios, as fish mortality will not occur unless total gas saturation exceeds 100 percent, regardless of the 02/N2 ratios. There was a significant decrease in mortality when the ratio of oxygen to nitrogen was increased while holding the total percent saturation constant. Much more extensive and severe signs of gas bubble disease developed at high 02/N2 ratios than at low 02/N2 ratios, indicating that oxygen plays a significant part in forming external emphysema and lesions. (Katz)
W77-07415

EXPERIMENTS ON THE RESISTANCE OF FISH TO RAPID INCREASE IN HYDROSTATIC PRESSURE,
Freiburg Univ. (West Germany). Limnologisches Institut.
W. Lampert.
Journal of Fish Biology, Vol. 8, (1976), p. 381-383, 2 tab., 2 ref.

Descriptors: *Hydroelectric power, Hydrostatic pressure, Freshwater fish, *Reservoirs, Methodology, Juvenile fish, Perches, Laboratory tests, Carp, Rainbow trout, *Bioassays, *Fish physiology.
Identifiers: West Germany, *Hydrostatic pressure increase, *Swim bladders, Grayling, Roach.

In a few hydro-electric pumping stations in the southern Black Forest it has been found that fish occurring in the high lying reservoirs could only arrive there from the river below after an upward transport through the pumping system. As there is a height difference of 400 m to overcome, the fish must withstand a sudden pressure change of 40 atm. To test whether this is actually possible various species of fish were subjected suddenly to a pressure of 50 atm which was then reduced to 1 atm over a period of 10 min. No mortality occurred. Although the pressure shock symptoms exhibited by the different species of fish were variable, all appeared to be perfectly normal 2 h after the experiment. (Katz)
W77-07416

SWIM BLADDER GAS PRESSURE OF COD IN RELATION TO HYDROSTATIC PRESSURE,
Institute of Marine Research, Bergen (Norway).
G. Sandnes, and T. Gytre.
Journal du Conseil, Vol. 134(3), October, 1972, p. 527-532, 2 fig., 8 ref.

Descriptors: *Cod, *Marine fish, *Hydrostatic pressure, *Fish physiology, *Fish behavior, Laboratory tests, Methodology, *Gases, Saturation, Laboratory animals.
Identifiers: Gadus morhua(L.), *Swimbladder, *Swimbladder gas pressure, *Negative pressure.

Buoyant fish near the surface did not show any swim bladder pressure different from the surroundings. At depths of 40 cm buoyant fish from the upper 20 cm of the open aquaria showed negative gas pressure from the surroundin. Under experimental conditions fish were able to maintain a negative pressure in the swimbladder gas in relation to the surrounding hydrostatic pressure. (Katz)
W77-07417

MINERALIZING MICROBIAL ACTIVITY IN LAKE FARO,
Messina Univ. (Italy). Instituto di Idrobiologia.
S. Genovese, and V. Bruni.
Boll Pesca Piscic Idrobiol 30(1), p 39-56, 1975.

Descriptors: Lakes, +Microbiology, *Mineralogy, Nutrients, Lake sediments, Brackish water, *Hydrogen sulfide, *Sulfides, Salts, Cycling nutrients.
Identifiers: *Lake Faro(Italy).

Continuing studies have been carried out in Lake Faro (Italy) on microbial mineralizing activity and on nutrient salt content. The results of new physico-chemical and microbiological observations on water and sediment samples are reported. The intense microbial activity in the brackish-wate environment causes a strong trophism. There is also a significant contribution of allochthonous material. The presence of H2S in Lake Faro determines a complex of specific, biochemical activities in the S cycle.--Copyright 1977, Biological Abstracts, Inc.
W77-07418

COLLECTION OF JUVENILE SALMONIDS FROM TURBINE INTAKE GATEWELLS OF MAJOR DAMS IN THE COLUMBIA RIVER SYSTEM,
Bureau of Commercial Fisheries, Seattle, Wash.
W. W. Bentley, and H. L. Raymond.
Transactions of the American Fisheries Society, Vol. 97 (1968), p. 124-126, 1 tab., 2 fig., 1 ref.

Descriptors: *Columbia River, *Dams, Dam sites, *Anadromous fish, Chinook salmon, Juvenile fish, *Fish migration, *Fish behavior, On-site investigations, Fish population, *Turbines, *Mortality.
Identifiers: Ice Harbor Dam, *Snake River, *Juvenile salmonids, *Turbine intake gatewells, Migration timing, Seaward migration.

Turbine intake gatewells at Ice Harbor Dam on the Snake River were evaluated for their utility as collection areas of juvenile salmonids. The investigation took place from 1964 through 1966; results indicated that gatewell collecting is economical and efficient. One 3-man crew, in 1964, did the sampling; depending on water flow, the collections represented 2 to 6% of the total population. The sampling rate in the gatewells will enable a high degree of confidence to be placed on measurements of timing, migration rates, survival, and relative mgnitude of the seaward migrations. (Katz)
W77-07419

THE RESPONSE OF FISH BLOOD CELLS, PARTICULARLY THROMBOCYTES, TO DECOMPRESSION,
Washington Univ., Seattle. Fisheries Research Inst.
E. Casillas, L. S. Smith, and B. G. D'Aoust.
Undersea Biomedical Research, Vol. 3(3), September 1976, p. 273-281, 5 tab., 18 ref.

Descriptors: *Chinook salmon, *Fish physiology, *Fish behavior, Laboratory tests, Laboratory animals, *Hydrostatic pressure, Bioassay, Mortality, *Pressure, Depth, Gases.
Identifiers: *Fish blood cells, *Thrombocytes, *Decompression, Hyperbaric chamber, *Lethal decompression, Non-lethal decompression, *Gas solubility, Blood coagulation, Erythrocytes, Leucocytes.

The effects of decompression on various blood-cell types in chinook salmon (Oncorhynchus tshawytscha) were investigated using a 4-liter hyperbaric chamber. Thrombocytes (platelets) were found to decrease significantly in numbers following lethal and nonlethal decompressions. The response was highly dependent on depth, gas solubility, and rate of decompression, whereby increasing depth or gas solubility caused greater and faster declines of thrombocyte levels. Return of thrombocyte numbers to normal values usually occurred within 48 hours, except after the more severe decompressions where recovery was never fully attained during the sampling period. Erythrocyte levels increased significantly 1 day after a severe decompression, suggesting hemoconcentration. Leucocytes appeared not to respond to decompression; they were not decreased compared to normal levels although they were significantly decreased compared to levels of the chamber controls in the nonpressurized chamber. (Katz)
W77-07420

THE EFFECTS OF HIGH VACUUM ON FISH,
Arkansas Game and Fish Commission, Lonoke.
J. Hogan.

Transactions of the American Fisheries Society, Vol. 70, 1941, p. 469-474.

Descriptors: *Freshwater fish, *Mortality, *Fishkill, Arkansas, Bass, Warm water fish, *Laboratory tests, *Floodways, *Siphons, Fish physiology, Methodology, Bioassays.
Identifiers: *St. Francis River(Ark), *Negative pressure, *High vacuum, *Bluegill sunfish.

A set of three large siphon tubes has been installed on the lower St. Francis River in Arkansas, which pass the normal flow of the river. They operate with a negative pressure equivalent to from 18 to 26 inches of mercury. Experiments with fish held under negative pressure in aquaria for the length of time required to pass through the tubes have been conducted and some species of fish show serious injury. Those that are physostomous are more able to make the sudden change or adjustment in the swim bladder necessary when passing through the tubes, while physoclistous fish are unable to make the sudden adjustment and suffer hemorrhage in the circulatory system and many die. There is need for close cooperation between engineers and fishery administrators in designing and constructing devices that are apt to affect fish life in public waters. (Katz)
W77-07421

A NITROGEN GAS (N2) MODEL FOR THE LOWER COLUMBIA RIVER, FINAL REPORT,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W77-07422

DISSOLVED GAS SURVEY, PACIFIC NORTHWEST REGION.
Bureau of Reclamation, Boise, Idaho. Regional Soil and Water Lab.
December, 1973. 26 p, 36 tab. 3 fig.

Descriptors: *Dissolved oxygen, Nitrogen, *Supersaturation, *Columbia River, *Pacific Northwest, U.S., Oregon, Washington, Idaho, On-site investigations, On-site data collection, Methodology, Dams, Dam sites, Water quality, *Water quality standards, Monitoring.
Identifiers: *Nitrogen supersaturation.

The Bureau of Reclamation conducted nitrogen gas surveys of all the Bureau dams in the Pacific Northwest. A mobile laboratory was used. Only four locations were found where the dissolved nitrogen content was above the usual state standards of 110%. Mason dam waters in Eastern Oregon were 120% saturation near the dam. Most of the excess was dissipated within two miles below the dam. Dissolved oxygen varied between 89 and 112 percent saturation. (Katz)
W77-07423

EFFECTS OF PRESSURE ON SURVIVAL OF SIX SPECIES OF FISH,
Maine Dept. of Inland Fisheries and Game, Augusta.
R. E. Foye, and M. Scott.
Transactions of the American Fisheries Society, Vol. 94 (1965), p. 88-91.

Descriptors: *Hydroelectric power, *Perch, *Lake trout, *Atlantic salmon, Laboratory tests, Bioassay, Mortality, *Hydrostatic pressure, *Maine, *Fish physiology, *Fish behavior, Pumping plants.
Identifiers: Kennebec River(Maine), Wyman River(Maine).

A study was made to determine the effects of pressures likely to be encountered in a pumping station in Maine. Experiments were conducted with chain pickerel, yellow perch, fall fish, common shiner, lake trout and Atlantic salmon. Test fish exhibited extreme and erratic violent swimming activity for the first few seconds after exposure to a pressure of 300 psi. Salmon, lake trout and fall fish experienced no mortality during the 7-day period after exposure. Sixty percent of yellow perch died after 7 days. (Katz)
W77-07424

SUPERSATURATION OF TOTAL DISSOLVED GASES: A REVIEW OF CURRENT LITERATURE,
Idaho Dept. of Environmental and Community Services, Boise.
E. Ralston, E. Quan, R. Pine, and R. Rulifson.
October, 1974, 4 p., 17 ref.

Descriptors: *Supersaturation, *Reviews, *Atmospheric gas, *Fish diseases, Research and development, Standards, Oregon, Washington, Idaho, Bibliographies, *Columbia River, Mortalities, *Salmon, Juvenile fish, Fish behavior.
Identifiers: *Gas bubble disease, *Juvenile steelhead, Juvenile chinook.

A brief review is presented of the more recent and the current research concerned with the biological effects of total dissolved gas supersaturation on Columbia River salmon. The purpose is to provide an informational base for coordinated implementation of the dissolved gas standards of the States of Oregon, Washington and Idaho. (Katz)
W77-07425

EFFECTS OF DAMS ON PACIFIC SALMON AND STEELHEAD TROUT,
National Marine Fisheries Service, Seattle, Wash.
G. B. Collins.
Marine Fisheries Review, Vol. 38(11), November, 1976, p. 39-46, 20 fig.

Descriptors: *Columbia River, *Chinook salmon, *Fish migration, *Fish passage, Fish behavior, Rainbow trout, Fish diseases, *Supersaturation, *Spillways, Water temperature, Research and development, Laboratory tests, On-site investigations, Juvenile fish.
Identifiers: *Snake River, *Gas bubble disease, *Columbia River Basin, *Steelhead trout, *Fishway, *Fish ladders, Fish tracking, Traveling screen, Fish transport, Pacific salmon.

The problems to salmon and steelhead trout utilizing the Columbia and Snake Rivers are described. Methods to solve these problems are suggested. Problems include the upstream passage of adult fish at dams; the downstream passage of juvenile fish; the changing environment caused by dams, gas bubble diseases due to supersaturated atmospheric gases. Engineering structures and fish transport facilities that move the juvenile salmon past the dam hazards are described. Research programs and facilities are discussed. (Katz)
W77-07426

SECOND STATUS REPORT ON ANADROMOUS FISH RUNS OF THE COLUMBIA RIVER,
Oregon Fish Commission, Portland.
C. O. Junge, and J. B. Haas.
Pacific Northwest River Basins Commission, Vancouver, Washington, May 1974, 24 p., 2 fig., 3 tab.

Descriptors: *Columbia River, *Chinook salmon, *Salmon, Rainbow trout, *Dams, *Fish migration, *Fish passage, *Shad, Sport fishing, *Hydroelectric power, Water quality, *Supersaturation, Fish diseases, Mortality, Sockeye salmon.
Identifiers: Spring chinook salmon, Fall chinook salmon, Summer steelhead coho salmon.

The status of the various runs of salmon and shad in the Columbia River is reported. The problems affecting the sports and commercial species on the river include fish passage problems, and the impact of power peaking. Progress is being made to compensate for fish and habitat loss. Supersaturation of atmospheric gases (nitrogen) is responsible for significant mortalities. The removal of water for irrigation and industrial use and the determination of water quality affects the fishery. Recommendations are presented. (Katz)
W77-07427

EFFECT OF SILT AND SALINITY ON THE MORTALITY OF MERETRIX LUSORIA (ROEDING), (IN KOREAN),
Pusan National Univ. (Republic of Korea).
S. D. Chang, P. Chin, and B. O. Sung.
Bull Korean Fish Soc 9(1), p 69-73, 1976.

Descriptors: *Silts, *Salinity, *Mortality, Sands, Oxygen, *Clams, Sediments, Clays, Soils, Water pollution.
Identifiers: Meretrix-lusoria.

Mortality of the clam M. lusoria was measured in experimental cultures under different sediment compositions and different salinities. Mortality was significant in silt and clay and low in sand and sand-silt. In groups cultured in silt and clay, young of 2.5 cm shell length were subject to early and high mortality (85% in 41 days). The larger the shell size the later and lower the mortality. Mortalities of groups maintained in silt and clay differed under different salinities. Survival rate in sea water of low salinity was higher than that in the high salinity water. O2 consumption of isolated gill tissue was little different in groups maintained in silt and clay and those in sand (the control-group). Mortality resulted mainly from the deposition of silt and clay, although the survival rate of M. lusoria depended on water temperature, salinity, dissolved O2, body size and other factors.--Copyright 1977, Biological Abstracts, Inc.
W77-07428

GAS BUBBLE DISEASE MORTALITY OF ATLANTIC MENHADEN AT PILGRIM NUCLEAR POWER STATION, APRIL, 1975,
Yankee Atomic Electric Co., Westborough, Mass. Environmental Engineering Dept.
R. A. Marcello, Jr.
Report prepared for Boston Edison Co., Boston, Massachusetts. Publish in: Marine Ecology Studies Related to Operation of Pilgrim Station, Semi-Annual Report 6, Vol. 2(6), 1975, 18 p., 3 fig, 1 tab., 11 ref.

Descriptors: Fishkill, *Mortality, *Thermal power, *Nuclear powerplants, Nuclear energy, Industrial wastes, Water temperature, *Thermal pollution, Fish disease, Supersaturation, Fish behavior, Marine fish, *Atlantic menhaden, On-site investigations.
Identifiers: *Gas bubble disease, Discharge channel, Thermal plume, Pilgrim Nuclear Power Station, Dissolved gases, *Discharge barrier net, Acoustic dispersion.

A mortality of Atlantic menhaden occurred in the discharge channel and thermal plume of the Pilgrim Nuclear Power Station Unit 1. Gas bubble disease was identified as the cause of this mortality. In April 1975, an additional mortality was observed in the discharge channel at Pilgrim Station. The events that transpired during the April 1975 episode are given. Data on dissolved oxygen saturation levels, fish behavior, mortality estimates, fish diversion attempts, were presented. (Katz)
W77-07429

EFFECT OF METHOD OF INTRODUCING WELL WATER ON THE GROWTH, BODY CHEMISTRY AND INCIDENCE OF EYE ABNORMALITIES OF JUVENILE BROWN AND RAINBOW TROUT,
Bureau of Sport Fisheries and Wildlife, Cortland, N. Y.
H. A. Poston, D. L. Livingston, and D. G. Hedrick.
The Progressive Fish Culturist, Vol. 35(4), October 1973, p. 187-190, 7 fig, 2 tab.

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Descriptors: *Rainbow trout, *Fish diseases, *Fish hatcheries, *Brown trout, Growth rates, Water supply, Wells, Laboratory, *Supersaturation, *Flow rate, *Nitrogen, Mortality, Juvenile fish, Water.
Identifiers: *Eye abnormalities, Popeye, Tissue fat, *Nitrogen supersaturation, *Gas bubble disease.

Rainbow and brown trout fingerlings held in water dispensed through metal, single-aperture flow regulators were larger, showed better food conversion, and had fewer eye abnormalities than those held in water from multiperforated PVC pipe. The brown trout, although larger at the start, grew less, showed more popeye, and contained less tissue fat and more water at the end than rainbow trout. Chronic exposure of fish to nitrogen supersaturation is probably the cause of increased eye abnormalities. When nitrogen supersaturation exists, a system for reducing the level to near saturation is necessary to help minimize development of fish eye abnormalities. (Katz)
W77-07430

TOLERANCE OF SELECTED FISH SPECIES TO ATMOSPHERIC GAS SUPERSATURATION,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
D. H. Fickeisen, J. C. Montgomery, and M. J. Schneider.
Presented at American Fisheries Society, 103rd Annual Meeting, Orlando, Florida, September 6-12, 1973, BNWL-SA-4794, 13 p., 21 fig., 1 ref.

Descriptors: *Bioassay, Mortality, Laboratory tests, *Atmospheric gas, Supersaturation, *Fish disease, Salmonids, Gas chromatography, Bass, Bullheads, Catfishes, *Rainbow trout, Carp, Suckers, Animal pathology.
Identifiers: *Nitrogen supersaturation, *Gas bubble disease, *Tolerance, *Relative tolerance, Heart embolism, Subepidermal emphysema, Molecular sieve, Gas chromatography, Mountain whitefish, Smallmouth bass, Channel catfish, Black bullhead, Pumpkinseed, Bluegill, Largescale sucker, Northern squawfish.

Several fish species were collected in SE Washington, acclimated to 20C and 100-150% gas supersaturation, and exposed to high gas content waters (100-140% supersaturation) at 20C under standard acute bioassay conditions. The fish were monitored to determine death time and necropsyed to determine the cause of death. The species exhibited a differential tolerance to high gas levels with smallmouth bass more tolerant and salmonids less tolerant. Nearly all fish which died during the test exhibited signs of gas bubble disease, ranging from massive heart embolism to mild subepidermal emphysema. These signs were related to exposure time and to gas supersaturation levels. Gas concentrations were monitored by molecular sieve gas chromatography. (Katz)
W77-07431

SPILLWAY REDESIGN ABATES GAS SUPERSATURATION IN COLUMBIA RIVER,
Army Engineer District, Portland, Oreg., North Pacific Div.
For primary bibliographic entry see Field 5G.
W77-07432

THE EFFECT OF TEMPERATURE ON SIZE AND STRUCTURE-II. THE BODY MUSCULATURE OF CYCLOPS AGILIS (KOCH, SARS),
Trinity Coll., Dublin (Ireland). Dept. of Zoology.
E. Campbell, and J. N. R. Grainger.
Proceedings of the Royal Irish Academy, Vol. 75, Sec. B, No. 20, 1975, p 391-399, 4 tab, 23 ref.

Descriptors: Environmental effects, *Temperature, *Crustaceans, Size, Growth rates.
Identifiers: Musculature, Body size, *Cyclops agilis.

Body muscle fibres of adult Cyclops agilis were measured in animals reared at 10, 15, and 25 C. It was concluded that differences existing between muscles of animals reared at different temperatures lie in the differences in fibre diameter. This was greatest at 15C and the average 15C fibre contained more myofibrils than the 25 C muscle. Filament spacing measurements showed that there was markedly more contractile material in the 15 C as compared with the 25 C muscle. The 15 and 25 C results followed the general pattern of decreasing size with increasing rearing temperature but the 10 C did not. This anomaly was not explained. Sarcomere length and A-band length were constant. (Chilton-ORNL)
W77-07433

PRELIMINARY INVESTIGATIONS ON BIVALVES BIVALVIA OF THE DAM RESERVOIR AT GOCZALKOWICE,
Polish Academy of Science, Pszcyna. Lab. of Water Biology.
E. Krzyzanek.
Acta Hydrobiologica, Vol. 18, No. 1, p. 61-73, 1976. 7 fig., 4 tab., 15 ref.

Descriptors: *Mollusks, *Reservoirs, *Biomass, *Spatial distribution, Dominant organisms, Reservoir stages, Succession.
Identifiers: *Bivalves, *Goczalkowice Reservoir(Poland), Unio pictorum, Anodonta cygnea.

The role of bivalves in the Goczalkowice dam reservoir is investigated, focusing on their qualitative and quantitative composition, their biomass including shells and their age structure. A succession of occurence of macrofauna between 1956 and 1973 was shown, from small species of the genus Pisidium, through the genus Anodonta, to the genus Unio pictorum. Results indicate that the current dominating species is Unio pictorum, found mainly in the sandy bottom of the northern part of the reservoir. The second most numerous species, Anodonta cygnea, was found in the muddier bottom of the southern part of the reservoir. The second most numerous species, Anodonta cygnea, was found in the muddier bottom of the southern part of the southern part of the reservoir. Spatial distribution analysis showed that Unio pictorum occurred most numerously at a depth of 2 m while Anodonta cygnea distribution was heaviest at 6 m. It is estimated that there were 106 million bivalves with a biomass of 5038 tons, or 4 specimens of 20 dag biomass per sq m. Biometric measurements to determine age structure indicated that Anodonta cygnea had the largest number of specimens in the 8 to 10 year age class, while Unio pictorum and Unio tumidus were predominant in the 6 to 8 and 4 to 6 year age classes, respectively. The number of younger specimens increased at greater depths for both Anodonta cygnea and Unio pictorum. (Luedtke-Wisconsin)
W77-07440

NITROGEN, PHOSPHORUS, PARTICULATE AND COLLOIDAL CARBON CONTENT OF SEDIMENTING SESTON OF A HARD-WATER LAKE,
W. S. White, and R. G. Wetzel.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 330-339, 1975. 8 fig., 20 ref.

Descriptors: *Seston, *Sediments, *Nitrogen, *Phosphorus, *Calcium carbonate, Colloids, Suspension, Translocation, Primary productivity, *Michigan, *Lake sediments.
Identifiers: *Lawrence Lake(Mich), Sedimentation traps.

Seston, the living and non-living particularate material suspended in the pelagic region of a lake, was collected biweekly at 4-meter intervals for two years by means of an improved sedimentation trap in Lawrence Lake (southwestern Michigan). Lawrence is a 4.96 ha 12.6 m-deep hard-water lake located in a drainage basin of predominantly limestone deposits. Chemical analyses of the sedimenting seston indicated significant spatial and temporal changes. A marked displacement of phosphorus from the epilimnion into the metalimnion was found in mid-summer. High rates of calcium carbonate precipitation, induced by photosynthesis, facilitated nutrient removal to the hypolimnion. During fall overturn an average of .17 micrograms per square meter per day was resuspended. Total nitrogen content of the sedimenting seston changed throughout the year; a marked displacement to the hypolimnion occurred in late summer. Pronounced changes in the particularate organic carbon fraction, strongly related to primary productivity, were not as apparent as other seston parameters. More than a third of the calcium content is in the form of colloidal calcium carbonate that forms a major sink for inorganic and organic nutrients. (Harris-Wisconsin)
W77-07441

SUCCESSION RATES IN LAKE PHYTOPLANKTON COMMUNITIES,
N. J. Williams, and C. R. Goldman.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 808-811, 1975. 1 fig., 7 ref.

Descriptors: *Rates, *Lakes, *Phytoplankton, *Succession, Limnology, Biological communities, Persistence, Speciation, Biomass, Trophic level, Climatic zones, Primary productivity.
Identifiers: Lake Tahoe(Cal-Nev), Castle Lake(Cal), Clear Lake(Cal), Lake Victoria(Africa).

Discussion is centered on progressive changes in relative species composition of phytoplankton in five lakes which represent extremes and medians of production. Included were: (1) Lake Tahoe, an ultra-oligotrophic, subalpine warm monomictic lake; (2) Castle Lake, California, a dimictic, mesotrophic subalpine lake; (3) Clear Lake, California, a polymictic, lower-altitude productive aquatic environment; (4) Lake Victoria, Africa, representing equatorial regions; and (5) an arctic pond to represent conditions typical of polar latitudes. Comparison of succession rates for the five lakes demonstrated that the non-tropical lakes show significant seasonal variation in succession. Additionally, maximum succession rates occur after community independent environmental perturbations which are usually but not necessarily correlated with periods of high primary productivity. Finally, it was found that in the absence of disturbance succession rates decline and remain low, partly because of community dependent processes. Equations are given in the text for measuring rate of succession by calculating the change in the relative contribution of individual species to total biomass diversity. Notation is given for the fraction of total diversity attributable to a single species, and a succession rate index that measures the speed at which the community moves through diversity space where the dimensions are the proportion of total diversity contributed by a particular species. (Harris-Wisconsin)
W77-07442

SPATIAL AND TEMPORAL CHANGES IN THE PRIMARY PRODUCTIVITY OF LAKE TAHOE, CALIFORNIA-NEVADA BETWEEN 1959 AND 1971,
California Univ., Davis. Inst. of Ecology.
C. R. Goldman, and E. de Amezaga.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 812-825, 1975. 7 fig., 2 tab., 24 ref.

Descriptors: *Primary productivity, *Trophic level, *Urbanization, Lakes, Phytoplankton, Social impact, Human population, Sewage disposal, Nutrients, Euphotic zone, Littoral, California, Nevada, Eutrophication.
Identifiers: *Lake Tahoe(Cal-Nev).

Intensive study of Lake Tahoe during 1967-71 and comparisons made with 1959-60 data show a dramatic increase in primary productivity for this remarkably blue and transparent alpine lake, a measure of increased cultural eutrophication that continues despite steps taken to export sewage from the lake's basin. During the latter period primary productivity increased 25.6% and this increase rises to 51% if compared with the 1959-60 data. It is assumed that the rapid build-up population around the lake in recent years have caused soil and vegetation disturbances which have replaced the nutrients that formerly were derived from treated sewage. The euphotic zone in Lake Tahoe often exceeds 100 m depth, and maximum phytoplankton may occur as deep as 50-75 m. The vertical profile is established in early December with a single production peak in the vicinity of 50 m. As stratification develops the unimodal productivity curve is transformed into a bimodal one which persists through the rest of the season. A trend is seen in which the seasonal maximum in productivity is retarded. Synoptic studies show that pelagic phytoplankton productivity has steadily increased relative to productivity in the littoral zone. Although the latter zone contributes only 10% of the lake primary productivity, it is visibly the greatest evidence of eutrophication in Lake Tahoe. (Harris-Wisconsin)
W77-07443

EFFECT OF DDT ON PHOTOSYNTHESIS OF SELENSTRUM CAPRICORNUTUM,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
S. S. Lee, S. C. Fang, and V. H. Freed.
Pesticide Biochemistry and Physiology, Vol. 6, No. 1, p. 46-51, 1976. 2 fig., 1 tab., 29 ref. PHS ES-00210, R01 ES00654-01.

Descriptors: *DDT, *Chlorophyta, *Photosynthesis, Algae, Chlorinated hydrocarbon pesticides, Path of pollutants, Carbon cycle, *Eutrophication, Water pollution effects.
Identifiers: Selenastrum capricornutum.

The effect of the chlorinated hydrocarbon DDT on carbon assimilation of a green alga, Selenastrum capricornutum, found in eutrophic freshwaters, was studied. Results indicated that DDT concentrations between 3.6 and 36 ppb (the latter approaching DDT concentration in polluted water) inhibited the incorporation of carbon-14 into both ethanol-soluble fractions and ethanol-insoluble fractions. Inhibition of carbon dioxide fixation was greater as the exposure of algae to DDT increased. Kinetic studies of photosynthetic carbon dioxide fixation indicated that DDT stimulated the incorporation of carbon-14 into glycolic acid, a major compound of photorespiration, and caused the concomitant suppression of flow of carbon-14 into aspartic acid, a major component of the C4-dicarboxylic acid pathway. The DDT shift from an efficient pathway into an inefficient pathway was interpreted to be through interruption of cyclic photophosphorylation. (Luedtke-Wisconsin)
W77-07444

A MODEL OF THE PHOSPHORUS CYCLE AND PHYTOPLANKTON GROWTH IN SKAHA LAKE, BRITISH COLUMBIA, CANADA,
W. M. Fleming.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 229-240, 1975. 5 fig., 2 tab., 22 ref.

Descriptors: *Trophic level, *Phosphorus, *Model studies, Eutrophication, Phytoplankton, Simulation analysis, Lakes, Dissolved oxygen, Water quality, Primary productivity, Diffusion, Sedimentation, *Canada, Cycling nutrients.
Identifiers: *Skaha Lake(British Columbia), *Phosphorus cycle.

A simulation model is described which shows that in measuring the phosphorus cycle in Skaha Lake (British Columbia), total phosphorus is a useful indicator for the prediction of trophic states. Difference equations and a daily time scale are used in a mass balance model which accounts for the dynamic stratification regime of the lake. A series of submodels detail total phosphorus movement between the epilimnion, hypolimnion and sediments. An eddy diffusion submodel predicts loading from the hypolimnion to the epilimnion which can equal external loading for short periods in the summer. A phosphorus regeneration submodel predicts organic sedimentation on the basis of primary production and inorganic sedimentation from adsorption considerations. A regeneration submodel considers temperature-related decomposition rates of sedimented phosphorus. A primary production submodel accounts for temperature, light and phosphorus dependency, as well as respiration, grazing, sinking and advection losses. Based on known phosphorus loading and limnological data from three years of study, reasonable agreement was found between real and simulated total phosphorus concentration, phytoplankton biomass and hypolimnetic dissolved oxygen. (Harris-Wisconsin)
W77-07445

PREDICTING THE IMPACTS OF PHOSPHORUS MANAGEMENT POLICIES ON THE EUTROPHICATION OF SKAHA LAKE, BRITISH COLUMBIA, CANADA,
W. M. Fleming, and J. G. Stockner.
Verhandlungen Internationale Vereiningung Limnologie, Vol. 19, Part I, p. 241-248, 1975. 4 fig., 1 tab., 8 ref.

Descriptors: *Eutrophication, *Trophic level, *Phosphorus, *Simulation analysis, *Phytoplankton, *Projections, Model studies, Water quality control, Tertiary treatment, Dissolved oxygen, Lakes, *Canada, Management.
Identifiers: *Skaha Lake(British Columbia).

Probable effects of four alternative phosphorus management policies on Skaha Lake (British Columbia) are assessed, using 20 years of hydrologic data and the eutrophic conditions of 1970 as a starting point. Using the first simulation, with no phosphorus removal and no increase in loading over the 20-year period, phytoplankton blooms will increase in intensity and hypolimnetic dissolved oxygen will approach zero while phosphorus concentrations will exceed 60 microgram/l. With 60% removal of municipal phosphorus and conditions of either high or low economic growth, the eutrophic conditions of 1970 are reached within 12-14 years. Algal blooms and hypolimnetic dissolved oxygen deficits are particularly serious during dry years. With 100% municipal phosphorus removal, trophic conditions appear to improve significantly, with the possibility of minor algal blooms during only dry years. The simulation uses a model previously made of the phosphorus-phytoplankton system in a British Columbia lake, which showed that total phosphorus can be a useful indicator for the prediction of trophic states. Skaha Lake is dimictic and has an average water residence time of 1.2 years. Maximum depth is 57 m, mean depth is 28 m, length is 11.9 km and width is 2.4 km. Total phosphorus at spring mixing is usually greater than 30 micrograms. Loading generally exceeds 1 gram per square meter per year and the hypolimnetic oxygen depletion rate is greater than .05 mg per square centimeter per day. (Harris-Wisconsin)
W77-07446

SUB-THERMOCLINE BIOMASS CONCENTRATION DETECTED BY TRANSMISSOMETER IN LAKE SUPERIOR,
N. H. F. Watson, K. P. B. Thomson, and F. C. Elder.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 682-688, 1975. 2 fig., 2 tab., 10 ref.

Descriptors: Instrumentation, *Lake Superior, *Thermocline, *Light penetration, *Telemetry, *Biomass, Transmissivity, Zooplankton, Phytoplankton, Euphotic zone, Limnology, On-site data collections, Suspension, Sampling, Eutrophication, Bioassay, Pollutant identification.
Identifiers: *Transmissometers, *Sub-thermocline.

A Martek Transmissometer (Model XMS) was used on Lake Superior study cruises in 1973 to measure the optical beam attenuance or transmittance, referenced to a clear air path, as a function of depth. The measured transmittance is dependant on the scattering due to particles in suspension as well as the absorption from dissolved substances and any absorption due to the particles themselves. During September, transmittance profiles showed a marked minima at about 20-25 m depth over very large areas of Lake Superior. Vertical zooplankton hauls with nets were frequently clogged with fine yellowish-brown material at stations where this layer of low transmission was extensive. Analyses which followed subsequent sampling indicated considerably more chlorophyll a in the layer of minimum transparency than in the upper 20 m. At some stations concentrations were up to four times as high at 25-30 m as in the 0-20 m stratum. This indicated that the bulk of the material causing the transmission minimum was of algal origin. A conclusion is postulated that considerable quantities of phytoplankton algae may accumulate at depths just below the thermocline and the bottom of the photic zone in deep, large lakes. Estimates of production of such bodies of water based on synoptic surveys of surface or mean epilimnion concentrations of phytoplankton biomass as suggested by other research may underestimate the production considerably. (Harris-Wisconsin)
W77-07447

SYNERGISTIC EFFECTS OF PHOSPHATE AND MANGANESE ON GROWTH OF LAKE SUPERIOR ALGAE,
J. Shapiro, and G. E. Glass.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 395-404, 1975. 6 fig., 2 tab., 7 ref.

Descriptors: *Lake Superior, *Manganese, *Phosphates, *Algae, Iron compounds, Lakes, *Growth rates, Mine wastes.
Identifiers: *Taconite tailings, *Synergistic effects, Biostimulants.

Continuing earlier research aimed at assessing effects of the wastes from an iron ore (taconite) processing plant on Lake Superior, further evidence is presented that taconite tailings do stimulate growth of the lake's native algae. Evidence is also shown that both manganese and phosphate are limiting elements in the lake; that phosphate and manganese are synergistic in their effects as are phosphate and taconite; and that the stimulatory agent in taconite is in fact manganese, addition of which to the lake probably makes Superior mush more responsive to phosphate that may enter it from other sources. Approximately 60,000 metric tons of taconite waste enter Superior every day near its western end. About 40% of the wastes are less than 44 microns in size, considerable quantities find their way throughout the western arm of the lake. The combined findings are also important because they demonstrate the combined effect of manganese and phosphate or taconite and phosphate in combination is very much greater than their individual effects. The significance of the findings is that, while the Lake Superior watershed is relatively uninhabited today, with consequently only a relatively small inflow of phosphate into the lake, increases in population and development in the future would increase the degree of synergism between the taconite wastes and newly-added phosphate. Dramatic increases in nuisance algal growth could well result. (Harris-Wisconsin)
W77-07448

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PLUTONIUM IN THE LAURENTIAN GREAT LAKES: COMPARISON OF SURFACE WATERS,
M. A. Wahlgren, and D. M. Nelson.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 317-322, 1975. 1 fig., 4 tab., 12 ref.

Descriptors: *Great Lakes, *Radioisotopes, *Lake Michigan, *Lake Erie, *Lake Huron, *Lake Ontario, *Lake Superior, *Fallout, *Radioactive wastes, Cesium, Water pollution sources, Trace elements, Turnovers, Distribution patterns, Plankton, Strontium radioisotopes, Pollutant identification.
Identifiers: *Plutonium.

Results of studies of plutonium in Lake Michigan suggest that biological processes are significant factors in determining the turnover time for this element in Great Lakes waters. Studies of plutonium fallout in the lake, which is essentially a closed system, have demonstrated that only about 3% of the estimated cumulative deposition is retained in the water column, and that winter mixing results in a homogeneous distribution of radionuclides in the water column by spring. In an experiment that assumed similar mixing behavior in the other Great Lakes, surface water and plankton samples were measured from all five lakes in 1973. The range in plutonium concentrations over the five lakes was remarkably narrow in view of the diverse area-to-volume ratios and outflow characteristics of the lakes. Average concentrations were about .6 fCi/l in Superior, Michigan and Huron and .2 fCi/l in Erie and Ontario. Most-rapid removal of plutonium and cesium was in the shallow and eutrophic Lake Erie western basin. A consistent relationship between plutonium concentrations in water and in plankton has been observed in all five lakes, suggesting equilibrium between aqueous and sorbed plutonium. The concentration of plutonium in the Lake Michigan epilimnion is depleted rapidly during early summer but returns to nearly its previous level by the following spring. (Harris-Wisconsin)
W77-07449

PHOTOSYNTHETIC RATES IN LAKE SUPERIOR,
J. Verduin.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 689-693, 1975. 1 fig., 1 tab., 3 ref.

Descriptors: *Lake Superior, *Photosynthesis, *Water sampling, *Estimating, Acidity, Alkalinity, Acid-base equilibrium, Euphotic zone, Primary productivity, Pollutant identification, Bioassay.
Identifiers: *Photosynthetic rates.

Determination was made of photosynthetic rates by three separate techniques on Lake Superior during a cruise in the summer of 1973: (1) carbon-14 uptake rates in clear and dark bottles; (2) change in acidity-alkalinity in clear and dark bottles; and (3) change in acidity-alkalinity between early morning and late afternoon as derived from acid-alkaline balance as compared with depth profiles in the open lake. Photosynthetic yields revealed large discrepancies among these three methods. Assuming that clear vs. dark bottle data represents the average yield in the euphotic zone (36 meters) and that the photoperiod is 14 hours, then the first method yields 14 millimoles per square meter per day, the second method yields 111 and the third method yields 200. Because practically all Lake Superior productivity data in the literature are based on carbon-14 data, it seems likely that the estimates of the degree of oligotrophy of the lake have been biased by the low photosynthetic yields obtained by this method. (Harris-Wisconsin)
W77-07450

INFLUENCE OF THE DRAINAGE BASIN ON THE EUTROPHICATION OF THE A-MESOTROPHIC LAKE PIASECZNO AND DISEUTROPHICATION OF THE POND LAKE BIKCZE,
Instytut Przyrodniczych Podstaw, Lublin (Poland). Produkeji Roslinnej AR.
I. Wojciechowski.
Acta Hydrobiologica, Vol. 18, No. 1, p. 23-52, 1976. 10 fig., 3 tab., 20 ref.

Descriptors: *Eutrophication, *Watersheds(Basins), Nutrient removal, Mesotrophy, Surface runoff, Subsurface runoff, Runoff, Lakes, Ditches, Embankments, Drainage engineering, Nutrients, Bogs, Humic acids, Drainage basins.
Identifiers: Lake Piaseczno(Poland), Lake Bikcze(Poland), *Lake renewal.

The eutrophic influence of the drainage basin on lakes in the Leczynsko-Wolodawskie Lake District was studiied and a method and the effect of isolating one of them from its drainage basin was ivestigated. It was found that fertilization of Lake Piaseczno and Lake Bikcze occurred only through surface and groundwater runoff from the drainage basin, depending on the balance of precipitation and water evaporation. During recent years, Lake Piaseczno has been marked by eutrophication, while a rapidly proceeding reverse tendency has been observed in nearby Lake Bikcze. Eutrophication inhibition in the latter resulted from its being isolated from its drainage basin by surrounding the lake with earth embankments and a ditch deeper than the groundwater level. Dissolved nutrients running off toward the lake from the drainage basin were carried beyond the lake. Blanket peat bogs left within the circumference of ditches were gradually transformed into raised peat bogs as the fertilizing waters were cut off. This supplied the lake with increased amounts of humic acids whose particles absorbed mineral salt cations dissolved in the water, causing diseutrophication of the lake. These mechanisms of inhibiting eutrophication and inducing diseutrophication may be applicable to other closed lakes in a similar climate, provided no discharge of sewage takes place. (Luedtke-Wisconsin)
W77-07452

EFFECT OF ZOOPLANKTON GRAZING ON PHOTOSYNTHETIC ACTIVITY AND COMPOSITION OF PHYTOPLANKTON,
Z. M. Gliwicz.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1490-1497, 1975. 4 fig., 1 tab., 13 ref.

Descriptors: *Photosynthesis, *Phytoplankton, Grazing, *Zooplankton, Tropical regions, Regression analysis, Biomass, Lakes.
Identifiers: Gatun Lake(Panama Canal Zone), Madden Lake(Panama Canal Zone).

Whether zooplankton grazing can be a stimulus for plankton primary production was investigated in two tropical reservoirs in the Panama Canal Zone (Gatun Lake and Madden Lake) and in a Polish temperate pond heated by power plant effluents. Multiple regression analysis based on light, temperature, nutrient income from the drainage basin and from deeper lake layers, light utilization efficiency, intensity of nutrient recycling, zooplankton grazing, the share of nannoplankton in the phytoplankton standing crop, efficiency of nutrient utilization by algae, and species diversity was utilized to determine which parameters most affect plankton photosynthetic activity. Only two factors--the quantity of phytoplankton biomass and the grazing intensity by filter feeding zooplankton--were significant. It was evident that phytoplankton photosynthesize more actively when their biomass is lower not only because of a weaker self-shading effect, but also because a smaller amount of nutrients is internally retained, thus enhancing the amount of nutrients available for algal growth. Consequently, more intensive grazing reduces the algal standing crop and the amount of nutrients retained, with resultant faster algal decomposition, and acceleration of nutrient regeneration, which, in turn, produces more efficient photosynthetic production. (Auen-Wisconsin)
W77-07453

COMPARISON OF PRIMARY PRODUCTIVITY (14C) PER UNIT BIOMASS BETWEEN PHYTOPLANKTON AND PERIPHYTON IN THE OTTAWA RIVER NEAR OTTAWA, CANADA,
A. S. Rosemarin.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1584-1592, 1975. 4 fig., 2 tab., 28 ref.

Descriptors: *Primary productivity, *Phytoplankton, *Periphyton, Biomass, Standing crops, *Canada, Carbon cycle.
Identifiers: *Ottawa River(Ontario).

The relative contribution of periphyton and phytoplankton to primary productivity in the Ottawa River was investigated near Ottawa, Canada by comparing biomass and the P/B ratio. The range between the seasonal minimum and maximum for phytoplankton was approximately 100-fold and that for periphyton 10,000-fold. The annual mean for phytoplankton biomass was 2.6 mg sq m while that for periphyton at 0.1 m depth was 14,000 mg/sq m and at 0.5 m depth, 2600 mg sq m. The P/B ratio for phytoplankton consistently exceeded that for periphyton; over the sampling year, that for phytoplankton was 27 and for periphyton 0.07. The data showed that the relatively-low periphyton P/B value is caused by high periphyton biomass, which was three orders of magnitude greater than that for phytoplankton. However, the periphyton and phytoplankton productivity values were of the same order of magnitude. It was evident that phytoplankton are the major primary producers. In the littoral zone periphyton are the dominant primary producers in terms of productivity and biomass even though the periphyton P/B is two orders of magnitude lower than that for the phytoplankton. The major conclusion is that the phytoplankton have much higher carbon turnover rates than the periphyton. (Auen-Wisconsin)
W77-07454

EXPERIMENTAL SEDIMENT ADDITION STUDIES ON THE HARRIS RIVER, N.W.T., CANADA: THE EFFECT ON MACROINVERTEBRATE DRIFT,
D. M. Rosenberg, and A. P. Wiens.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1568-1574, 1975. 1 fig., 3 tab., 8 ref.

Descriptors: *Spatial distribution, *Sedimentation, *Benthic fauna, *Suspended load, *Canada, On-site investigations, Analytical techniques, Model studies, Invertebrates.
Identifiers: *Harris River(NWT), Macroinvertebrate drift.

In this first of a series of studies on the effects of increased suspended sediment concentrations on various aspects of benthic macroinvertebrtes, the extent of macroinvertebrate drift due to various sediment loadings was investigated. The experiments were conducted in a segment of the Harris River, Northwest Territories (Canada), with sediment additions in concentrations ranging from 10 to 500 mg/1. Sand-sized particles (2 to .05 mm) composed approximately 25% of bankside sediment was used; the remainder was composed of approximately 50% silt (.05 to .002 mm) and 25% clay (<.002 mm). The total weight of sediment added during each experiment ranged from 2.4 to 26.3 kg or .05 to 2.9 kg sq m of stream bottom. Preliminary results of the investigation of the responses of individual macrobenthic taxa to various weights of sediment used showed that the

number of Chironomidae in the drift always increased with sediment addition. However, Ephemeroptera, Simuliidae, and Hydracarin were inconsistent in their responses to sediment additions. The least difference in mean numbers of macrobenthos drifting during control and sediment addition periods was at an intended suspended sediment concentration of 250 mg/1; the greatest was at 100 mg/1. The drift is not quantified in this research due to insufficient data on symbiotic interactions. (Auen-Wisconsin)
W77-07455

THE VERTICAL DISTRIBUTION OF PLANKTON ROTIFERS IN A SMALL ALPINE LAKE WITH A SHARP OXYGEN DEPLETION (LUNZER OBERSEE),
A. Ruttner-Kolisko.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1286-1294, 1975. 7 fig., 8 ref.

Descriptors: *Rotifers, *Oxygen sag, *Spatial distribution, Vertical migration, Ecological distribution, Behavior, Europe, Diel migration, Alpine, Lakes.
Identifiers: *Lunzer Obersee(Austria), *Alpine lakes.

The vertical distribution of planktonic rotifers was studied in relation to oxygen depletion in a small Austrian alpine lake, the Lunzer Obersee. Although unaffected by humans, the lakes's oxygen regime has changed in the last 30 years when the whole water column was oxygenated during the autumn turnover, while in recent years the bottom 3-4 meters remained practically oxygen-free. Among the seven plankton species which presently occur, Keratella cochlearis dominates the winter plankton completely, forming two maxima-- a large one in the upper layer and a smaller but very distinct maxima in the deeper deoxygenated zone. The two major constituents of winter plankton, observed in 1943, Filinia terminalis and Keratella testudo, both with a maximum at a very low oxygen content, are now reduced to a few individuals per liter. During summer stratification the rotifer diversity has changed to a nearly uniform population of Polyarthra dolichoptera, which shows a similar vertical distribution and about an equal density as K. cochlearis in winter. At turnover time, K. cochlearis dominates, but a variety of other species, even greater than in 1943, coexist. The vertical distribution pattern is a characteristic ecological feature which is maintained throughout the whole seasonal appearance of a particular species. The rotifers appear to respond to oxygen depletion by use of oxygen diffusion, vertical migration, and reduced metabolism. (Auen-Wisconsin)
W77-07456

COMPOSITION AND DYNAMICS OF THE BOTTOM ANIMALS IN THE LITTORAL ZONE OF DOJRAN LAKE, MACEDONIA,
J. A. Sapkarev.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1339-1350, 1975. 11 fig., 4 tab., 24 ref.

Descriptors: *Benthos, *Littoral, Varieties, Eutrophication, Aquatic animals, Animal populations, Dominant organisms, Europe, *Bottom sediments, *Lakes.
Identifiers: *Lake Dojran(Yugoslavia).

The density, species, seasonal dynamics and ecological distribution of the benthic animals in the littoral zone of eutrophic Lake Dojran, Macedonia (Yugoslvia), are described. The substrate of the littoral zone is composed mainly of fine sands, mud mixed with sand, and mud with detritus, but the greater portion is covered with dense macrophytic vegetation. The stony habitat contains the greatest variation, dominated by chironomids and leeches, which together with gastropods, oligochaetes and crustaceans, form the major community structure. The fine sand habitat (0-1 m depth) includes only six animal groups, dominated by oligochaetes and chironomids, followed by crustaceans and leeches; mayflies and caddisflies are represented by only one species each. The mud and sand habitat covered by macrophytes, located mainly between 1 and 3 m depth, contains the richest bottom fauna. At least 16 animal groups inhabited this community, but 13 oligochaete species and 8 crustacean species predominate, some reaching very high densities. The mud-detritus habitat, at 3-4.5 m depths, is relatively rich in bottom fauna; it contains at least 14 groups with the greatest number of species (9 oligochaetes and 7 chironomids). Seasonal variations in population densities and the species occupying each habitat are detailed. (Auen-Wisconsin)
W77-07457

THE LARVAL SPIRURID NEMATODES OF FRESH-WATER CRUSTACEANS: I. THE IDENTIFICATION AND THE EXAMINATION OF THEIR PATHOGENICITY,
Niigata Univ. (Japan). Dept. of Medical Zoology.
H. Hasegawa, T. Shiraki, and M. Kemmotsu.
Jpn J Parasitol 25(4), p 254-261, 1976.

Descriptors: *Nematodes, *Crustaceans, *Pollutant identification, Pathology, *Fish parasites, Shrimp, Larvae, Water pollution, *Parasitism.
Identifiers: Anisogamarus-Annandalei, Paratya-Compressa-Improvisa, Spirurid, Streptocara-Crassicauda.

Spirurid larvae parasitic on fresh-water crustaceans were identified to elucidate the possibility of their larva migrans. The larvae were collected from Paratya compressa improvisa (edible shrimp) and Anisogammarus annandalei. Larvae from A. annandalei developed to adults under the cuticular lining of the gizzard of chickens and ducklings when the larvae were orally inoculated, and they were identified as Streptocara crassicauda (Creplin, 1829) (Spiruridae: Acuariidae) by morphological characteristics. Larvae of P. compressa improvisa were not recovered in such experimentally infected avian hosts. Although infection to the birds indicated an apparent difference between the spirurid larvae from the 2 crustaceans, both larvae might be the same species because their morphological features were identical. To obtain positive evidence of their pathogenicity in the human body, the larvae were confined in the lumen of a surgically isolated intestinal tract - a small piece of intestine of rat or guinea pig ligated on oth ends and enclosed in the abdominal cavity of the host animal. The closed tract was investigated 3 or 6 h after the operation to confirm whether the larvae invaded the wall. Some larvae migrated to the intestinal wall or through it to the abdominal cavity. A kind of visceral larva migrans with these larvae may be caused by eating raw the intermediate hosts, such as some fresh-water shrimps or possible paratenic hosts, such as some fishes.--Copyright 1977, Biological Abstracts, Inc.
W77-07458

PIGMENT CYCLE IN A NORTH GERMAN LAKE,
H. Rai.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1220-1228, 1975. 3 fig., 2 tab., 15 ref.

Descriptors: Chromatography, Fluorometry, *Chlorophyll, *Measurement, *Pigments, *Degradation(Decomposition), Freshwater, Europe, Spatial distribution, *Lakes.
Identifiers: *Pluss See(Germany), Phaeopigments.

General distribution patterns of chlorophyll and phaeopigments were determined in Pluss See, germany, in an effort to overcome significant errors in chlorophyll estimations by fluorometric or trichromatic spectrophotometry sometimes caused by chlorophyll degradation products. The error depends on portions of the compounds relative to chlorophyll; if no corrections are made for phaeopigments the chlorphyll values would be greater by the amount of phaeopigments. The presence of even very small phaeopigment quantities will give erroneous results because they absorb light in the same spectral region as chlorophyll. Fluorometric studies in the lake indicated that the maximum chlorphyll concentration was usually in the euphotic zone and at times coincided with that of the phaeopigments. Phaeopigments maximally occurred above the portion of the water column where nutrient concentrations increased and chlorophyll degradation increased with percentage of depth. The seasonal cycle of chlorophyll and their degradation products showed a bimodal pattern with the phaeopigments consituting a significant fraction of the chlorophylls. It is concluded that post-lytic photochemical oxidation could be responsible to a large extent for chlorophyll decomposition products in lakes. Chlorophyll derivatives, especially phaeophytins and phaeophobides, have been detected chromatographically. (Auen-Wisconsin)
W77-07459

A SURVEY OF THE PHYSICAL AND CHEMICAL LIMNOLOGY OF LAKE TITICACA,
P. J. Richerson, C. Widmer, T. Kittel, and A. Landa.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1408-1503, 1975. 4 fig., 1 tab., 9 ref.

Descriptors: *Physical properties, *Chemical properties, *Lakes, *Tropical regions, South America, Thermal stratification, Water temperature, Secchi disks, Dissolved oxygen, Light penetration, Heat budget, Ions, Cations, Elevation, Basic data collections.
Identifiers: *Lake Titicaca(Peru-Bolivia).

Lake Titicaca is located in the southern tropics (Peru-Boliva) at an elevation of 3800 m, with a surface area of 7800 sq km. The annual range of monthly mean temperatures is small compared to the diurnal range, with minimum winter air temperatures rarely dropping below -5C. Evaporation accounts for 95% of the water lost from the lake; the rest flows out through the Rio Desaguadero. It is classified as a warm monomictic lake; the low concentrations of dissolved oxygen and high concentrations of silica at 150 to 200m before and after mixing indicate that the lake probably mixes down to at least 150 m. The lakes's annual heat budget is low and the heat balance is potentially sensitive to small variations of input and output from year to year. Secchi disk depth was 4.5-5 m in February, but as the rainy season ended, clarity increased and the Secchi depth reached 10.5 in August; with the onset of light spring rains in September, followed by increased phytoplankton biomass, Secchi depth decreased to 6 m by December. Extinction coefficients followed a pattern influenced by rainfall during the first half of the year and by photoplankton biomass during the latter half. Major ion concentrations varied only slightly. (Auen-Wisconsin)
W77-07460

SEDIMENT RESPIRATION IN SIX ITALIAN LAKES IN DIFFERENT TROPHIC CONDITIONS,
A. Provini.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1313-1318, 1975. 2 fig., 2 tab., 4 ref.

Descriptors: *Lake sediments, *Respiration, *Hypolimnion, *Biochemical oxygen demand, *Trophic level, Oxygen sag, Water temperature, Depth, Europe, Lakes.

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Identifiers: Lake Montorfano(Italy), Lake Alserio(Italy), Lake Pusiano(Italy), Lake Segrino(Italy), Lake Annone(Italy), Lake Oggiono(Italy), *Italy.

Lake sediment respiration was measured in six Italian lakes, five eutrophic and one oligomesotrophic, to determine hypolimnetic oxygen depletion from the late winter overturn to the appearance of anoxic conditions between March-July. At the end of the overturn, oxygen uptake of the five eutrophic lakes was about 20 mg/sq m/hr; consumption in the oligomesotrophic lake equaled 12 mg/sq m/hr. Differences in algae, bacteria and invertebrate species seemed of secondary importance in affecting oxygen uptake, but oxygen concentration in the overlying water and temperature are the major forces in the sediment respiration process. The data suggest that the oxygen uptake rate of sediments is not a useful parameter for trophic classification for stratified lakes because the uptake rate is mainly dependent upon the physiographic and climatic characteristics. Biochemical oxygen demand (BOD) measurments in the deep waters were consistent with the trophic level and lake depth for each lake. Generally, anoxic conditions ranged in the same order as primary production capacity and mean water oxygen demand, except for Lake Pusiano; the latter is both the most productive and the deepest of the six lakes and thus has a larger hypolimnetic oxygen reserve and lower BOD of the hypolimnion. (Auen-Wisconsin)
W77-07461

MODELING THE ANNUAL THERMAL EVOLUTION OF MID-LATITUDE LAKES,
For primary bibliographic entry see Field 2H.
W77-07462

TRIPTON SEDIMENTATION IN EUTROPHIC LAKES--SAMPLE CORRECTION FOR THE RESUSPENDED MATTER,
A. Gasith.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 116-122, 1975. 2 fig., 3 tab., 11 ref.

Descriptors: *Sedimentation, *Tripton, *Suspension, *Sedimentation rates, *Analytical techniques, *Equations, Seston, Estimating, Lakes, Lake sediments, Pollutant identification, *Eutrophication.

Errors in estimations of tripton sedimentation measured by the suspended-containers technique, caused by interference by resuspended bottom deposits, can be eliminated by application of a correction formula based on differences between the organic fraction of tripton and that of resuspended sediment. In a control experiment for the evaluation of the correction technique, the recovery of the calculated tripton compared to the measured tripton was 95.6%. The correction formula allows extension of the technique to shallow bodies of water and eliminates the requirement for calm water conditions during tripton collections. The suggested correction can be applied only in cases of short-term trap exposure, preferably one day, during which grazing and decomposition of the material collected in the traps is presumed negligible. In deep lakes where the surface sediment is usually stratified, correction for occasional mixing and resuspension of bottom deposits may require more discrete sampling of the surface sediment for determination of the organic fraction of the resuspended matter. In addition to its application for suspended matter, the formula could be applied to distinguish between any two sources of organic matter which are significantly different in their organic content. (Harris-Wisconsin)
W77-07463

ALGAL SEDIMENTATION: THE CAUSE OF A DIATOM-BLUE-GREEN SUCCESSION,
R. Knoechel, and J. Kalff.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 745-754, 1975. 7 fig., 2 tab., 16 ref.

Descriptors: *Phytoplankton, *Succession, *Sedimentation, *Radioactivity techniques, *Primary productivity, Radiochemical analysis, *Canada, Anabaena, *Cyanophyta, *Diatoms, Trophic level, Dominant organisms, Lakes.
Identifiers: *Track autoradiography, *Lac Hertel(Quebec).

Application was made for the first time of track autoradiography to the study of aquatic primary production, in an examination of a system of succession where Tabellaria fenestrata (Lyngbye) Kuetzing is replaced by Anabaena plactonica Brunnth. Experiments were carried out in Lac Hertel, a small undisturbed naturally eutrophic lake near Montreal, Quebec. Carbon-14 content of individual cells of the slide-mounted material from samples was measured by track autoradiography, wherein a thick layer (greater than 30 microns) of photographic emulsion records the passage of a beta particle as a visible string of silver grains. Samples were concentrated on slides in a similar manner to those for cell counts and were then dipped in Kodak NRB-3 nuclear emulsion. Following exposure the slides were processed by Kodak K-19 developer. Track counts were normally made on at least 100 cells of Tabellaria per slide and on 25 cell sections of 20 Anabaena filaments. The results permitted calculation of daily growth rates of the individual species. The decline of the summer diatom population (Tabellaria) appears to be the result of a high sinking rate rather than a low production rate. In contrast the blue-green algal popultion(Anabaena) continues to increase due to a lower sinking rate. (Harris-Wisconsin)
W77-07464

POPULATION CHANGES IN THE AQUATIC FAUNA INHABITING THE BLADDERWORT, UTRICULARIA FLEXUOSA VAHL., IN A TROPICAL SWAMP, TASEK BERA, MALAYSIA,
R. P. Lim, and J. I. Furtado.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1390-1397, 1975. 3 fig., 2 tab., 13 ref.

Descriptors: *Monsoons, *Swamps, *Ecosystems, Biological communities, Aquatic plants, *Biomass, *Productivity, *Succession, Wet climates, Wet seasons, Wetlands, Foreign countries, Seasonal, Food chains, Standing crops, Population, Crustaceans, Fish, Larvae, Tropical regions.
Identifiers: *Tasek Bera Swamp(Malaysia), *Utricularia flexuosa Vahl, Tropical swamps.

A quantitative study of the macro- and microfauna inhabiting the bladderwort Utricularia flexuosa Vahl was made over a period of nine months in Tasek Bera, a Malaysian tropical swamp. An objective of the study was to learn how Tasek Bera, itself poor in nutrients, plankton and benthic organisms, can nevertheless support a diversified fish fauna which feeds on aquatic insects and zooplankton. It was found that curstaceans, fish, odonate larvae and dipteran larvae predominate in the biota associated with Utricularia. Similar dominant groups (with the exception of the fish) had been found in Ceratophyllum, a finely-dissected plant studied earlier. Seasonal fluctuations in the Utricularia mat and the populations of the biota associated with it were obviously unaffected by the twice-annual monsoons. Large portions of the mats were washed away at the beginning of each monsoon and only when the bladderwort reestablished itself during the dry season did the periphyton and debris accumulate. These then provide the substrate for a detritrivorous and herbivorous microfauna, which in turn provided the substrate for a canivorous macrofauna. This community provided a concentrated food source for larger transient grazers and predators, especially fish. Thus, the rich standing crop of the Utricularia community contributed significantly to the Tasek Bera swamp ecosystem. (Harris-Wisconsin)
W77-07465

EFFECT OF NUTRIENT ENRICHMENT ON THE HETEROTROPHIC UPTAKE OF ORGANIC SOLUTES BY MICROORGANISMS,
K. J. Hall.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 280-285, 1975. 1 fig., 3 tab., 14 ref.

Descriptors: *Primary productivity, *Nutrients, *Kinetics, *Absorption, *Measurement, *Eutrophication, Food chains, Lakes, Microorganisms, Bays, *Lake Ontario.
Identifiers: *Bay of Quinte(Lake Ontario), Limnocorrals, Michaelis-Menten enzyme kinetics, *Organic solutes.

As part of an ongoing study of the effects of nutrient enrichment on the trophic dynamics of the food chain process in the aquatic environment, net uptake and mineralization of the radioactive solutes glucose, glycine and acetate by microorganisms in the water and sediments were measured in three limnocorrals located in the Bay of Quinte, Lake Ontario during summer 1973. The bay is a shallow arm on the north shore of the lake and is connected by a very narrow channel to the main lake. Little water is exchanged between the lake and the bay. The slow exchange, coupled with nutrient input from agriculture and urban development, has caused algal blooms in recent years. In the study, limnocorrals (plastic enclosures) were anchored in the bay in 4 m of water. Each was triangular, measuring 25 ft per side, and contained approximately 100,000 l of water. One limnocorral served as a control and the others were enriched with either phosphorus or nitrogen + phosphorus. Uptake rates and turnover times were determined using the techniques of modified Michaelis-Menten enzyme kinetics. Preliminary results indicate higher levels of heterotrophic activity in the nutrient-enriched limnocorrals. The sediment microorganisms demonstrated much higher levels of activity than the water column bacteria. (Harris-Wisconsin)
W77-07466

SEASONAL VARIATION IN SEDIMENT-WATER EXCHANGE OF NUTRIENT IONS IN LAKE ESROM,
L. Kamp-Nielsen.
Verhandlungen Internationale Verinigung Limnologie, Vol. 19, Part II, p. 1057-1065, 1975. 16 fig., 7 ref.

Descriptors: *Cycling nutrients, *Ion exchange, *Sediment-water interfaces, *Seasonal, Sedimentation rates, Temperature, Thermoperiodism, Oxidation-reduction potential, Foreign countries, Foreign research, Littoral, Profundal zone, Lakes, Ions.
Identifiers: *Lake Esrom(Denmark).

In an effort to study the relative importance of the processes involved in nutrient ion exchange under the influence of seasonal differences in temperature, rate of sedimentation and composition of the sediment surface, undisturbed sediment cores were collected each month for one year from the littoral and from the profundal zones in Lake Esrom, Denmark. Exchange rates were calculated for two week periods at the temperaturs found in the lake. Data for the seasonal variation in vertical distribution of temperature, pH, oxygen, primary production and other sedimentation data were obtained from another ongoing research project. Results showed that exchange rates of nutrient ions across the sediment surface are mainly governed by temperature and sedimentation rate and only to some smaller extent by the variation in redox conditions and pH. The spring maximum in primary production in March-April is followed by

a high rate of sedimantation from April 15 to June. Due to increasing surface and bottom temperature in this period the decomposition of the sedimented organic matter accelerates. This is reflcted in the maximum release in June of all the studied ions. The exchange between bottom water and profundal sediment is to some extent influenced by the redox conditions during the summer stagnation. However, during most of the year the profundal nutrient exchange follows the variation in temperature and sedimentation. The most distinct temperature depenpence is seen in the case of silicate exchange. (Harris-Wisconsin)
W77-07467

THE UTILIZATION OF THE GREEN ALGA DICTYOSPHAERIUM PULCHELLUM AS FOOD FOR CERTAIN CRUSTACEANS OF FRESH WATER PLANKTON,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
R. Zurek.
Acta Hydrobiologica, Vol. 18, No. 1, p. 53-59, 1976. 5 fig., 1 tab., 9 ref.

Descriptors: *Chlorophyta, *Crustaceans, *Feeding rates, *Nitrogen compounds, Foods, *Plankton, Growth rates, *Food chains, *Nutrients, Sewage, Fertilizers.
Identifiers: *Dictyosphaerium pulchellum, Nutrient value.

The nutritive value of the green alga Dictyosphaerium pulchellum was investigated as a food for Daphnia longispina, D. magna, Simocephalus vetulus, Scapholeberis nucronata (Cladocera, Phyllopoda), Notodroma monacha (Ostracoda), Macrocyclops fuscus (Cyclopoida, Copepoda), and Diatpmus sp. (Calanoida, Copepoda). D. pulchellum was selected because it develops very well in diluted sewage containing large amounts of nitrogen compounds. Out of the seven crustaceans tested only Daphnia magna consumed Dictyosphaerium pulchellum in an amount attaining almost 16% of its body weight. The other species consumed very little of the alga. The nutritive value of the green alga was evaluated on the basis of the assimilation index, Ca/W bar=(R2)(Cr)(2400))/W bar %, where R2 is the sum of the animals' activity after the excretion of food and of the activity of respirated carbon in impulse/hr/individual, Cr is the reverse of specific activity in milligrams of dry weight per impulse, and W bar is the mean dry weight of an animal in mg. Assimilation indices were less than 1% for all species suggesting poor suitability of the alga for the crustaceans examined. (Luedtke-Wisconsin)
W77-07468

UPWELLING IN A MODEL OF AN INTERMONTANE LAKE,
For primary bibliographic entry see Field 5B.
W77-07469

AN ORGANIC CARBON BUDGET FOR AN OLIGOTROPHIC LAKE IN NEW HAMPSHIRE, U.S.A.,
M. Jordan, and G. E. Likens.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 994-1003, 1975. 3 fig., 3 tab., 23 ref.

Descriptors: *Carbon cycle, *Lakes, *Trophic level, *Eutrophication, Limnology, *New Hampshire, Phytoplankton, *Oligotrophy, *Pollutant identification, Gas chromatography.
Identifiers: *Mirror Lake(NH), *Organic carbon budget, Dissolved inorganic carbon, Dissolved organic carbon, Fine particulate organic carbon.

A complete organic carbon balance is presented for Mirror Lake, a small (15 ha) lake with a mean depth of 5.57 m and a maximum depth of 10.9 m with a mountainous, granitic drainage basin. The water is nutrient-poor, slightly acid and oligotrophic. The lake is usually dimictic and is ice-covered from mid-December to mid-April. In summer the thermocline is at a depth of 4-5 m and oxygen concentrations in the hypolimnion are often less than 0.5 ppm. Dissolved inorganic carbon (DIC) ranges from 0.84 to 5.88 mg C/1. Dissolved organic carbon (DOC) and fine particulate organic carbon were determined with an infrared gas analyzer. DIC was determined by gas chromatography. Results of these and other budgetary measurements show that autochthonous sources represent 83% of the total organic carbon inputs for the lake. Phytoplankton are the major producers, accounting for 90% of autochthonous inputs. Fluvial DOC is the most important allochthonous carbon source(47%). Of the total carbon inputs, 83% are lost through respiration, 7% by sedimentation and 10% by fluvial outputs. Parts of the budget are considered tentative, awaiting further studies on the lake. (Harris-Wisconsin).
W77-07470

ALGAL PRODUCTIVITY OF NATURAL AND ARTIFICIALLY ENRICHED FRESH WATERS IN MALAYA,
J. L. Richardson, and L. T. Jin.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1383-1389, 1975. 1 fig., 2 tab., 4 ref.

Descriptors: *Tropical regions, *Eutrophication, *Oligotrophy, *Fish farming productivity, Algae, Aquatic plants, Ponds, Photosynthesis, Electrical conductance, Soil types, Asia, Lakes.
Identifiers: *Malaya, Aquatic plant utilization.

Algal productivity in two natural lakes, several man-made reservoirs, fish culture ponds, and pools left by mining operations on the Malay Peninsula is described. The greatest contrasts were those between waters not intentionally enriched and those fertilized for fish culture. When unenriched by human activities, Mala yan waters have low algal production because local soils are mostly part granite, are highly leached and usually deep; this is in contrast to many other tropical areas that support productive lakes from young, volcanic soils and grassland wild animal habitats. Nutrient enrichment, however, has a marked effect on productivity. A pond fertilized for fish culture for three years more than doubled its conductivity and its algal production increased 14-fold. Rural inhabitants use both mining pools and specially-constructed shallow ponds for fish culture, and traditionally raise pigs and ducks as part of an integrated complex. Aquatic macrophytes are harvested from the pond and boiled down to form food for the pigs. Wastes from the sty are washed into the pond, promoting vigorous growth not only of macrophytes for the pigs but of algae which directly or indirectly feed the carp and ducks. Maximal production was recorded in a fish pond only 40 cm deep; rates near the surface were 18.7 mg oxygen/1/hr (gross) and 17.2 mg oxygen/1/hr (net). (Auen-Wisconsin).
W77-07471

POST-GLACIAL HISTORY OF MIRROR LAKE AND ITS WATERSHED IN NEW HAMPSHIRE, U.S.A.: AN INITIAL REPORT,
G. E. Likens, and M. B. Davis.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 982-993, 1975. 5 fig., 2 tab., 42 ref.

Descriptors: *Paleolimnology, *Sampling, *Cores, Lake sediments, *Lake basins, *New Hampshire, Sedimentation, Bottom sediments, Bottom sampling, Forest watersheds, Pollen, Glaciation, Pollutant identification.
Identifiers: *Mirror Lake(NH), Pollen analysis.

Analyses were made of a continous sediment core of 12.42 m length from near the center of Mirror Lake, New Hampshire, a small (15 ha) lake with a mean depth of 5.57 m and a maximum depth of 10.9 m with a mountainous, granitic drainage basin. The deposits represented an opportunity to quantify historical linkages between the lake and its terrestial watershed, using output data from the surrounding area. Samples of the sediment, carbon-14 dated at about 11,300 years old, were analyzed for organic carbon, total sulphur, phosphorus, and total calcium, magnesium, sodium, potassium, copper, zinc, aluminum and iron. Extractable amounts of the latter eight elements were determined by a separate technique. Pollen samples were also taken for analysis. As a result of analyses of the sample, the sediment profile of the lake was divided into four zones: Zone I, late glacial, extends from the bottom (1,242 cm) to about 1,125 cm and spans about 2,000 years (11,300-9,300 B.P.); Zone II, early post-glacial, extends from 1,125 cm to about 560 cm and spans about 4,500 years (9,300-4,800 B.P); Zone III, late post-glacial, extends from 560 cm to about 25 cm and spans about 4,600 years (4,800-200 B.P.); Zone IV, the recent cultural horizon, extends from 25 cm to the mud-water interface and spans about 200 years (200 B.P. to present). The fossil record of phytoplankton in the lake is presently being separately studied, in an effort to provide a better record of historical nutrient levels in the water. (Harris-Wisconsin).
W77-07472

THE STRUCTURE OF PHYTOPLANKTON ASSOCIATIONS IN LAKE TAHOE (CALIFORNIA-NEVADA),
P. J. Richerson, B. J. Dozier, and B. T. Maeda.
Verhandlungen International Vereinigung Limnologie, Vol. 19, Part II, p. 843-849, 1975. 5 fig., 19 ref. NSF GA-34099.

Descriptors: *Phytoplankton, *Biological communities, *Distribution patterns, *Environmental effects, Spatial distribution, Correlation analysis, California, Nevada.
Identifiers: *Lake Tahoe(Calif-Nev), Phytoplankton associations.

Phytoplankton associations and their diversity as related to the physical environment were investigated in Lake Tahoe and its Emerald Bay (essentially a separate lake, about 1/10th of the dimension of the main lake, connected over a 2.5 m-deep sill). These 1973 observations were a portion of a larger study to relate phytoplankton distribution as directly as possible to physical environmental conditions. Physical measurements included current speed, current fluctuations and temperature structure. Biological measurements included in-situ chlorophyll fluorescence and phytoplankton sample enumeration. Diversity spectra were analyzed by several techniques, including averaged and unaveraged methods. The observations confirmed the existence of spatial heterogeneity in phytoplankton associations. Even in the horizontal direction, patterns may exist on length scales ranging downward to about 200 m. The results were generally consistent both with the comparisons of chlorophyll and with turbulence measurements which showed divergence in the spectral form of chlorophyll and velocity variance at similar length scales. The cause for the lack of regular variation in phytoplankton community structure observed is obscure. (Auen-Wisconsin).
W77-07473

AREAL DISTRIBUTION AND STRATIGRAPHY OF DIATOMS IN THE SEDIMENTS OF LAKE SALLIE, MINNESOTA,
Geological Survey, Lakewood, Colo. Water Resources Div.; and Geological Survey, Denver, Colo. Geologic Div.
J. P. Bradbury, and T. C. Winter.
Ecology, Vol 57, No 5, p 1005-1014, 1976. 7 fig, 2 tab, 21 ref.

Descriptors: *Diatoms, *Ecology, *Eutrophication, *Lakes, *Sediments, Limnology, *Minnesota, Paleolimnology, Stratigraphy, Areal, Distribution.

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Identifiers: *Lake Sallie(Minn), *Areal distribution.

The patterns of modern diatom sedimentation in presently eutrophic Lake Sallie, Minnesota, have aided in elucidating the trophic changes in the lake caused by man's activities since the 1870s. The modern sedimentation patterns were determined from a transect of surface sediment samples taken through littoral and profundal zones of the lake and the trophic history is interpreted from the diatom content of two lake-sediment cores. The transect shows that, in this lake, diatom valves are mostly deposited in the area of their living habitats and are not homogeneously redistributed by lake currents. Planktonic diatoms Stephanodiscus sp. cf. S. hantzschii, Stephanodiscus niagarae, and Melosira granulata dominate in the profundal sediments, and sessile Fragilaria species characterize the sediments beneath the littoral habitat. Fragilaria construens var. binodis prefers nutrient-rich water entering the littoral zone near the inflow of the Pelican River, a stream carrying secondary sewage effluent from the town of Detroit Lakes. The Diatom stratigraphy indicates that the benthic and planktonic diatom communities have changed in species composition and probably in productivity as a result of cultural eutrophication. Spring-blooming Stephanodiscus sp. cf. S. hantzschii dominates the post-settlement record. A core near the Pelican River inflow shows a marked increase in Fragilaria construens var. binodis that probably reflects increased nutrient levels during the most recent history of Lake Sallie. (Woodard-USGS)
W77-07481

USE OF QUANTITATIVE CORRELATIONS BETWEEN MICROORGANISMS FOR RIVER POLLUTION EVALUATION, (IN RUSSIAN),
Ministerstvo Melioratsii i Vodnogo Khozyaistva, Vilnius (USSR).
For primary bibliographic entry see Field 5B.
W77-07482

WIND CONTROL OF ALGAE GROWTH IN EUTROPHIC LAKES,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5G.
W77-07497

AN INVESTIGATION OF COLLOIDAL ORGANIC PARTICLES ISOLATED FROM DIFFERENT POPULATIONS OF BIVALVES,
For primary bibliographic entry see Field 5A.
W77-07498

ASPECTS OF ZOOBENTHOS ECOLOGY OF THE MACKENZIE DELTA, N.W.T.,
N. B. Snow, and P. Chang.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1562-1567, 1975. 1 fig., 3 tab., 6 ref.

Descriptors: *Deltas, *Benthic fauna, *Canada, Varieties, Aquatic insects, Mollusks, Copepods, Crustaceans, Invertebrates, Estuaries, Arctic, Natural gas, Oil spills.
Identifiers: *Mackenzie Delta(NWT).

The 13,000 sq km Mackenzie Delta in the Canadian Artic area is a complex of sinuous channels and approximately half a million lakes, 95% of which are flood plain lakes. This investigation represents a preliminary data base of the region's aquatic fauna and factors controlling their distribution and abundance. Some macrophyte, phytoplankton and zooplankton collections were also made. Concern for the area is generated by hazards resulting from oil and gas development spills. The channels are impoverished habitates dominated by chironomid, ceratopogonid and caddis larvae and oligochaetes. Lake mollusc species are dominated by pelecypods, except for one Pisidium species which was peculiar to turbid lakes, and P. ferrugineum which was only found in clear lakes, Castropods showed a distinct separation into clear and turbid lake forms. Only four species occurred in both lake types, with greater diversity in clear lakes. Caddis larvae were distinctly separated into lake and channel species. Phryganeids dominated in lakes and hydropsychids predominated in channels. Two species of tanypodine chironomids were ubiquitous, but Tanypus was only found in clear lakes. Tanytarsine chironomids attained maximun numbers in lakes but one Tanytarsus and a Paratanytarsus species are ubiquitous. A single Diamesine species was found in turbid waters only. The dominant copepoda, cladocera, molluscs and insects and their habitats are listed. (Auen-Wisconsin).
W77-07499

PRELIMINARY ESTIMATES OF PRODUCTION BY A CALANOID COPEPOD IN SUBTROPICAL LAKE SIBAYA,
R. C. Hart, and B. R. Allanson.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1434-1441, 1975. 4 fig., 2 tab., 13 ref.

Descriptors: *Productivity, *Zooplankton, *Subtropic, *Copepods, Growth rates, Standing crops, *Africa, Estimating, Analytical techniques, Lakes.
Identifiers: *Lake Sibaya(South Africa), *Pseudodiaptomus hessei.

This production assessment of the copepod Pseudodiaptomus hessei represents an initial investigation of subtropical zooplankton productivity as exemplified in oligotrophic Lake Sibaya, South Africa. Data is given for egg development rates, duration of naupliar and copepodite instars, length-weight determinations, population age structure, standing stock and production. Mean standing crop of the 27-month investigation period was 5.704 mg dry wt/cu m and mean daily production was 2.458 and 0.634 mg dry wt/cu m/day, computed by Elster's and Winberg's methods respectively. Mean daily P/B ratios were 0.43 and 0.11. Seasonal changes in production of P. hessei correlate better with temperature than with chlorophyll, however an interaction of temperature and food availability is involved. Little is known of the subtropical or tropical zooplankton production. A 1971 study on Lake George, Uganda, reflects a highly eutrophic system unlike Sibaya, where the mean daily production of Thermocyclops hyalinus is more than 750 times as great as that of P. hessei on unit volume basis and nearly 140 times as great on unit area basis. The low P. hessei production in Lake Sibaya almost certainly reflects its inherent paucity, particularly of nitrogen and phosphorus, which lies on and is surrounded by recently exposed marine sands. (Auen-Wisconsin)
W77-07500

CHANGES IN PHYTOPLANKTON SPECIES COMPOSITION SINCE 1894 IN TWO LAKES IN EAST-HOLSTEIN, GERMANY,
B. Hickel.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1229-1240, 1975. 2 fig., 6 tab., 39 ref.

Descriptors: *Speciation, Phytoplankton, *Algae, *Biological communities, *Baseline studies, Foreign countries, Varieties, Eutrophication, Ecotypes, Lakes.
Identifiers: *Plussee(Germany), *Grosser Ploener See(Germany).

Data from two lakes in northern Germany are among the few examples of long-term phytoplankton investigations which enable a comparison of species composition over more than 50 years. The first plankton composition in Grosser Ploener See and in the Plussee, located in East-Holstein, Germany, were recorded in 1894 just before the onset of eutrophication. Comparisons are based on investigations during the years 1894-1908, 1921-1925 and 1929, and the most recent starting in 1964. These two lakes are naturally eutrophic and their trophic status has been further enhanced by agricultural runoff and from various other sources. Two tables list the phytoplankton species for the three investigation periods, showing marked changes in species composition and dominance. The number of species in the Plussee has decreased markedly within the last 80 years, but in the Grosser Ploener See it has remained almost constant (two species more than in 1893-1901). In the Plussee the number of chlorococcal green algae species has decreased whereas in the Grosser Ploener See they have increased. (Auen-Wisconsin)
W77-07501

THE EFFECT OF FOOD CONCENTRATION AND TEMPERATURE ON RESPIRATION AND EXCRETION IN HERBIVOROUS ZOOPLANKTON,
E. J. LaRow, J. W. Wilkinson, and K. D. Kumar.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 966-973, 1975. 3 fig., 1 tab., 20 ref. NSF AG-199, BMS 69-01147 A 09.

Descriptors: *Zooplankton, *Metabolism, *Respiration, *Water temperature, Food abundance, *Nitrogen, *Phosphorus, *Daphnia, Copepods, Statistical methods, New York, Lakes.
Identifiers: Excretion, Daphnia galatea mandotae, Diaptomus siciloides, *Lake George(NY).

Experiments are described which were designed to estimate effects of temperature and food concentrations on respiration and on nitrogen and phosphorus excretion for zooplankton, in the Lake George (N.Y.) ecosystem using Daphnia galatea mendotae and Diaptomus siciloides. The initial hypothesis was that respiration and excretion would directly reflect changes in feeding rates when organisms were exposed to different food concentrations. The latter have been shown to be curvilinear. However the resultant data were not curvilinear but linear in nature. The possible explanation for the linear response is that the experimental food levels were below the incipient level of food concentration. The organisms were starved for 48 hours prior to feeding experiments, causing them to feed at abnormally high rates for a short period of time. Hence what appears to be an exceptionally high incipient food concentration level is most likely an artifact due to the physiologically stressed organisms. Functional rates obtained in these experiments were generally greater than those reported in the literature but respiration values for all species, as well as the Daphnia excretion values, fell within the range of reported values. Comparative literature for limnoplankton respiration and excretion are presented, with data sets listing mean values for five replicates under each of the experimental conditions for both nitrogen and phosphorus excretion and respiration. (Auen-Wisconsin)
W77-07502

A SURVEY OF THE BIOLOGICAL LIMNOLOGY OF LAKE TITICACA,
C. Widner, T. Kittel, and P. J. Richerson.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1504-1510, 1975. 4 fig., 2 tab., 17 ref.

Descriptors: *Primary productivity, *Tropical regions, *South America, Biological communities, Lakes, Zooplankton, Phytoplankton, Biomass, Silica, Limnology.
Identifiers: *Lake Titicaca(Peru), Bolivia.

Lake Titicaca (Peru) supports an abundant and varied flora and fauna and provides important food resources for a human population of nearly one million local rural residents. Rainbow trout and silversides also supply the restaurants of near-

by Peruvian and Bolivian cities. The lake is situated at 3800 m altitude, impounds 820 cu km of water, with a total surface area of 7800 sq km and a maximum depth of 280 m. Primary production, phytoplankton, and zooplankton populations were generally sampled at 100 m depths. Annual primary production was 529 g/C sq m and biomass production was calculated at a conservative 4.02 million metric tons. Changes in phytoplankton populations tended to reflect changes in production. Zooplankton populations, dominated by Boeckella titicacae, varied little throughout the year. The general pattern of biological processes in Lake Titicaca resembled those of tropical East African lakes, especially Lake Victoria, as the low seasonal variations dampen the usual annual patterns of higher latitude lakes. Productivity varied relatively little and seasonal changes in the phytoplankton and zooplankton were muted. The general stimulatory effect of tropic latitudes on species diversity seemed to be directly reversed in the zooplankton assemblages, perhaps because of a strong temporal component in zooplankton niches. (Auen-Wisconsin)
W77-07503

LAKE IZABAL, GUATEMALA,
M. M. Brinson, and F. G. Nordlie.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1468-1479, 1975. 5 fig., 4 tab., 16 ref.

Descriptors: *Lakes, *Tropical regions, *Limnology, Rainfall, Areal hydrogeology, Geology, Bathymetry, Hydrology, Hydrologic budget, Water chemistry, Plankton, Benthos, Water temperature, Varieties, Fishing, Primary productivity.
Identifiers: *Lake Izabal(Guatemala), Central America, Guatemala, Polymictic lakes.

Limnological characteristics of tropical, lowland, polymictic Lake Izabal (Guatemala) are described. The lake lies a few meters above sea level, in a broad, nearly flat plain, has a maximum depth of 16 m near the center; thus most of its volume is below sea level. Most of the 50 rivers and streams discharge into the lake's eastern, northern and southern edges, but the greatest volume of water is received through the massive Polochic Delta to the west. The lake's outlet is at the northeastern extremity, where the Rio Dulce continues the drainage to Amatique Bay in the Gulf of Hunduras on the Carribean Sea. Two mountain ranges delimit the Izabal hydrologic unit--the Sierra de las Minas and the Montanas del Mico life end-to-end and parallel the southern boundary, while the Sierra de Santa Cruz and Sierra Chama create the divide to the north. Details are given of climate, (including rainfall), geology, bathymetry and hydrology, water temperature, water chemistry, and the planktonic and benthic communities. Dominant net plankton are diatoms, cyanphytes, chlorophytes, cladocerans, copepods, and rotifers. Fishing is of local importance, but is threatened by overexploitation. The annual gross primary productivity was estimated at 1400 g oxygen/sq m during 1972. (Auen-Wisconsin)
W77-07504

ANNUAL CONTRIBUTION OF CARBON, NITROGEN AND PHOSPHORUS BY MIGRANT CANADA GEESE TO A HARDWATER LAKE,
B. A. Manny, R. G. Wetzel, and W. C. Johnson.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 949-951, 1975. 7 ref. AEC AT-(11-1)-1599, COO-1599-84, NSF GB-28900X.

Descriptors: *Geese(Wild), *Nutrients, *Eutrophication, Waterfowl, *Carbon, *Nitrogen, *Phosphorus, Michigan, Canada goose, Animal wastes(Wildlife), Lakes.
Identifiers: *Non-point pollution, *Wintergreen Lake(Mich), Bird droppings.

The hypereutrophic condition of Wintergreen Lake, Michigan, is attributed to the droppings of more than 6000 migrant Canada geese which rest for 3-10 days during March, October, November and December on this 15-hectare hardwater lake. This nutrient source was measured on January 9-11, 1970 when the geese rested in a clearly-defined area on newly fallen snow covering the frozen lake. The average weight of the geese was 2.56 kg. During the three-day study each goose defecated an average dropping weighing 5.56 grams wet weight, or 1.17 g dry weight, 28 times per day. The average dropping contained, by weight: 79.30% moisture, 24.14% dry ash, 75.86% dry carbon, 4.38% dry nitrogen, and 1.34% dry phosphorus. Using a four-year average of 134,447 effective goose-use days, the average defecation rate of 28 times per goose, the average dry weight of a goose dropping of 1.17 g, and the average percentages of carbon, nitrogen, and phosphorus, migrant Canada geese were calculated to contribute 4404.8 kg dry weight of feces, 3341.24 kg of carbon, 192.92 kg nitrogen, and 59.02 kg phosphorus each year to Wintergreen Lake. These estimates do not include nutrients contributed to the lake by the year-round resident flock of 200 Canada geese or the more than 4200 mallard and diving ducks which use the lake each year. (Auen-Wisconsin)
W77-07505

UPTAKE AND RETENTION OF KUWAIT CRUDE OIL AND ITS EFFECTS ON OXYGEN UPTAKE BY THE SOFT-SHELL CLAM, MYA ARENARIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
W. C. Fong.
Journal of Fisheries Research Board of Canada, Vol. 33, No. 12, p. 2774-2780, 1976. 3 fig., 2 tab., 26 ref.

Descriptors: *Oil pollution, *Absorption, *Clams, Animal physiology, Respiration, Water pollution effects, *Canada, Oil spills, Water pollution effects.
Identifiers: Hydrocarbon effects, *Three Fathom Harbour(Nova Scotia).

This study, in which Mya arenaria from Three Fathom Harbour (Nova Scotia) were exposed to sea water to which crude oil had been added, tested the theory that the rate and extent of accumulation of petroleum hydrocarbons are affected by the lipid content of shellfish. Acute and prolonged exposure effects of oil on oxygen utilization by the soft-shell clams were also studied. The gills of this clam are capable of removing finely dispersed oil globules of 1-30 micrometer diameter from sea water along with food particles. Clams exposed to seawater concentrations of 90-380 microgram oil per liter for 10 days at 18C accumulated oil in their tissues. Concentrations incorporated are directly related to the lipid content of tissues. Approximately 6 mg oil per gram lipid was observed within the tissue of individual clams. Only one of three experiments demonstrated that Kuwait crude oil can cause significant increases in the respiratory rates of clams. Even these effects were only achieved in small clams (shell length 3.75-4.50 cm) after prolonged exposure to relatively high oil concentrations and high temperature (18C). Short-term exposure to high oil concentrations did not alter gill tissue respiration. Similarly, respiration rates of clams of various sizes were not significantly affected after exposure to low oil concentrations. (Auen-Wisconsin)
W77-07506

GRAZING EFFECTS ON NANNOPLANKTON IN GATUN LAKE, PANAMA,
E. T. Weers, and T. M. Zaret.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1480-1483, 1975. 2 tab., 5 ref. NSF GB 33396.

Descriptors: *Nannoplankton, *Grazing, *Zooplankton, Water chemistry, Food chains, Lakes.
Identifiers: *Gatun Lake(Panama Canal Zone), Ceriodaphnia cornuta, Diaptomus gatenensis.

Feeding habits of two abundant zooplankters, Ceriodaphnia cornuta and Diaptomus gatenensis, were experimentally investigated in an effort to relate their grazing to the 85% predominance of small green and blue-green phytoplankton cells in Gatun Lake in the Panama Canal Zone. The grazing decreased the nannoplankton species Cyclotella stelligera, Oocystis lacustris, Scenedesmus bifuga, Chroomonas, two chlorophytes, one flagellate, Synechocystis, and Dactylococcopsis irregularis. Ankistrodemus, one chlorophyta and two flagellates increased; Chrooccaceae cyanophyte and two other Cyanophytes did not change numerically. The unchanged species were spherical, probably all blue-greens with gelatinous matrices, and commonly 1-2 microns in diameter. They constituted an average of more than 75% of the total nannoplankton cells. Since these forms are well within the filtration range of these passively size-selective grazers, the presumption is that these dominant algal forms were ingested by the zooplankton but since their numbers were not reduced in the grazing experiments, they apparently were not eaten. The observations suggest that although in this lake any filter-feeding zooplankter will ingest a large number of algae particles, most have no nutritive value this explaining why the nannoplankton can maintain such numerical density. This may be the reason why the normal diurnal zooplankton densities rarely exceeded 10/l. (Auen-Wisconsin)
W77-07507

ROLE OF OLIGOCHAETES IN THE CIRCULATION OF WATER AND SOLUTES ACROSS THE MUD-WATER INTERFACE,
L. W. Wood.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1530-1533, 1975. 1 fig., 5 ref.

Descriptors: *Oligochaetes, *Mud-water interfaces, *Translocation, *Tracers, Rhodamine, New York, Water circulation, Path of pollutants.
Identifiers: *Canadarago Lake(NY).

The extent of movement water and dissolved materials from the water column into sediment by pumping action of oligochaetes was investigated in Lake Canadarago (New York), using rhodamine B as the tracer. The method relies on the high sorptive capacity and possible microbial degradation of the dye. A control experiment measured physical and microbial elimination of the dye and its results were used to determine the movement of water by the macroinvertebrates alone. While burrows exist to depths of 30-35 cm below the mud-water interface, work with tritiated water indicated that in reconstituted systems of 6 cm maximum depth, most of the circulation is limited to the upper 4 cm. This suggests that most of the pumping exchange by the oligochaetes may be related to respiratory rather than feeding movements. The results showed a considerable influx of water to the sediments, which must equal the volume of water containing solutes flushed from the sediments. In eutrophic Canadarago Lake the potential export of water from the sediments due to sludgeworm activity amounted to 51 to 107 ml/sq m/hr, thus they are not only ecologically important but are a factor in the transport of pollutants from the sediments to the water column. (Auen-Wisconsin)
W77-07508

STRATEGIES FOR EXISTENCE OF ZOOPLANKTON PREY IN HOMOGENEOUS ENVIRONMENTS,
T. M. Zaret.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1484-1489, 1975. 1 tab., 26 ref.

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Descriptors: *Selectivity, *Lakes, *Predation, *Zooplankton, Behavior, Resistance, Movement, Vertical migration.
Identifiers: *Pelagic waters, *Prey behavior, Prey selection.

Predator avoidance behavior by zooplankton is discussed, especially in pelagic lake waters, as it relates to the selective factor of the prey population and community structure. Different types of selective pressures from visual predators (primarily vertebrates) and grasping predators (invertebrates) exploit. In those instances where the prey coexists with its predator, its avoidance mechanism is by vertical migration, i.e., the potential prey species remain in deep waters during the day and appear in the surface waters only when reduced light deters the light-dependent planktivores' feeding. This behavior is exemplified by the calanoid copepod Diaptomus gatunensis and by Daphnia. To avoid non-visual grasping predators, prey that are too large to be captured or handled effectively can escape. It has been shown that planktivorous fishes do not actually select individual prey according to body-size, but rather by total visible pigmentation, concentrated mainly in the large compound eye with the body-size usually a direct correlate. This type of predation pressure can lead to changes in composition within a single species, so that a second morph, having a reduced total pigmentation, may appear in the population when fish predation is heavy. Other predation avoidance strategies employed by rotifers and crustaceans are by direct swimming or reduced motility. (Auen-Wisconsin)
W77-07509

SIMILARITIES AND DIFFERENCES IN THE CHEMICAL COMPOSITION OF WATERS FROM WEST, CENTRAL, AND EAST AFRICA,
For primary bibliographic entry see Field 5A.
W77-07510

SYMAP COMPUTER PROJECTIONS OF SUMMER ZOOPLANKTON POPULATIONS IN VAN LAKE, MONTANA,
For primary bibliographic entry see Field 7C.
W77-07511

BACTERIOLOGICAL STUDIES IN THE CIENAGA GRANDE (GREAT MARSH) OF SANTA MARIA, COLUMBIA, (IN SPANISH),
R. Jeske.
Mitt Inst Colombo-Aleman Invest Cient 'Punta De Betin' 8, p 17-32, 1976.

Descriptors: *Bacteriology, Bacteria, South America, E. coli, *Aquatic bacteria, *Salmonella, Salinity, Marshes, Water pollution, *Salt marshes, Water pollution.
Identifiers: Crassostrea-Rhizophorae, *Columbia(Cienaga Grande), Santa Maria(Columbia).

Among the aquatic bacteria of the Cienaga Grande halophilic forms predominate in the salinity range of brackish water. Their number further rises while the salinity decreases during the rainy season. Only at salinities below 10‰, however, the fresh water bacteria increase. They reach a temporary maximum at about 3‰ salinity. At the same time the halophilic flora decreases. Using the intestinal bacterium Escherichia coli as an indicator, a certain degree of pollution can be detected near the fishing villages, and rarely in the rest of the lagoon. Oysters, Crassostrea rhizoforae (100), were examined for Salmonella and gave negative results. Of 6 water samples collected between the lake dwellings of Bocas de Aracataca, 4 contained Salmonella. The present degree of pollution of the Cienaga Grande is not alarming with respect to the oyster fishery.--Copyright 1977, Biological Abstracts, Inc.
W77-07512

CALCULATION OF CALCIUM CARBONATE-CARBON DIOXIDE EQUILIBRIUM IN WATER AND MIXTURES OF WATER,
For primary bibliographic entry see Field 5A.
W77-07513

THE LENTIC AND LOTIC FRESHWATER TYPES OF MARION ISLAND (SUB-ANTARCTIC): A LIMNOLOGICAL STUDY,
J. U. Grobbelaar.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 949-951, 1975. 3 fig., 2 tab., 8 ref.

Descriptors: *Limnology, *Subarctic, *Antarctic, Lakes, Rivers, Chemical properties, Productivity, Morphology, Streams, Ponds, Lentic environment, Lotic environment.
Identifiers: *Marion Island(South Atlantic Ocean), Sub-antarctic.

Limnological characteristics of subantarctic Marion Island are described, including water chemistry, productivity, morphology, and the ecology of the small crater lakes, lava-lakelets, wallows, rivulets, creeks or streams. The volcanic island, situated at 46 35'S and 37 45'L, is exposed to a cold, wet and windy climate. The lentic bodies are shallow, with the littoral zone usually extending over the entire basin, and covered by a benthic algal felt lining. Their shallowness and prevailing strong winds preclude thermal stratification. Wind and wave action resuspend sediments, causing high turbidity. Humic acids leach from the surrounding peat deposits coloring the water light brown. The pH is 5.88 and mineral content varies between 15.2-1335.3 mg/l total ions. The bicarbonate content is low and the average alkalinity is 0.11 milliequivalents/l. Nitrogen and phosphorus were detectable only in biotically-fertilized waters. Major components of these waters are sodium, potassium, calcium, manganese, chlorine and sulfate; minor components are alkalinity, iron, nitrate-nitrogen, ammonia-nitrogen, and total dissolved phosphorus. The major ions duplicate those of sea water because the constant winds deposit seaspray and condense seawater in raindrops. Primary production in abiotic waters is among the lowest recorded in the world--0.01-0.05%. There are only two trophic levels: the first consists of phytoplankton and benthic algal felts; and the second, the herbivores represented only by zooplankton. Only the first trophic level may be present in wallows. (Auen-Wisconsin)
W77-07514

ALGAL RESPONSE TO NUTRIENT INPUTS IN SOME IOWA LAKES,
J. R. Jones, and R. W. Bachmann.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 904-910, 1975. 2 fig., 3 tab., 18 ref.

Descriptors: *Estimating, *Algae, *Standing crops, *Phosphorus, *Iowa, *Eutrophication, Agricultural runoff, Rainfall, Analytical techniques, Lakes.
Identifiers: *Nutrient budgets, Lake West Okoboji(Iowa), Lake East Okoboji(Iowa), Big Spirit Lake(Iowa), Gar Lake(Iowa).

If algal populations are controlled by annual phosphorus inputs and if plankton algae are able to use all the phosphorus made available, then maximum algal crop should be related the the potential phosphorus concentration; consequently this maximum would represent the largest standing crop attained from a given phosphoru load. This assumption was investigated by determining annual phosphorus inputs from agricultural runoff and rainfall to four Iowa lakes(West Okoboji, East Okoboji, Big Spirit, and Gar). On the average, 0.35 kg/ha of total phosphorus annually was lost from the watersheds during the three-year study. Rainfall contributed approximately 0.032 gm/sq m of phosphorus annually. Potential phosphorus concentrations differ among lakes and are inversely proportional to their hydrologic turnover times. The mean July-August chlorophyll-a value, representing the peak bloom, was used to represent maximum biomass and then regressed on the respective potential phosphorus concentrations. The lake with the highest potential phosphorus concentration had the greates chlorophyll concentrations, and lakes with proportionally smaller phosphorus inputs had smaller algal crops; also, the algal populations were responsive to annual inputs. This approach provides a means of using nutrient budgets to estimate algal standing crops. The relationships between potential phosphorus concentrations and summer algal crops explains the differences among lakes as well as muchof the year-to-year differences within a single lake.(Auen-Wisconsin).
W77-07515

THE RELEASE OF DISSOLVED ORGANIC CARBON FROM SUBMERSED AQUATIC MACROPHYTES: DIEL, SEASONAL AND COMMUNITY RELATIONSHIPS,
R. A. Hough, and R. G. Wetzel.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 939-948, 1975. 9 fig., 4 tab., 15 ref. AEC AT-C11-1)-1599, C00-1599-82; NSF GB-15665, GB-81018X, GB-40311.

Descriptors: *Carbon cycle, *Aquatic plants, *Photosynthesis, *Respiration, *Michigan, Bulrushes, Kinetics, Lakes.
Identifiers: *Dissolved organic carbon, *Lawrence Lake(Mich), Najas flexilis, Scirpus subterminalis.

Release of dissolved organic carbon(DOC) as recent photosynthate has been demonstrated in aquatic vascular plants and has been estimated to comprise about 4% of total fixed carbon annually in a hardwater lake. This reduction of net photosynthesis is detrimental to plant production but the organic release may be beneficial to the community production. DOC release from Najas flexilis and Scirpus subterminalis in axenic cultures and in Lawrence Lake, Michigan, was measured simultaneously with release of carbon dioxide in a C14-assay for photorespiration. Najas released DOC somewhat more rapidly in darkness than in light, with a surge following sudden darkness. Organic release rates were largely independent of oxygen and carbon dioxide concentration. Release kinetics suggested that glycolate was not extensively excreted by Najas but rather was oxidized in photorespiration. Organic carbon release from Najas cultures was greater in presence of epiphytic diatoms whereas release in presence of organic carbon in situ was relatively low in Najas in summer but increased 4-fold in the fall during senescence. Release rates in early afternoon were over 2-fold those in the morning and late afternoon. Release of organic carbon by Scirpus was lowest in fall and highest in the spring. (Auen-Wisconsin).
W77-07516

THE ROLE OF PHOSPHATE IN EUTROPHICATION. STIMULATION OF PLANKTON GROWTH AND RESIDENCE TIMES OF INORGANIC PHOSPHATE IN LAKE KINNERET WATER,
M. Halmann, and A. Elgavish.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1351-1356, 1975. 3 fig., 1 tab., 13 ref.

Descriptors: *Eutrophication, *Phosphates, *Nitrates, *Biomass, Algae, Growth rates, Limiting factors, Turnovers, Asia, Lakes.
Identifiers: *Lake Kinneret(Israel).

The effects of added nutrients on the plankton biomass and the influence of environmental factors on the residence time of dissolved phosphate in Lake Kinneret, Israel, were investigated. Bottle

tests were made on the growth stimulatory effect of added nitrate, ammonium, phosphate, nitrate + phosphate, iron and silicate ions, and vitamin B12 on the total biomass. Turbidity, dry weight and chlorophyll content were used as biomass measurements. Addition of phosphate significantly increased both the growth rate and the biomass production, while addition of phosphate + nitrate caused an even larger increase in biomass. Growth stimulation induced by added phosphate was most noticeable during winter and spring, and was less pronounced during late summer. The other added nutrients did not affect growth. The residence times of dissolved phosphate were measured, using P32-orthophosphate as a tracer. Residence times varied between winter and summer(water temperatures 14.5-30C)from several hours to about 13 minutes. Turnover of phosphorus was inhibited to various extents by additions of 3-(3,4-dichlorophenyl)-1, 1-dimethylurea, m-chlorocarbonylcyanide phenylhydrazone, and arsenate but was completely blocked by the addition of formalin. (Auen-Wisconsin).
W77-07517

THE INFLUENCE OF SPRING CIRCULATION ON ZOOPLANKTON DYNAMICS IN THE PLUSSEE,
W. Hofmann.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1241-1250, 1975. 11 fig., 8 ref.

Descriptors: *Zooplankton, *Spring, *Mixing, *Stratification, Niches, Distribution, Foreign countries, Seasonal, Lakes.
Identifiers: *Lake Plussee(Germany).

The effect of incomplete spring circulation on the zooplankton community and individual populations were investigated in Lake Plussee, Germany. It had been noted that many zooplankton populations exhibited an exponential growth rate after the ice break-up, generally with large changes in abundance and distribution within a short period. In 1970 the ice break-up occurred on April 20th, mixing only the upper 10M of the water column; conversely, in 1972 the ice break-up occurred on March 20th and before stratification began there was a total mixing of the water column. While the ice break-up occurred one month later in 1970 than in 1972, the maximum zooplankton abundance was as high as in 1972 due to the very rapid growth of rotifers. In contrast to the increase, abundance decreased at nearly the same time in both years. Both cladocerans and copepods were much more abundant in 1970 than they were in 1972. The 1972 conditions were advantageous for Keratella guadrata, Kellicottia longispina, Asplanchna priodonta, Bosmina longirostris, Eudiaptomus gracilis and Mesocyclops luecharti, whereas in 1970 Asplanchna girodi and Synchaeto pectinata were more abundant. The niche overlap was high in 1970 due to crowding of all populations in the 10 m of the water column, and contained a low diversity index. (Auen-Wisconsin).
W77-07518

RESPONSE TO EUTROPHIC SHAGAWA LAKE, MINNESOTA, U.S.A., TO POINT-SOURCE, PHOSPHORUS REDUCTION,
D. P. Larsen, K. W. Malueg, D. W. Schults, and R. M. Brice.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 884-892, 1975. 6 fig., 1 tab., 14 ref.

Descriptors: *Nutrient removal, *Phosphorus, *Lakes, *Tertiary treatment, Sewage effluents, Cycling nutrients, *Minnesota.
Identifiers: *Lake restoration, *Shagawa Lake(Minn.), Point-source pollution.

Changes brought about by the construction of a tertiary sewage treatment plant at Ely, Minnesota, and a subsequent 70% reduction of phosphorus loading to nearby eutrophic Shagawa Lake, are discussed. The average annual load of wastewater phosphorus to the lake from 1967 to mid-1974 was 5380 kg. Waste phosphorus loas was reduced to about 25% during 1973, when the treatment plant first went into operation. During 1973 and 1974 the lake had entered a phosphorus washout phase, approximately 50% more phosphorus leaving the lake than entering. However, Shagawa Lake appears to have reached a state of internal loading, especially during July and August, that contributes a sufficient amount of phosphorus to produce large algae crops. Mass balance estimates demonstrated that the internal phosphorus load during July-August 1971-1973 was sufficient to increase the average phosphorus concentration in the lake 1-2 microgram/1/day. Most of this internal load was redeposited during the fall overturn and thus had little influence on the annual calculations of the phosphorus budget. During 1973,the internal phosphorus load increased from 30 microgram/1 to more than 80 microgram/1, thus the projected improvement of the lake in two years was unattainable.(Auen-Wisconsin).
W77-07519

MEROMIXIS IN ULMENER MAAR (GERMANY).
K. M. Stewart, and E. Hollan.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1211-1219, 1975. 5 fig., 1 tab., 17 ref.

Descriptors: *Thermal stratification, *Lakes, Profiles, Foreign countries, Limnology, Water temperature.
Identifiers: *Meromixis, *Ulmener Maar(Germany).

Extensive changes noted in the temperature profiles of the Ulmener Maar, Germany, lead to investigations of whether this classic example of a spring-fed meromictic lake was undergoing changes in its stratification. Because of increased water usage from Ulmener Maar, the Jungfernweiher Reservoir was constructed on the north side of the lake between 1940-1945 by damming a small brook, which did not affect the lake. Water from the reservoir was directed through a tunnel to the lake to augment it's water supply. The intensive water use from the lake caused the water level to fluctuate more than 7 m over the years. The water was normally taken from drilled wells on the bank of the lake to provide 'bank filtered' water. About 1957, two wells were extended from approximately 5 m to 20 m below the mean water level to increase the water supply. Comparisons of oxygen and density values with historical records indicated that the water withdrawal, the water level fluctuations, and the inflow from the reservoir have apparently changed the strong meromictic condition of Ulmener Maar to one which is only marginally or irregularly meromicic, or to one with a very thin monimolimnion. (Auen-Wisconsin)
W77-07520

SOURCES OF NITROGEN AS A WATER POLLUTANT: INDUSTRIAL WASTE WATER,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5B.
W77-07521

OIL-OXIDIZING BACTERIA OF THE RIVER YENISEI, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Microbiology.
T. V. Koronelli, and V. E. Golimbet.
Biol Nauki (Mosc) 19(1), p 105-108, 1976.

Descriptors: *Aerobic bacteria, Isolation, *Lipids, Water pollution, Pollutant identification.
Identifiers: *Arthrobacter-Sp, Mycobacterium-Ceroformans, Mycobacterium-Paraffinicum, *Mycobacterium-Sp, Russian-SFSR, *River Yenisei(USSR), *Oil-oxidizing bacteria.

Different strains of Mycobacterium and Arthrobacter were isolated from the water of the Yenisei (Russian SFSR, USSR) and divided into 4 groups according to their cultural properties in hard medium with paraffin. The Mycobacterium and Arthrobacter strains differed in the qualitative composition of free lipids. The lipids of Mycobacterium sp. E-27 were similar to Mycobacterium paraffinicum, and the lipids of Arthrobacter sp. E-8 to Mycobacterium ceroformans.--Copyright 1977, Biological Abstracts, Inc.
W77-07532

MATHEMATICAL MODELS OF STRONTIUM-90 BEHAVIOR IN 'WATER-FRESH WATER FISH SPAWN' SYSTEM FOR PARTICULAR CASES OF RADIOACTIVE CONTAMINATION OF RESERVOIRS, (IN RUSSIAN),
Institute of Radiation Health, Leningrad (USSR).
S. Y. Sukal'skaya, I. A. Likhtarev, N. I. Mashneva, and A. A. Moiseec.
Zh Obshch Biol 37(3), p 459-470, 1976.

Descriptors: *Mathematical models, *Stronium radioisotopes, *Radioactivity, Reservoirs, Water pollution, *Spawning, Fish behavior.
Identifiers: *Strontium-90.

A 2-compartment model for 90Sr exchange in the water-fresh water fish spawn system is proposed. Systems of differential equations were examined which describe kinetics of 90Sr accumulation in and elimination from the fish spawn in some likely situations of aquatic radioactive contamination. Theoretical calculation results were compared to those of experimental studies of the time course of 89Sr accumulation and retention. The proposed model can be used for data interpretation and for designing further experiments.--Copyright 1977, Biological Abstracts, Inc.
W77-07539

DYNAMICS OF GAS BUBBLE FORMATION IN SALMONIDS,
Washington Univ., Seattle. Coll. of Fisheries.
L. S. Smith, D. L. Beyer, and B. G. D'Aoust.
Research in Fisheries, 1974, p 12-13. 2 fig.

Descriptors: *Fish diseases, *Fish physiology, *Animal pathology, *Laboratory tests, Methodology, Test animals, *Supersaturation, *Hydrostatic pressure, Argon, Helium, Neon, Bioassays, Coho salmon, Mortalities, *Salmonids.
Identifiers: *Gas bubble disease, Human medicine, Gas embolism.

Studies using fish with dissolved atmospheric gases can be utilized to test certain responses of fish that can be directly applicable to human diving physiology. Critical fish tissues were saturated with gas within 60 to 90 minutes. Fish tissues saturated to 115% are equilibrated to this gas level long before bubbles start to form. (Katz)
W77-07559

A BACTERIOLOGICAL INVESTIGATION OF MEAT PACKING PLANT EFFLUENTS IN THE PROVINCE OF ALBERTA WITH PARTICULAR EMPHASIS ON SALMONELLA,
Environmental Protection Service, Edmonton (Alberta). Northwest Region.
For primary bibliographic entry see Field 5D.
W77-07560

SALMONELLA IN POULTRY PACKING PLANT EFFLUENTS,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5D.
W77-07561

THE DISTRIBUTION OF RESIDUAL QUANTITIES OF DDT IN THE ORGANS AND TISSUES

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OF FISH OF THE KIEV RESERVOIR, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5B.
W77-07572

STUDIES ON THE TYPOLOGY OF BALTIC LAKES WITH DIFFERENT STATES OF EUTROPHICATION, (IN GERMAN),
For primary bibliographic entry see Field 5B.
W77-07576

LAKE RESTORATION BY BOTTOM WATER SIPHONING, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland).
For primary bibliographic entry see Field 5G.
W77-07577

MODELS FOR SIMULATION OF EUTROPHICATION OF LAKES FOR LAKE CONSTANCE (BODENSEE-OBERSEE): I. DATA FROM LAKE CONSTANCE USED IN SIMULATION MODELS, (IN GERMAN),
Baden-Wuerttemberg Landesanstalt Fuer Unweltschutz (West Germany). Inst. of Seenforschungs Fischereiwesen.
G. Wagner, and H. Wohland.
Arch Hydrobiol 77 (4), p 431-457, 1976.

Descriptors: *Eutrophication, Lakes, *Simulation analysis, *Model studies, Algae, Fertilizer, Water pollution, Data collections, *Phosphorus, Oxygen, *Phosphates.
Identifiers: *Lake Constance(Switzerland), Oxygen balance.

Simulation modeling data describing the water layers, the input and accumulation of P compounds, the quantity of algae and the balance of 02 in Lake Constance are presented. The data correlate with the time-dependent growth of the human population and to the sales of poly-phosphate and P fertilizers. --Copyright 1976, Biological Abstracts, Inc.
W77-07579

MACROPHYTES AND PHOSPHORUS IN LAKE ANDSJON, CENTRAL SWEDEN, (IN SWEDISH),
L. Thofelt, and L. Olden.
Fauna Flora (Stockh) 71(1), p 29-34, 1976.

Descriptors: *Phosphorus, Lakes, Farm wastes, Birds, Aerial photography, Vegetation, Biomass, Water pollution control, Algal control, Aquatic weed control.
Identifiers: Bird sanctuary, *Carex-Rostrata, *Macrophytes, *Phragmites-Communis, Reeds, *Lake Andsjon(Sweden).

Lake Andsjon, a bird sanctuary and nature preserve in central Sweden, is a shallow lake surrounded by agricultural land and housing developments. Due to manuring of the fields the phosphorus content of the lake frequently exceeds 20 micrograms P/dm-3 and the lake is becoming overgrown with reeds, primarily Phragmites communis and Carex rostrata. Ten sample plots were taken in the northern part of the lake and all vegetation was removed for biomass determinations. The areal extent of the vegetation was determined by means of aerial photos and through the ice in late winter. Of the 34.2 ha surface of the lake 37.1% was covered with Phragmites and 4.4% with Carex. The dry weight of vegetation per m2 of sample plot was 5000 g for Carex. Phragmites ranged from 600 g for thin stands up to 4100 g for dense stands. The P content per gram of dry matter was 1.7 mg in Carex roots and 1.2 mg in tops with comparable values for Phragmites of 1.1 and 0.68 for thin stands and 0.67 and 0.54 for dense stands. By removing the vegetation the P content would be decreased by 80% and new vegetation would be able to absorb most of the P entering the lake in the future.--Copyright 1977, Biological Abstracts, Inc.
W77-07582

STUDIES ON FUNGAL PROPAGULES IN THE WESER ESTUARY (GERMAN BIGHT): I. QUANTITATIVE DATA 1974, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
K. Schaumann.
Veroeff Inst Meeresforsch Bremerhaven 16(1), p 63-82, 1976.

Descriptors: *Bacteria, *Estuaries, Data collections, *Aquatic fungi, Seasonal, Nitrogen, Oxygen, Yeasts, Water temperature, Biochemical oxygen demand, Turbidity.
Identifiers: *Fungal propagules, *Mycelia-forming fungi, *Weser Estuary(Germany), German Bight.

As part of the Weser Estuary Research Program, initiated for the control of hydrographic and biological conditions in this habitat; the number of higher fungal propagules in the waters of the Weser estuary at Bremerhaven was determined monthly during a 1 yr period from Jan.-Dec. 1974, using the pour-plate method. Mycelia-forming fungi (Hyphomycetes) and yeast-like fungi occurred in numbers up to 145,800 and 135,600, respectively, and revealed striking seasonal variations, with high numbers in winter and much lower number in summer. This pattern was evident in the surface waters as well as in the near-bottom waters. During winter the fungal numbers in the latter was nearly twice as high as the surface. Similar fluctuations were exhibited by several hydrographic factors, e.g., turbidity, organic N, biological O2 demand, freshwater inflow, water temperature and number of heterotrophic bacteria. Whether the correlation between these factors and fungi is causal or parallel cannot be decided. The origin and activity of the fungal propagules in the ecosystem of the Weser estuary are discussed.--Copyright 1977, Biological Abstracts, Inc.
W77-07583

DATA 1973/1974 REGARDING HYDROGRAPHY AND WATER QUALITY IN THE WESER ESTUARY, GERMANY, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
S. Wellershaus.
Veroeff Inst Meeresforsch Bremerhaven 16(1), p 45-62, 1976.

Descriptors: *Bacteria, *E coli, Water quality, *Estuaries, Data collections, Salinity, Water temperature, Dissolved oxygen, Nitrogen, *Aquatic fungi, Water pollution.
Identifiers: *Weser Estuary(Germany).

At 6 positions between Esenshamm and Robbenplate monthly measurements were done of salinity, temperature, dissolved O2, 5-day biochemical O2 demand (BOD5), Kjeldahl-N, turbidity (light-attenuation), settling volume and pH. At 1 station, counts of bacteria including Escherichia coli, of higher fungi and of chytrid fungi were added. According to the water quality evaluation suggested by Liebmann (1969) and Hamm (1969) the Weser Estuary can be classified into class II-III, III, and III-IV, sometimes locally reaching class IV. Water quality is poorest within the turbidity cloud which develops near Bremerhaven and Nordenham, and a few Kilometers seaward of Bremen.--Copyright 1977, Biological Abstracts, Inc.
W77-07584

OUTBREAK OF CHIRONOMID MIDGE IN A POLLUTED RIVER AND THE CHEMICAL CONTROL OF THE LARVAE, (IN JAPANESE),
Kagoshima Univ. (Japan). Dept. of Medical Zoology.
For primary bibliographic entry see Field 5G.
W77-07585

STUDY OF BACTERIAL CONTAMINATION IN THE PORT MAHON HARBOR: EFFECT OF ECOLOGICAL CONDITIONS OF THE HARBOR, (IN SPANISH),
Instituto Espanol de Oceanografia, Palma de Mallorca (Spain). Coastal Lab.
For primary bibliographic entry see Field 5A.
W77-07588

HYGIENIC STANDARDIZATION OF DISODIUM SALTS OF META-AND PARA-DIISOPROPYLBENZENE IN WATER BODIES, (IN RUSSIAN),
Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR). Div. of Public Hygiene.
A. G. Ilichkina.
Gig Sanit 5, p 19-21, 1976.

Descriptors: Salts, Public health, Organic compounds, *Organoleptic properties, *Self purification, *Toxicity, *Lethal limit, Water quality standards, Water pollution.
Identifiers: *Benzene.

The effects of the disodium saltof digydroperoxide of m-diisopropylbenzene (Na-M) and that of p-duspropylbenzene (Na-P) on the organoleptic properties and self-purification processes of water were studied Toxicity stuties on greases and oils are used for extraction and concentration of surfactants from waters and wastes. The rdies were done with single and chronic oral administration to mice, rats and rabbits. The maximum permissible cecovery rate is 97 1% with vaseline oil in the conditions exposed. On this oil, surfactants may form colored complexes with ligands allowing direct colorimetric determinations. Different techniques are developed. --Copyrigoncentration of Na-P is 1 mg/1 and that of Na-M is 0.5 mg/1. The limiting index is toxicologic. --Copyright (c)ht (c) 1977, Biological Abstracts, Inc.
W77-07590

SELF-PURIFICATION IN THE COASTAL WATERS OF THE BLACK SEA, (IN RUSSIAN),
O. G. Mironov, L. N. Kiryukhina, M. I. Kucherenko, and E. P. Tarkhova.
Naukova dumka: Kiev, USSR, (1975), 143 p.

Descriptors: *Self purification, Bottom sediments, Water purification, *Oil pollution, *Bacteria, Marine life, Pseudomonas.
Identifiers: Bacillus, Chromobacterium, Microbacterium, Micrococcus, Mycobacterium, Pseudobacterium, USSR, Vibrio, *Petroleum oxidizing bacteria, *Black Sea.

The self-purification of the waters and bottom sediments of the coastal zone of the Soviet shores of the Black Sea (USSR) from petroleum is discussed. Data on the numbers, species composition, distribution and biochemical characteristics of petroleum-oxidizing bacteria are presented, and the physicochemical properties and processes of the transformation of organic substances from the marine bottom sediments are analyzed. Petroleum-oxidizing bacteria of the genera Pseudomonas, Pseudobacterium, Chrombacterium, Micrococcus, Microbacterium, Mycobacterium, Bacterium, Bacillus and Vibrio were isolated in the studied area. The capacity of this marine area for self-purification is evaluated. The monograph is intended for oceanographers, hydrobiologists, ichthyologists and those employed in fisheries, the marine fleet, hydrometeorological service and environmental protection.--Copyright 1977, Biological Abstracts, Inc.
W77-07592

FIRST INFORMATION ABOUT N, P NUTRIENTS AND THE PRODUCTION OF LAKE TRASIMENO, (IN ITALIAN),
Perugia Univ. (Italy). Istituto di Idrobiologia e Pescicultura.
M. V. DiGiovanni, F. S. Gianotti, L. Mantilacci, and O. Tiberi.
Riv Idrobiol 13(2/3), p 281-360, 1974.

Descriptors: *Nitrogen, *Phosphorus, Lakes, *Phytoplankton, *Nutrients, Air temperature, Water temperature, Seston, *Zooplankton, Water pollution.
Identifiers: Lake Trasimeno(Italy).

This research was carried out from May 1973-May 1974 in 3 stations of Lake Trasimeno: the central zone of the lake (pelagic zone), Monte del Lago (neritic zone) and La Frusta (neritic SE zone). Air and water temperature, depth, transparency, suspended matter, seston, nitrogen (total N on the filter, total N in the water: ammonia-N, N02-N, N03-N p (total p on the filter, total p in the water), phytoplankton and zooplankton were examined. Copyright 1977, Biological Abstract,. Inc.
W77-07593

PHYTOMICROBENTHOS OF THE KURTLI RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Botaniki.
K. Sadykov.
Izv Akad Nauk Turkm SSR Ser Biol Nauk 2, p. 50-55, 1976.

Descriptors: *Algae, *Benthos, *Cyanophyta, Diatoms, Reservoirs, Water pollution.
Identifiers: *Protococcal algae, *Kurtli Reservoir(USSR).

Plants (230) were recorded in the benthos of the Kurtli Reservoir (USSR). Included are diatoms, blue-green algae and some protococcal algae. The algae are characterized by a rich qualitative composition and intensive development during the summer-autumn period, in benthic silty sands in particular.--Copyright 1977, Biological Abstracts, Inc.
W77-07596

EFFECT OF ORGANIC ACIDS ON EXPERIMENTAL MANGANESE ISOLATION FROM BOTTOM SEDIMENTS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5B.
W77-07597

CUMULATION, DESORPTION AND MECHANISM OF ACTION OF ORGANOCHLORINE TOXIC CHEMICALS ON CESTODES OF FISHES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
O. N. Davydov, I. I. Perevozchenko, L. P. Braginskii, and G. Bal'on.
Parazitologiya (Leningr) 10(3), p. 238-244, 1976.

Descriptors: *DDT, *Pesticide residues, Carp, Toxicity, *DDD, *DDE, Pikes, *Fish parasites, Water pollution effects, Distribution, Chemical wastes, Chlorine.
Identifiers: *Amylolysis activity, Bothriocephalus-gowkongensis, *Cestodes, Desorption, Glycogen, Triaenophorus-nodulosus, *Organochlorine chemicals.

The distribution of residues of DDT and its metabolites (DDD and DDE) in tissues of Triaenophorus nodulosus and its host (pike) was studied. Cestodes can accumulate large amounts of organochlorine substances. The ability of Bothriocephalus gowkongensis (cestode of carp) to dechlorinate p, p-DDT and to excrete p,p-; o,p- and m,p-DDD from the organism was established. p,p-DDT decreased the glycogen content and caused increased amylolytic activity in the cestodes in acute tests. The effect of p,p-DDT on locomotor activity in the cestodes has 2 phases, the first associated with the muscular influence and the second with a neurotrophic effect. m,p-DDD (0.1 mg/1) was highly toxic to the locomotor activity of cestodes, as compared with the effect of p,p-and o,p-DDD.--Copyright 1977, Biological Abstracts, Inc.
W77-07598

STUDY OF BACTERIA ASSOCIATED WITH THE REARING OF LARVAE OF MARINE BIVALVES, (IN FRENCH),
Universite de Bretagne-Occidentale, Brest (France). Laboratoire de Zoologie.
D. Prieur.
Aquaculture 8(3), p. 225-240, 1976.

Descriptors: *Bacteria, *Algae, Larvae, *Nutrient requirements, Marine animals, Water pollution.
Identifiers: Antibiotics, *Bivalves(Marine), Mytilus-edulis.

Bacterial strains (81) associated with the rearing of marine bivalve larvae were isolated from different origins: unicellular algal cultures, filtered sea water, unhealthy larvae, Mytilus edulis spawn, and contaminating strains from the laboratory atmosphere. The ecological, bio-chemical and nutritional characteristics and the sensitivity to antibiotics of these strains were studied with the aid of 115 tests. This population appears to be similar to comparable populations studied by others. Complementary studies taking into account the quantitative and qualitative variations of each source of bacterial contamination are necessary and are now in progress. When these are complete, more efficient bacterial control of the breeding of marine bivalve larvae will be possible.--Copyright 1977, Biological Abstracts, Inc.
W77-07599

5D. Waste Treatment Processes

INTERACTIONS OF CUPRIC ION WITH HUMIC ACID,
Missouri Univ. Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-07104

USE OF CATION POLYELECTROLYTES FOR WATER PURIFICATION FROM VIRUSES, (IN RUSSIAN),
Academy of Municipal Economy, Moscow (USSR). Research Inst. of Public Water Supply, Water Purification.
For primary bibliographic entry see Field 5F.
W77-07108

NITRATE IN GROUND WATER AND ITS RELATION TO FERTILIZATION, (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
For primary bibliographic entry see Field 5B.
W77-07112

THE DEVELOPMENT OF REGIONAL INDUSTRIAL WASTE PROCESSING CENTRES,
Re-Chem International Ltd., Southhampton (England).
A. K. Coleman.
Water Pollution Control, Vol. 76, No. 1, p 67-74, 1977. 1 fig.

Descriptors: *Chemical wastes, *Treatment facilities, Industrial wastes, Pollution abatement, Chemical treatment, Waste disposal, Inorganic compounds, Organic matter, Filtration, Incineration, Laboratory tests, Sludge treatment, Waste water treatment, Dewatering, Design criteria, Legislation.

Legislation and increasing public concern have created a need for regional industrial waste treatment facilities in England. Alternatives to land disposal and discharge to receiving streams, such as chemical treatment, incineration, polymerization, recovery, and recycling are receiving much investigation. Design criteria for these regional centers should consider all possible safeguards against any type of environmental pollution that might result from the disposal scheme chosen. The Re-Chem International Regional Waste Treatment Center was discussed in detail. A major feature of this facility is strict laboratory control at all stages of each process. Inorganic wastes are treated by wet chemical processes to convert them into water soluble or insoluble derivatives which can be removed from the water. Recovery products are later dispatched to a purchaser. Non-recoverable materials are subjected to effluent filtration, gravity sludge thickening, dewatering by pressure filtration, and land disposal, pending laboratory analysis. Water produced by the process is analyzed for toxicity and treated by a 'polishing' chemical process for decontamination. Solids are passed to the filter cake disposal bins. Final effluent is subject to laboratory certification. Organic wastes are incinerated by a process having various automatic controls and safeguards to ensure proper operation. Odor from the treatment processes are controlled by air extraction systems and high incineration temperatures. The process is most applicable to wastes from the chemical industry. (Collins-FIRL)
W77-07205

PHENOL-SELECTIVE, HIGHLY RESISTANT RO-MEMBRANES MADE FROM PVA FOR THE PURIFICATION OF TOXIC INDUSTRIAL WASTES,
Erlangen-Nuremberg Univ. (West Germany). Institut fuer Technische Chemisches.
S. Peter, N. Hese, and R. Stefan.
Desalination, Vol. 19, p 161-167, 1976. 7 fig, 1 tab, 11 ref.

Descriptors: *Phenols, *Reverse osmosis, *Chemical wastes, *Membrane processes, Ion exchange, Separation techniques, Water purification, Chemical industry, Industrial wastes, *Waste water treatment.
Identifiers: *Polyvinylalcohol membranes.

Phenols have been amongst the most difficult chemical wastes to remove in water purification processes. Experiments using membranes of polyvinylalcohol (PVA) were conducted to determine their usefulness in removing phenols by reverse osmosis. Two types of membranes were used. One of them was formed by complexing PVA in an aqueous or organic solution with boric acid, precipitating by acetone and air-drying, solving in a solvent or solvent mixture, and drawing to size on a steel plate. The other was made by drawing a film of defined thickness on steel plates from a concentrated solution of PVA in water. This was also precipitated in acetone; both were crosslinked by immersion in a polyvalent metal ion solution. The membranes are insoluble in water, acids, bases, and the usual organic solvents. They are resistant to phenol up to 5 weight % and show a pronounced phenol selectivity. Retentions up to 90-95% were produced. (Collins-FIRL)
W77-07206

LARGE-SCALE REVERSE OSMOSIS PROCESSING OF METAL FINISHING RINSE WATERS,
Universal Oil Products Co., San Diego, Calif. Fluid Systems Div.
S. S. Kremen, C. Hayes, and M. Dubos.
Desalination, Vol. 20, p 71-80, 1977. 1 fig, 2 tab.

Descriptors: *Water reuse, *Reverse osmosis, *Heavy metals, Industrial wastes, Copper, Zinc, Salts, Chromium, Acids, Flocculation, Filtration, Polyelectrolytes, Filters, Waste treatment, Performance, Design, *Waste water treatment.

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Identifiers: *Metal finishing wastes.

Desalination is only one tool for augmenting potable water supplies. Another way to achieve this goal is to increase reusable water sources by purification. A reverse osmosis process and system were developed to purify a dilute waste stream from a metal finishing plant. The wastes contain copper, zinc, salts, acid, and chromium compounds. The chromium present in the waste water was precipitated for use a a flocculating aid by increasing the pH of the solution to 5.5; additional polyelectrolyte flocculant was added prior to filtration. After this treatment, the filtrate from the granular media filters generally had a turbidity of less than 0.2 turbidity units. The solution was acidified to prevent precipitation of the remaining metal salts during reverse osmosis. The waste was first concentrated by a factor of about 5, then the pH was raised again for further concentration to a 95% water recovery. Finally, the solution was acidified, chromate was reduced with sulfur dioxide, and caustic soda was added to precipitate the hydrous oxides of copper, zinc, and trivalent chromium. The resulting sludge, about 400 gallons per day, was landfilled. The plant performance, after shake-down, is in good agreement with design predictions. (Collins-FIRL)
W77-07207

CALCIUM CARBONATE IN THE REVOMAL OF IRON AND LEAD FROM DILUTE WASTE WATER,
Western Regional Research Lab., Berkeley, Calif.
E. Hautala, J. Randall, A. Goodban, and A. Waiss, Jr.
Water Research, Vol. 11, No. 2, p 243-245, 1977. 3 fig, 1 tab, 7 ref.

Descriptors: *Iron, *Lead, *Calcium carbonate, *Metals, *Waste water treatment, Water purification, Industrial wastes, Water reuse, Water quality control, Chemical wastes.
Identifiers: *Chemical treatment.

A treatment was investigated for acidic waste water containing iron and lead resulting from the production of lead storage batteries. The presence of these metals prevents recycling of the water for production and prohibits disposal to sewer systems. Acid mine waters and steel pickle liquor resemble this effluent in acidity and sulfate and soluble iron content. They have been treated by calcium carbonate. This treatment was attempted with storage battery waste waters. Simple settling with CaC03 did not remove enough iron to meet the water quality standards required for reusing the water. Some form of filtration using CaC03 was recommended. Powdered CaC03 added to a slurry concentration of neutralized waste water, which was then filtered, produced an effluent with less than 0.2 ppm of iron and a lead concentration of less than 0.3 ppm. Lead concentrations depended upon proper pH control. Further filtration through a bed of redwood bark produced an effluent suitable for recycling or disposal to a sanitary sewer system. (Collins-FIRL)
W77-07208

TOXIC WASTE DISPOSAL,
Clyde River Purification Board, Glasgow (Scotland).
For primary bibliographic entry see Field 5G.
W77-07209

WASTE WATER RECLAMATION SYSTEM UPS PRODUCTIVITY, CUTS WATER USE,
Beckman Instruments, Inc., Porterville, Calif.
J. E. Warnke, K. G. Thomas, and S. C. Creason.
Chemical Engineering, Vol. 84, No. 7, p 75-77, March, 1977. 1 fig, 1 tab.

Descriptors: *Water consumption(Except consumptive use), *Reverse osmosis, *Evaporation, *Water reuse, *Water purification, *Heavy metals, Industrial water, Industrial wastes, Waste disposal, Water quality control, Sludge treatment, Filtration, *Waste water treatment.
Identifiers: Solar evaporation ponds.

A waste water reclamation system, featuring reverse osmosis and a solar evaporation pond for metal wastes disposal, was installed at a California electronics plant. Objectives of the program were to reduce water use, improve reclaimed water quality, and reduce waste discharges which interfered with production. Sensors were installed on the plating line to monitor the conductivity of reclaimed water in the rinse tanks and to make necessary corrections. This reduced comsumption from 1.5 million to 750,000 gallons/month. Plating shop waste water was split into two streams. One, consisting of previously reclaimed rinse water containing tin, lead, palladium salts, pumice, silicates, or methylene-chloride and contaminated city water, flowed to the solar evaporation pond. Reclamation was not attempted. The other stream was pretreated and processed by the reverse osmosis unit. Nearly 90% of the contaminated concentrate from reverse osmosis was returned to pretreatment for recycling. The remainder was sent to the pond. Pretreatment consisted of filtration, pH adjustment, and algae growth prevention. The reverse osmosis unit was capable of processing 25 gallons/minute of waste at a design efficiency of 90%. A granular carbon filter unit was used as a final polish for reverse osmosis permeate, even though about 90% of the heavy metals were removed by the membranes. The solar pond was designed to accommodate a waste discharge of 6,000 gallons/day. It was estimated that sludge removal would not be necessary for fifty years. When sludge is to be removed, it will be processed for metals recovery. Costs of the system were offset by water reduction, increased product quality, and the replacement of other treatment systems. (Collins-FIRL)
W77-07210

ELECTROLYTIC TREATMENT OF CHROMATE AND CYANIDE WASTES WITH PACKED BIPOLAR CELL, (IN JAPANESE),
Kyoto Univ. (Japan). Dept. of Industrial Chemistry.
S. Yoshizawa, Y. Miyazaki, and A. Katagiri.
Nippon Kagaku Kaishi, No. 1, p 19-24, 1977. 8 fig, 3 tab.

Descriptors: *Electrolysis, *Aqueous solutions, *Liquid wastes, Chemical reactions, Chemical properties, Physical properties, Oxidation, Waste treatment, *Waste water treatment, Evaluation, Activated carbon, Particle size.
Identifiers: *Cyanide wastes, Chromate wastes, Power efficiency, Reaction rates.

A packed bipolar cell was used for the electrolysis of liquid wastes containing cyanide and chromate. Characteristics of the system were evaluated by testing K2Cr04 and KCN solutions under various conditions of particle material, particle size, and applied voltage. Chromate ion was reduced to Cr(OH)3 that deposited on packed particles and cyanide ion was oxidized to CN0(-) or C02 and N2. When the cell was packed with activated carbon particles, power efficiency and the reaction rate were higher than in conventional cells. Increased applied voltage reduced power efficiency and increased the reaction rate. The solution concentration probably determined optimum particle size and applied voltage. (Collins-FIRL)
W77-07211

ULTRAFILTRATION OIL RECLAMATION PROCESS,
Chester Engineers, Inc., Coraopolis, Pa.
A. F. Lisanti, and R. Helwick
Iron and Steel Engineer, Vol. 54, No. 3, p 60, March, 1977. 1 fig.

Descriptors: *Oil wastes, *Filtration, *Membrane processes, *Waste water treatment, Performance, Temperature, Sedimentation, Separation techniques, Industrial wastes, Heat treatment, Automatic controls, Water reuse.
Identifiers: *Ultrafiltration, Steel production.

An ultrafiltration process, using recovered oil as fuel and discharging separated water into a municipal sanitary sewer system was used to treat waste oil at three Pittsburgh, Pennsylvania, steel plants. No chemicals were added, no inorganic sludge was produced, and the effluent was free of floating oil. About 90% of the wastes was, by volume, and oil-in-water emulsion; 10% was tramp oil. The tramp oil was water insoluble and easily removed by quiescent settling and skimming. Water soluble oil emulsions were pumped through tubular membranes which retained oil droplets and suspended particles. Water and dissolved low molecular weight materials were passed through the membranes. The ultrafiltration membranes did not clog with contaminants. Backflushing removed any surface fouling. Productivity decreased as the feed concentration was increased. The temperature used should be the highest possible without creating short-term failure or long-term degradation. Normal operating temperatures were between 90 and 100 F. Safe operating pressures were found to be between 20 and 60 psig. The system also comprises a temperature indicator controller, pressure gauge switch assemblies, a flow meter, and an automatic purge system. Concentrated oily emulsions can be pumped to an available cooker where there is further oil and water separation. Sulfuric acid is added to facilitate this separation process and recovered oil is fed to a storage tank while the water is recycled to the ultrafiltration feed tank for retreatment. The system is reliable and flexible. (Collins-FIRL)
W77-07212

TECHNIQUES FOR PURIFYING OILY WASTE WATER,
Betz Labs., Inc., Trevose, Pa.
L. C. Hale, and D. Bauer.
Plant Engineering, p 131-133, March 17, 1977. 5 fig.

Descriptors: *Oil wastes, *Chemical treatment, *Polymers, Chemical degradation, *Waste water treatment, Water purification, Pollution abatement, Environmental control, Coagulation, Sedimentation, Flocculation, Industrial wastes.

Stricter environmental pollution regulations have forced industries to remove oily wastes from their effluents before discharging them into receiving streams or sewer systems. The removal of oil contaminants present many problems, but increased oil costs have given impetus to the search for suitable recovery methods. These alternatives were reviewed. Waste water from hot-strip-rolling mills, cold-rolling mills, and automotive and metal-forming plants is usually an oil-in-water emulsion. Polymers and emulsion breakers neutralize the repulsive charges between particles, precipitate or salt out emulsifying agents, or alter the interfacial film. Emulsion breakers for these wastes should be oil soluble and surface active. An acid and aluminum sulfate have been traditionally used; a newer method for coagulating and breaking emulsions is to use liquid cationic polymers. Separation by heat treatment can also be used for water-in-oil emulsions containing solids. Coagulation, flocculation, and sedimentation are used in combination to treat steel mill wastes. Refinery wastes are usually treated in gravity-type separators and then further treated in induced-air flotation units. Either batch or continuous processes can be used to remove oily contaminants. The former handles variations in waste composition better because the batches can be analyzed for specific final treatment. Continuous processes call for automatic controls to intensively monitor changes in waste composition. (Collins-FIRL)
W77-07213

INLINE SENSOR TIGHTENS CONTROL ON SLUDGE CONSISTENCY TO WITHIN 1.4-1.5% SOLIDS,
Crown Zellerbach Corp., Port Townsend, Wash.
H. Bolling, and K. Robe.
Chemical Processing, Vol. 40, No. 3, p 86-87, March, 1977.

Descriptors: *Filtration, *Automatic control, *Pulp wastes, *Sludge treatment, Solid wastes, Liquid wastes, *Waste water treatment, Equipment, Filters, Waste disposal, Efficiency, Performance, Pulp and paper industry.
Identifiers: Clarifiers, Kraft mill, Port Townsend(WA).

An inline viscosity sensor for the automatic control of clarifier underflow was developed to improve sludge consistency in the 1.4-1.5% solids range for a kraft mill in Port Townsend, Washington. The sensor element is attached to a measuring shaft and a propeller is attached to the drive shaft. The shafts are connected by a rubber torque coupling. The propeller feeds the sensing element with pulp of actual consistency and as the element rotates through the pulp, a movement is produced on the measuring shaft. The relative torque of the measuring shaft to the drive shaft is measured according to the force balance principle and a signal linear to consistency is provided. This signal directs a controller to open or close a valve which adds enough higher solids stock or water to attain the needed viscosity range. This process is very useful for dewatering sludges from clarifier underflows. The filter has a permanent, stainless steel coil spring arrangement in a corduroy fashion around the drum, producing a greater projected drainage area. The arrangement of the spring layers allows complete media washing and positive cake discharge. Sludge is continuously fed from the filter to the press where two revolving press wheels with perforated screen plate facings carry sludge to the point of maximum pressure. Easy discharge of the press cake into the discharge mechanisms is provided. The system recovers three tons/day of pulp to be burned for heat recovery. It requires little operating labor and low maintenance. (Collins-FIRL)
W77-07214

REDUCED WATER DEMAND--RESULT OF SWEDISH ANTI-POLLUTION PROGRAM,
M. Falkenmark.
Ambio, Vol 6, No 1, p 66-70, 1977. 7 fig, 2 tab, 10 ref.

Descriptors: *Water supply, *Water utilization, Water users, *Pollution abatement, Pulp and paper industry, Water purification, Legislation, Economics, Water reuse, *Waste water treatment, *Water demand.
Identifiers: Resource recovery, *Sweden.

Considerations involved in the reduction of a Swedish water demand were described. Antipollution and environmental protection legislation, as well as administrative, technological, and economical factors contributed to this reduction. The hydrologic conditions of Sweden were described and reviewed. Industrial water consumption and means of reducing it were illustrated by the example of the pulp and paper industry, the largest water user in Sweden. Modifications of existing and new mills and new techniques applied to reduce and treat discharged waste effluents contributed to environmental protection efforts. Water purification and water reuse have reduced the demand for water supplies. External methods of waste water treatment are generally not practiced. It was estimated that using the best available and most economically feasible treatment methods could reduce this industry's freshwater demand to about one-third of its 1971 usage. (Collins-FIRL)
W77-07215

AN OZONE REACTOR FOR COLOR REMOVAL FROM PULP BLEACHERY WASTES,
P. B. Melnyk, D. Judkins, and A. Netzer.
Tappi, Vol 60, No 3, p 97-100, March, 1977. 4 fig, 2 tab, 8 ref.

Descriptors: *Color, *Ozone, *Bleaching wastes, *Pulp wastes, Chemical reactions, *Mass transfer, Waste treatment, Pulp and paper industry, Costs, Industrial wastes, *Waste water treatment.
Identifiers: *Ozone reactors.

An experimental ozone reactor was used to investigate color removal from pulp bleachery wastes. The influent was from a softwood kraft pulp mill with a color concentration of 1300-1400 milligrams/liter. Kinetic data revealed that color removal rates were determined by chemical reaction and mass transfer. These rates are strongly dependent upon chromogenic lignin concentrations. Ozone concentrations had some effect on color removal, but reactor temperature was of slight effect. BOD increased when color removal was less than 50%, and both COD and BOD decreased by about 40% when color removal approached 90%. At color concentrations of 500 milligrams/liter or less, color removal rate decrease and ozone uptake rate increase were exponential. The capital and operating costs for this process would best be kept to a minimum by either reducing the ozone production cost or the ozone requirement, rather than by increasing color removal rates. (Collins-FIRL)
W77-07216

DESIGN CONSIDERATIONS OF FOAM SEPARATION PROCESS FOR DETOXIFICATION OF KRAFT EFFLUENTS,
B. C. Research Ltd., Vancouver.
K. S. Ng, and P. Temoin.
Pulp and Paper Canada, Vol 78, No 2, p 37-42, February, 1977. 1 fig, 9 tab, 9 ref.

Descriptors: *Foam separation, *Pulp wastes, *Design criteria, Industrial wastes, Toxicity, Aeration, Liquid wastes, Bleaching wastes, Water pollution sources, Pollution abatement, Costs, Equipment, *Waste water treatment.
Identifiers: *Detoxification(Kraft mills).

Design criteria were presented for a process to detoxify kraft mill effluents by foam separation. All considerations were for a plant with a 25 mgd flow. The jet aeration system was recommended for foam generation because it produces very uniform bubbles and foaming is copious. A thorough mixing motion is produced from a strong plume, and the system appears to be the most consistent in the production of fine bubbles. It also is simple to operate and requires minimum maintenance expenses. The turbine-centrifugal system used for black liquor oxidation systems in many pulp mills is recommended for large-scale foam breaking. It produces a suction force which improves the rate of foam removal. Commercial turbine systems can be installed over the top of a foam separator. This has the advantage of equally distributing the suction force over a large foam surface. Separate discharge of collapsed foam to a foam treatment system is an integral component of the design. Operating costs were estimated to be $2.44/ton of pulp for a 25 mgd foam separation plant, including foam treatment and foam breaking, based on 1975 costs. (Collins-FIRL)
W77-07217

GREAT LAKES PAPER LAUNCHES FIRST CLOSED-CYCLE KRAFT PULP MILL.
Paper Trade Journal, Vol 161, No 6, p 29-32, March, 1977. 3 fig.

Descriptors: *Pulp wastes, *Bleaching wastes, Water pollution sources, *Water reuse, *Pollution abatement, Pulp and paper industry, Waste treatment, Liquid wastes, Industrial wastes, *Waste water treatment.
Identifiers: *Closed-cycle kraft mill.

A bleached kraft market pulp mill with a closed-cycle effluent treatment system was constructed in Canada. The process consists of recycling bleach plant effluents through a standard black liquor recovery cycle and separating salt from the resulting white liquor. This salt is the basic material for manufacturing chlorine dioxide. Changes in operating procedure involve the replacement of chlorine with chlorine dioxide in the first bleaching stage, high-temperature chlorination, and countercurrent washing during the bleaching cycle. White water is recycled for further use, and small amounts of freshwater are used to prevent evaporator overloading. The screening and cleaning systems are closed. The installation of special equipment allows salt recovery. This system's advantages are: lower steam consumption with greater steam production; a 1% decrease in fiber loss from screening, washing, and other operations; a 1% increase in bleached pulp yield; lower consumption of bleach chemicals; reduced salt cake and defoamer use; lower water consumption, and the elimination of external waste treatment. (Collins-FIRL)
W77-07218

FIFTY MILLION DOLLARS IS A LOT OF FISH,
L. Webster, and F. Stevens.
Pulp and Paper Canada, Vol 78, No 3, p 11-13, March, 1977. 1 fig.

Descriptors: *Treatment facilities, *Water reuse, *Water purification, Industrial wastes, Pulp wastes, Pulp and paper industry, *Waste water treatment, Pollution abatement, Water pollution sources, Water quality control, *Canada.

A spent liquor recovery plant is being constructed at Port Alice, British Columbia, to bring an ammonia-base sulfite mill effluent discharge up to levels needed to meet environmental protection requirements. Pulp from existing digesters will be discharged to a new blow tank and washed pulp will go to stock tanks, while 90-95% of the red liquor will be filtered for residual fiber removal and passed to the feed tank of the multiple-effect falling-film evaporator. The processed liquor, containing 48-50% solids, moves to the recovery boiler via the storage tanks. High-pressure steam from the boiler will drive a turbogenerator. All NH3 is burned and SO2 in the flue gas is absorbed in aqueous ammonia. Hot water is to be recovered by heat exchangers. Ammonium bisulfite liquor is filtered, stored, and pumped to the acid plant. (Collins-FIRL)
W77-07219

THE DESALTING AND RECYCLING OF WASTE WATERS FROM TEXTILE DYEING OPERATIONS USING REVERSE OSMOSIS,
Mansoura Univ. (Egypt). Dept. of Mechanical Engineering.
A. M. El-Nashar.
Desalination, Vol 20, p 267-277, 1977. 6 fig, 4 tab, 2 ref.

Descriptors: *Dyes, *Textiles, *Reverse osmosis, *Desalination, *Water reuse, Pilot plant, Separation techniques, Industrial wastes, Waste treatment, Water purification, Waste water treatment, *Recycling.

The role of reverse osmosis in desalting and recycling textile dye waste waters was investigated. A pilot plant was constructed containing a precast membrane reverse osmosis loop and a dynamic membrane loop. The membrane materials used were polyamide, in a hollow fine fiber configuration; cellulose acetate, in spiral wound and tubular configurations; and hydrous ZZr(IV)-polyacrylate, in a tubular configuration. Dye process waste water was separated into a stream rich in salts and dyes and a purified water stream. The membranes suffered from a tendency to

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become fouled with the inorganic or organic colloids in the feed solution. Flushing with tap water after each loop shut down prevented bacterial growth on the membranes. The feed was subjected to prefiltration and pH adjustment before reverse osmosis was applied. The test results indicated that the product water from each module could be recycled in the dyeing process. (Collins-FIRL)
W77-07220

DYEHOUSE WATER TREATMENT WITH CATALYTIC OXIDATION.
International Dyer, Textile Printer, Bleacher, and Finisher, p 176, 179-180, February 18, 1977. 1 fig.

Descriptors: *Dyes, *Oxidation, *Pilot plants, *Textiles, Industrial wastes, Liquid wastes, Treatment facilities, Biological treatment, Equipment, Desalination, Sedimentation, Organic matter, Flocculation, *Waste water treatment.
Identifiers: *Catalytic oxidation, Chemical treatment.

A pilot study was conducted for the treatment of effluents from a British dyehouse. Problems involved in treating these effluents included: variations in the amounts of waste water impurities, pH values, temperature, suspended matter, and salt content. Effluent regulations and the availability of water are also important considerations. Several means of treatment are available. The effluent can be diluted with city effluent at a rate of 1:6 or 1:8 in a biological sewage treatment plant, or it can be pretreated before passage to biological treatment plants. In the latter case, it may be neutralized by combustion gas or neutralized and chemically precipitated with ferric sulfate or aluminum sulfate. Chemical precipitation leads to sediment problems. A multi-stage treatment scheme based on catalytic oxidation from organic matter, was developed to treat effluents which are to enter municipal treatment plants, to be discharged to a river, or to be used for complete water recycling. There is a compensating basin for buffering the concentration. An oxidation stage decolors effluent and oxidizes organic matter, producing organic matter reductions of 30-60%. The remaining organic matter is removed by coagulation with the aid of flocculating agents. Polyelectrolytes can accelerate the sedimentation of flocs. The sediment is dehydrated and disposed. A two-stage desalination unit is designed for a residual salt content of 500-700 milligrams/liter. The process can reduce COD by 85-95%. (Collins-FIRL)
W77-07221

PURIFICATION OF INDUSTRIAL WASTE WATER CONTAINING ORGANIC IMPURITIES--BY CONTACTING WITH ADSORBENT POLYMER MATERIAL IN SOLVATED GEL STATE.
Netherlands Patent NL 7606-582. Issued December 21, 1976. Derwent Netherlands Patents Abstracts, Vol Y, No 2, p D2, February 18, 1977.

Descriptors: *Patents, *Water purification, *Textiles, *Polymers, *Waste water treatment, Surfactants, Pollution abatement, Temperature, Separation techniques, Industrial wastes.

A patent was issued for a waste water purification system for the textile industry. The process involves contacting water with an adsorbent polymer material in a solvated gel state. About 100% of the contaminants are eliminated and treated water can be recycled. Anionic, cationic, and nonionic surfactants are also removed by this process. Any number of adsorbent polymers may be used. A temperature up to 100 C can be used, but the most effective range is between 10 and 70 C when employing a fixed bed process. The most effective polymer is of a hydrated gel with a molecular weight of 500, and a specific surface of 30 sq m/gram. A synthetic thermoplastic polymer in a spun fiber form with a thickness of 0.2-20 denier is preferred. Other useful polymers include a polyamide, an anionically modified polyamide, a linear polyester, and a linear polyester modified with an acid or an acrylonitrile polymer. Other applications are in the paper, leather, and dye industries. (Collins-FIRL)
W77-07222

TREATING EFFLUENT CONTAINING IONIC COMPOUNDS PREFERABLY DYES--BY ADDING SALT GENERATOR OF OPPOSITE CHARGE TO EFFLUENT ION THEN ULTRAFILTERING.
French Patent FR 2302-122. Issued October 29, 1976. Derwent French Patents Abstracts, Vol Y, No 1, p D3, February 14, 1977.

Descriptors: *Patents, *Filtration, *Tannery wastes, *Ion exchange, Salts, Liquid wastes, Waste treatment, Industrial wastes, Membrane processes, *Waste water treatment, Chemical reactions, Separation techniques.
Identifiers: Ionic compounds, *Ultrafiltration.

A patent was issued for a process to remove water-soluble ionic compounds from aqueous solutions. A water-soluble salt generator with a high molecular weight and a charge opposite that of the ionic compound is added. This is followed by ultra-filtration under pressure. A semi-permeable membrane allowing for high flow rate may be used with this process, although it would have been impractical for filtering untreated effluent. The method is suitable for treating tannery effluents containing ionic tanning agents or low concentrations of dyes. (Collins-FIRL)
W77-07223

TWO NEW METHODS OF SLUDGE REMOVAL,
Vallero, Cesare and Figli, Turin (Italy).
P. Vallero.
The Leather Manufacturer, Vol 94, No 2, p 10-13, February, 1977.

Descriptors: *Tannery wastes, *Sludge treatment, Equipment, Sedimentation, *Filtration, Solid wastes, Industrial wastes, Dewatering, Chrome, Lime, Polyelectrolytes, Polymers, *Waste water treatment, Sludge disposal, *Filters.
Identifiers: Resource recovery, *Rotary filters, *Idronova hydrodynamic filters.

An Italian manufacturer has developed two new sludge disposal methods, the Idronova hydrodynamic filter, or sedimentator; and the Idronova rotary filter, or sludge concentrator. The sedimentator removes sludge from hair pulp solutions to allow recycling of sulfide, settles and regenerates chrome from exhaust chrome liquors, and clarifies and settles all tannery effluents. The sludge concentrator can dewater tannery sludge from 2 to 3% total solids to about 20% at up to 1600 imperial gallons/hour. This unit is self-cleaning, automatic, uncomplicated, and can concentrate precipitated chrome to 1/10 its original volume. The sedimentator can permit continuous recycling of lime liquors. About 50-70% of the sulfide can be salvaged, restrengthened, and reused. One advantage of this method is a smoother, softer leather. BOD5 reductions also occur, but percentages of reduction are not available. The sedimentator can also be used as a filter, in addition to providing skimming and settling without moving parts. Chrome recovery can be accomplished in a similar manner with the addition of polyelectrolyte to aid coagulation and settling. The rotary filter accomplishes chrome recovery with the aid of polymers. It is a rotating screen along which solids are moved by baffles. Chemical and biological treatment may be necessary with these methods if sewage limits are exceeded. (Collins-FIRL)
W77-07224

A MINI-POLLUTION TANNERY,
Environmental Protection Agency, Kansas City, Mo. Region VII.
W. L. Banks.
Journal of the American Leather Chemists Association, Vol. 72, No. 2, p 62-68, February, 1977. 1 fig.

Descriptors: *Tannery wastes, Water pollution sources, *Pollution abatement, Waste treatment, Industrial wastes, Water purification, Water reuse, Treatment facilities, Equipment, Biological treatment, Environmental control, *Waste water treatment, Design criteria, Costs.
Identifiers: Chemical treatment.

A tannery design was proposed to avoid or reduce potential pollution problems. Recommendations were presented for handling the hide in an efficient manner. Various chemical and biological treatment processes for production waste streams were discussed in terms of the different process steps involved. Automatic control of solution quantities and computer calculation of variables, such as times, weights, temperatures, and ingredients were suggested. Reusing purified water and reclaiming chemical and metal resources were primary concerns. Two processing systems were considered for the pollution treatment section. One was a conventional physical, chemical, and biological process. The other employed dilution with a silt laden stream. It was noted that this tannery design was a hypothetical one which assumed unlimited financial resources for implementation. (Collins-FIRL)
W77-07225

PURIFYING WASTE LIQUOR CONTAINING SULPHIDE, SULPHITE AND THIOSULPHATE-ALKALINE OXIDATION FOLLOWED BY ACID OXIDATION, USING OXYGEN.
Belgian Patent BE 844-891. Issued February 7, 1977. Derwent Belgian Patents Abstracts, Vol. Y, No. 6, p D4, March 16, 1977.

Descriptors: *Patents, *Oxidation, *Sulfur compounds, Industrial wastes, Liquid wastes, Pulp wastes, Pulp and paper industry, Oxygen, Chemical reactions, Water purification, Air pollution sources, Pollution abatement, *Waste water treatment.

A patent was issued for an oxidation process to treat waste liquor containing sulfides, sulfites, thiosulfates, or their mixtures. The effluent is reacted with oxygen at pH 7, at 20-200 C, and under approximately 20 bars pressure for the conversion of sulfide to thiosulfates. The water is then treated with oxygen, under the same conditions, at pH 0-5 or, if it only contains sulfites, at pH 0.8. This is done in the presence of catalysts to form sulfates with sulfur if the liquor contains sulfides and/or thiosulfate. Effluents from the paper and dye industries are treated by this process. With this method rapid oxidation to sulfate occurs at low temperatures and pressures. Air oxidation is slow, and if sulfite is present, sulfur dioxide is formed which produces atmospheric pollution problems. (Collins-FIRL)
W77-07226

EVAPORATION AND THERMAL OXIDATION OF LIQUID EFFLUENTS--BY BURNING WITH FLAME IN COMBUSTION CHAMBER.
French Patent FR 2302-483. Issued October 29, 1976. Issued October 29, 1976. Derwent French Patents Abstracts, Vol. Y, No. 1, p D5, February 14, 1977.

Descriptors: *Patents, *Oil wastes, *Evaporation, *Oxidation, Heat treatment, Industrial wastes, Equipment, Fuels, *Waste water treatment, Waste disposal, Toxicity, *Incineration.
Identifiers: *Thermal oxidation.

A patent was issued for a process to treat effluents containing toxic products from refineries and plants which chemically treat petroleum products. A continuous evaporation process is created and combustible substances are burned and eliminated by thermal oxidation. The effluent is vaporized by convection currents in the combustion chamber. Solid wastes can be burned along with the effluent products by mixing with the fuel. (Collins-FIRL)
W77-07227

P. L. 92-500 V LOCAL PRIORITIES,
Brown and Caldwell, Seattle, Wash.
R. C. Bain.
Water and Wastes Engineering, Vol 13, No 7, p 72-74, 101, July 1976.

Descriptors: *Priorities, *Water policy, *Federal Water Pollution Control Act, Treatment, Water pollution treatment, Water treatment, Treatment facilities, Water law, Water pollution, Water quality, Constraints, Legal aspects, Secondary treatment, Water quality standards, Water quality control, Regulation, Planning, Facilities, Flexibility, Local governments.
Identifiers: *National Environmental Policy Act, *P. L. 92-500, *Federal Water Pollution Control Act(FWPCA) Amendments of 1972, Merit alternatives, Environmental risk maps.

PL 92-500 calls for blanket secondary treatment for all plants discharging to surface waters regardless of local water quality needs. Current Environmental Protection Agency (EPA) priorities also focus on treatment plant upgrading. However, in many areas such as Seattle, treatment plant upgrading raises site questions associated with local land and shoreline use. In some instances adherence to the mandate of PL 92-500 will produce no measurable water quality benefit to surrounding waters. To enable more relevant pollution control measures to be pursued at a local level, flexibility in the law is needed. In Seattle, the strategy for meeting the 1983 Water Quality goal has been to develop merit alternatives which favor solving local concerns such as combined sewer overflow control. These merit alternatives are not constrained by the legal requirements of PL 92-500. To ensure effective application of these merit alternatives, priority systems are being developed with the aid of environmental risk maps. A comparison of the costs and benefits associated with the legal alternatives of PL 92-500 and those of the merit alternatives will provide a forum for debate over these two approaches to water quality control. (Petruff-Florida)
W77-07229

BRACE RESEARCH INSTITUTE, ANNUAL REPORT, (1976),
Macdonald Coll. Montreal (Quebec). Brace Research Inst.
For primary bibliographic entry see Field 3A.
W77-07242

THERMAL POLLUTION AND ITS CONTROL,
Washington Univ., St. Louis, Mo. Dept. of Chemical Engineering; and Washington Univ., St. Louis, Mo. Program in Technology and Human Affairs.
For primary bibliographic entry see Field 5G.
W77-07245

HOW THE ARMY DOES A BANG-UP JOB OF TREATING EFFLUENTS,
Picatinny Arsenal, Dover, N.J. Modernization and Special Technology Div.
A. Carotti, and J. C. Thomas.
Environmental Science and Technology, Vol 10, No 8, p 751-56, August 1976. 3 illus.

Descriptors: *Effluents, *Waste water treatment, *Industrial wastes, *Waste water(Pollution), Wastes, Water pollution, Abatement, Treatment, Water pollution control, Discharge(Water), Pollutants, Industrial water, Water pollution sources, Chemical wastes, Pollution abatement, Water treatment, Recycling, Federal Water Pollution Control Act.
Identifiers: *Nitrocellulose, *Acetic anhydride, *Trinitrotoluene(TNT), *Sodium nitrate, *Federal Water Pollution Control Act(FWPCA) Amendments of 1972.

An extensive effort to eliminate pollution from Army Ammunition Plants (AAP), which was begun as early as 1968, gained added impetus from the 1972 Federal Water Pollution Control Act (FWPCA) Amendments, which directs this country toward a national goal of eliminating the discharge of pollutants into navigable waters. The importance of water management as a tool for water pollution abatement has been recognized, so that concentrated efforts are being expended in this direction to insure timely compliance with future effluent standards. The key concept in the water management program is the consideration of total plant water utilization, thus avoiding traditional reliance upon treatment for discharge for standards achievement. The methodology of abatement of plant scale water pollution is best resolved by using a mixture of such strategies as: improved product recovery, recycle of acceptable wastewater for repeat operation, recycle of effluent to concentrate contaminants to permit their economic recovery, and wastewater treatment. Water management schemes for nitrocellulose manufacture, TNT manufacture, acetic anhydride manufacture, and sodium nitrate recovery are described in detail. (Petruff-Florida)
W77-07247

ECONOMIC ASPECTS OF POLLUTION ABATEMENT, PART 1,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07260

LEGAL ASPECTS OF CHANGES BROUGHT ABOUT BY BUCKEYE'S POLLUTION ABATEMENT PROGRAM, PART II,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07261

EVAPORATION OF WASTEWATER FROM MOUNTAIN CABINS,
Colorado State Univ., Fort Collins, Solar Energy Applications Lab.
For primary bibliographic entry see Field 5E.
W77-07284

OZONATION IN A BETTER PERSPECTIVE,
C. Winklehaus.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 190-193, February, 1977.

Descriptors: *Ozone, Water purification, *Chlorination, *Disinfection, *Water treatment, Biodegradation, *Waste water treatment, Byproducts, Toxicity.
Identifiers: Chlorine dioxide, Bromine chloride, Ferrate ion, *Ozonation.

While recent attention to the harmful halogenated organic byproducts of disinfection by chlorination has resulted in much publicity for ozonation as the obvious alternative, ozonation's disadvantages should not be overlooked completely. A recent workshop sponsored by the EPA and the International Ozone Institute focused on both the advantages of ozonation (higher potency as a disinfectant and chemical oxidant than chlorine, oxygen rather than halogenated organics as principal byproduct) as well as its drawbacks (generally higher cost than chlorine and lack of residual disinfectant action). Some toxic byproducts do result from ozone reactions with organic compounds, however these byproducts are usually unstable, their formation and breakdown rates being dependent on ozone concentration in the water; in many cases, the intermediaries are more biodegradable than the organics from which they were formed. Other disinfectants were discussed during the workshop, notably chlorine dioxide, bromine chloride, and the ferrate ion. The assessment of ozonation's potential based on European experience is to view ozone treatment as a unit process in combination with chlorine and chlorine dioxide treatment, and that ozonation will produce fewer harmful intermediaries and byproducts than chlorination alone. (Eberle-NWWA)
W77-07293

INFLUENCE OF AN OZONISATION PLANT ON THE BACTERIAL CONTENT IN WATER OF A DEMONSTRATION AQUARIUM,
Kiel Univ. (West Germany).
For primary bibliographic entry see Field 5C.
W77-07311

PROCEEDINGS OF THE ANNUAL CONFERENCE, APRIL 20-23, 1975, TORONTO, ONTARIO,
American Water Works Association, Toronto (Ontario). Ontario Section.
Environment Canada, Environmental Protection Service, Ottawa, Canada, 1976, 429 p.

Descriptors: *Canada, *Conferences, *Water pollution, *Water quality, Water pollution control, Water pollution sources, Industrial wastes, Water pollution treatment, Waste treatment, Chlorination, Environmental control, Environmental sanitation, Water supply, Water works, *Waste water treatment, *Water treatment.
Identifiers: Ontario.

The conference proceedings of the annual conference involving the Ontario Section of the American Water Works Association, the Pollution Control Association of Ontario, and the Ontario Municipal Water Association, are contained in this book. The conference was held in Toronto on April 20-23, 1975. Basically, the conference dealt with water pollution sources, water treatment facilities and operation, water works designs and Environmental engineering. The six sessions of the conference were: (1) an introductory session; (2) the Pollution Control Association of Ontario session ; (3) the American Water Works Association section, dealing with chemical and engineering aspect of waste water treatment and water purification; (4) the Ontario Municipal Water Association session which was concerned with Ontario programs and examples; (5) a joint operations forum which dealt with management and training programs; and (6) a joint session which discussed future problems, environmental sanitation in the north, and waste water treatment effluents. (WATDOC)
W77-07329

PROCEEDINGS, TECHNOLOGY TRANSFER SEMINAR ON HIGH QUALITY EFFLUENTS,
Environmental Protection Service, Ottawa (Ontario). Water Training and Technology Transfer Div.
Canada-Ontario Agreement on the Great Lakes Water Quality, Environment Canada, Ottawa, Canada. Held in Toronto, Ontario, December 2-3, 1975. Published March, 1976, 371 p.

Descriptors: *Conference, *Effluents, *Waste water treatment, *Water pollution control, Treatment facilities, Model studies, Water quality, Filtration, Waste water disposal, Wastes, Technology, *Waste water treatment.
Identifiers: *High quality effluents, *Technology transfer.

The seminar on high quality effluents was planned with two axioms in mind, namely: a particular environmental area can assimilate only a finite quan-

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tity of pollution; and, with the inevitable increase in the production of pollutants resulting from economic growth and urbanization, the degree of treatment must be improved. The seminar was designed to discuss, many of the questions concerning the need for higher quality effluents. (WATDOC)
W77-07330

WASTEWATER AND SLUDGE CONTROL IN THE CANADIAN METAL FINISHING INDUSTRY, SEGMENT INCLUDING CHEMICAL, ELECTROLYTIC TREATMENT; ELECTROCHEMICAL MACHINING AND POLISHING; CYANIDE HARDENING,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
L. Buffa, and K. Coulter.
Economic and Technical Review Report, No. EPS 3-WP-76-10, December, 1976, 33 p., 1 fig., 5 tab, 7 ref, 2 append.

Descriptors: *Metals, Waste water(Pollution), *Sludge, Control, Effluents, *Industrial wastes, Technology, *Canada, Sewers, *Waste water treatment, Costs, Chemical wastes, Pollution abatement, *Electrolysis, Electrochemistry.
Identifiers: *Metal finishing industry wastes, *Fisheries Act(Canada).

Described are technical and economic aspects of the development, under the Fisheries Act, of national effluent requirements for the segment of the Canadian metal finishing industry which includes chemical and electrolytic finishing of surfaces and cyanide hardening. Recommendations for the control of effluents are presented, based on the best practicable technology and economic considerations. (WATDOC)
W77-07333

LAND APPLICATION OF DIGESTED SLUDGE UNDER ADVERSE CONDITIONS.
Regional Municipality of Niagara, Niagara Falls (Ontario). Public Works Dept.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No, 53, Environmental Protection Service, Environment Canada, Ottawa, Canada, 55 p., 32 fig., 11 tab, 12 ref, 2 append.

Descriptors: *Sewage, *Sludge, *Rain, *Melting, Application methods, Soil disposal fields, Waste disposal, Equipment, Crop production, Weather, Water spreading, Costs, Time lag, Spraying, Frozen soils, *Water reuse, Waste treatment, *Canada.
Identifiers: Vehicles, Niagara, Ontario.

The disposal of sludge on land which, because of continual periods of rain or spring melting conditions, had become impassable to normal sludge hauling vehichles (tank trucks). The reasons for this concern were: (1) the deterioration of the sewage treatment plant effluent quality if sludge removal cannot be carried our for an extended period, and (2) the cost of sludge holding facilities in adverse conditions. Initially, two separate literature reviews were conducted: (2) The first was made to determine current equipment used in sludge application to land and to assess potential problems associated with the equipment to be tested. Little written information was available on this topic and it was necessary to obtain data by personal communication. (2) Agricultural literature on soil compaction was reviewed to determine the effects of vehicular traffic on soil. Five vehicles (a tank truck, a sludge injector, a bulldozer, a front-end loader and an all-terrain vehicle) were field tested and evaluated. A system for sludge spraying was also investigated. Soil compaction analyses, crop analyses, problems experienced, and breakdowns encountered during spreading were used as parameters for evaluation. None of the vehicles investigated proved ideally suitable and effective in the spreading of sludge on wet soils. Spraying of sludge proved to be the most suitable method for land application under certain weather conditions but was suitable only for well-screened sludge. (WATDOC)
W77-07337

REVIEW OF TREATMENT TECHNOLOGY IN THE FRUIT AND VEGETABLE PROCESSING INDUSTRY IN CANADA.
Stanley Associates Engineering Ltd., Edmonton (Alberta).
Economic and Technical Review Report, No EPS 3-WP-77-5, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, March, 1977. 207 p, 19 fig, 89 tab, 18 ref, 2 append.

Descriptors: *Reviews, *Treatment, Technology, Solid wastes, Industrial crops, Vegetable crops, Waste water, Sedimentation, Food processing industry, Fruit crops, Wastes, Waste treatment, *Waste water treatment, *Canada, Costs, Screens, Flotation, Filtration, Control Toxicity, Lagoons.
Identifiers: *Processing plants, Washwater, *Fruit and vegetable processing industry.

A review is presented of the state-of-the-art of wastewater treatment in the Canadian fruit and vegetable industry. The findings are based on data from eight plants and are not an inventory of Canadian processing plants. Because the fruit and vegetable industry is both wide ranging and complex, 11 major commodities were designated for study. Additionally, investigators used much available data from U.S. sources where a data bank on 650 processing plants exists. Only data which were pertinent to the Canadian scene were used Current technology and treatment practices were found to be very similar in both countries but spray irrigation treatment is more costly in Canada as climatic conditions generally require winter storage facilities. Other treatment methods include screening, sedimentation, flotation and biological treatment. Available U.S. and Canadian technology should produce a reduction of BOD5 and suspended solids greater than 90%. However, where receiving streams are small, even 90% reductions may not be sufficient, making polishing or land applications necessary. This report found that the BOD5 levels of the wastewaters discharged by the Canadian industry were generally high with a great potential for oxygen depletion in receiving waters. (WATDOC)
W77-07341

APPLICATION OF VASCULAR AQUATIC PLANTS FOR POLLUTION REMOVAL, ENERGY AND FOOD PRODUCTION IN A BIOLOGICAL SYSTEM,
National Space Technology Labs., Bay St. Louis, Miss.
B. C. Wolverton, R. M. Barlow, and R. C. McDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-22938, Price codes: A02 in paper copy, A01 in microfiche. NASA TM-X-72726, May 1975. 17 p. 7 fig., 19 ref.

Descriptors: *Aquatic plants, *Pollution abatement, *Water hyacinth, *Alligator weed, Nitrogen, Phosphorus, Heavy metals, Phenols, Chemical wastes, Sewage disposal, Harvesting, Laboratory tests, Filtration, Energy conversion, Feeds, Food, *Waste water treatment.
Identifiers: *Pollutant removal.

Laboratory results of NASA/National Space Technology Laboratories investigations to determine the pollution removal capabilities of vascular aquatic plants are reported. Results suggest that aquatic plants, such as water hyacinths and alligator weeds, may represent a very efficient and inexpensive filtration and disposal system for toxic materials and sewage released into waters, when utilized in a controlled biological system which includes a regular program of harvesting to achieve maximum growth and pollution removal efficiency. One acre of water hyacinths has the potential to remove over 3500 pounds of nitrogen and over 800 pounds of phosphorus annually from sewage effluent, to absorb and metabolize over 150 pounds of phenol every 72 hours, and to remove over 120 grams of trace heavy metal contaminants every 24 hours. This same acre has the potential of producing over 70 tons of dry plant material annually which could be used for animal feeds and human food, or could produce over one million cubic of biogas through anaerobic decomposition with 70 tons of residual high-grade fertilizer as a byproduct. A biological system for removing chemical and sewage pollutants from waste waters and a potentially self-sufficient agricultural homestead, are both conceptually illustrated. (Luedtke-Wisconsin)
W77-07474

WATER QUALITY CRITERIA AND WASTE WATER TREATMENT,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
L. Landner.
Report IVL B 313, June 1976. 31 p. 3 fig., 11 tab.

Descriptors: *Water quality standards, *Industrial wastes, *Sewage treatment, *Foreign countries, Water pollution control, Safety, Permits, Water utilization, Sewerage, Hazards, Waste treatment, Sewage effluents, Treatment facilities, Efficiences, Regulation, Water policy.
Identifiers: *Sweden.

The Swedish approach to water pollution control relates water quality criteria to specific water uses and a defined limit for a particular parameter at a given locality, with the latter based on threshold value. This value designates at what concentration of a given parameter, under well-defined experimental conditions, a specified effect begins to take place. Waste discharges are restricted by a permit system incorporating detailed, individual conditions regarding types and amount of discharges, which are monitored by a network of environment control officers. The philosophy behind the Swedish attitude is that pollutant discharges should not be tolerated if they can be avoided by use of current, economically-feasible technology, regardless of effects on receiving waters. Several proposals for 'limit values' for industrial wastes are aimed at avoiding damage to sewer systems, to treatment plants using biological and chemical methods, and at limiting effects on receiving waters (or soil) based on 1/10th lethal concentrations for an unspecified fish species. Various methods of urban sewage treatment are outlined and their efficiences compared. (Auen-Wisconsin)
W77-07522

NETWORK APPROACH TO OPTIMAL WASTEWATER TREATMENT SYSTEM DESIGN,
Toronto Univ. (Ontario).
B. J. Adams, and D. Panagiotakopoulos.
Journal of the Water Pollution Control Federation, Vol. 49, No. 4, p 623-632, April 1977. 4 fig, 4 tab, 6 ref.

Descriptors: *Waste water treatment, *Water pollution control, *Design, *Optimization, Economic efficiency, Networks, Methodology, Algorithms, Biochemical oxygen demand, Linear programming, Effluents, Standards, Costs, Equations, Mathematical models, Operations research.
Identifiers: *Network algorithm, Cost minimization.

The design of a wastewate treatment system is considered to be the selection of treatment processes that form the system and the selection of efficiencies at which these processes will be operated. The optimal design is a least cost design that meets a required effluent standard. Compared are the shortcomings of previous approaches to the solution of this problem in terms of their sim-

plifying assumptions and proposed is a linear programming approach which is based on a network algorithm. The network approach is facile to apply, computationally convenient, and overcomes the problems of a number of previous simplifying assumptions. (Bell-Cornell)
W77-07531

ECONOMIC VALUE OF LOW FLOW DATA,
Technical Univ. of Denmark, Copenhagen.
J. C. Refsgaard, and E. Hansen.
Nordic Hydrology, Vol. 7, No. 1, p 57-72, 1976. 5 fig, 2 tab, 10 ref.

Descriptors: *Economics, *Value, *Low flow, *Hydrologic data, *Water resources, Decision making, Design, Treatment plants, Streamflow, Regression analysis, Evaluation, Digital computers, Costs, Probability, Mathematical models, Systems analysis.
Identifiers: *Bayesian decision approach, Denmark, Opportunity loss, Heuristic method, Uncertainty, Rainfall-runoff model, Goal function.

Utilizing the Bayesian decision approach, the economic value of low flow data is considered with special reference to the design of treatment plants for typical Danish conditions. For a specific case, the worth of primary data in the form of direct observations of low streamflows has been investigated in terms of an expected opportunity loss (EOL). Indirect information concerning the low flow properties of interest may be obtained by means of a secondary data set in combination with a regression model. Suggested is a heuristic method for the economic evaluation of a secondary set of data taking into account the uncertainty embedded in the regression model. Examined are the costs in the cases of both underdesign and overdesign. Discussed are the results of the computations of Bayes Risk, Bayes Solution, and EOL made on a digital computer. Finally, the potential economic benefits of transmitting information on low flows by means of a rainfall-runoff model are considered. (Bell-Cornell)
W77-07537

EVALUATING ALTERNATIVE LEVELS OF WATER AND SANITATION SERVICE FOR COMMUNITIES IN THE NORTHWEST TERRITORIES,
Associated Engineering Services Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 6A.
W77-07557

VACUUM SEWER SYSTEMS AND THEIR POSSIBLE CANADIAN APPLICATIONS,
Project Planning Associates Ltd., Toronto (Ontario).
D. W. Averill, and G. W. Heinke.
Canadian Journal of Civil Engineering, Vol 1, No 1, p 50-61, September 1974. 5 fig, 2 ref.

Descriptors: *Canada, *Sewers, *Waste water(Pollution), *Flow, Pipes, Networks, Design, Operating costs, Capital costs, Water conveyance, Mathematical models, Equations.
Identifiers: *Waste water transport, *Vacuum sewer systems.

The basic principles of vacuum sewer systems are reviewed and their introduction to Canada is described. A vacuum sewer uses air pressure instead of gravity as the driving force for waste water transport. Waste water is moved in plugs, separated by air gaps, at high velocities through small diameter pipes. The pressure differential of about one-half atmosphere is created by a central vacuum pump. Specially designed vacuum toilets, valves, and a central collection tank complete the system. Discussed are vacuum transport theory and design practices, including flow theory and friction loss by a homogeneous model. The advantages of a vacuum sewer system over a conventional gravity system are its ability to transport waste water horizontally and to a certain extent upgrade, its much lower water usage, and its lower capital cost. However, the length, capacity, and lift potential of vacuum sewers are limited by the available pressure differential, which precludes their use in many cases. There appears to be considerable potential for their application in Canada, particularly in remote locations such as cottage areas and in the Arctic. (Bell-Cornell)
W77-07558

A BACTERIOLOGICAL INVESTIGATION OF MEAT PACKING PLANT EFFLUENTS IN THE PROVINCE OF ALBERTA WITH PARTICULAR EMPHASIS ON SALMONELLA,
Environmental Protection Service, Edmonton (Alberta). Northwest Region.
J. M. Vanderpost, and J. B. Bell.
In: A Bacteriological Investigation of Meat and Poultry Packing Plant Effluents, with Particular Emphasis on Salmonella, Economic and Technical Review Report EPS 3-WP-76-9, Ottawa, Canada, December, 1976, 74 p., 4 fig., 95 ref., 21 tab, append.

Descriptors: *Food processing industry, *Bacteria, *Salmonella, *Effluents, *Waste water treatment, Waste water(Pollution), Coliforms, Water analysis, Filtration, Disinfection, Antibiotics(Pesticides), Resistance, *Canada, Treatment facilities.
Identifiers: *Meat, *Packing plants, *Alberta, Food poisoning, Edmonton, Red Deer, Calgary, Slaughterhouses.

The waste treatment facilities and final effluents of eleven meat packing plants in the Province of Alberta were investigated primarily to determine the numbers of indicator bacteria and the presence of Salmonella. This was done to discover the efficiency of the treatment systems presently in operation in reducing bacterial numbers, and to establish the need for disinfection and for bacterial standards for these effluents. Data obtained showed that the final effluents were of very poor quality bacteriologically with numbers of indicator organisms comparable to those found in raw sewage. Primary treatment facilities were totally ineffective in reducing these bacterial numbers and in addition, Salmonella were isolated from the final effluents of 80% of the plants. Although secondary treatment was somewhat more efficient in reducing bacterial counts, again Salmonella were isolated from the final effluents. In total, 21 different serotypes were identified. Salmonella isolates were not antibiotic resistant, but certain coliform and fecal coliform isolates demonstrated resistance to chloramphenicol, tetracycline, and ampicillin. S. typhimurium cells survived up to 12 days in nutrient-free water, and Rainbow Trout fingerlings became carriers of these organisms when placed in water containing an inoculum of the cells. It is recommended that a bacterial standard be included in regulations controlling the quality of meat packing plants effluents and that disinfection be implemented. (See also W77-07561) (WATDOC)
W77-07560

SALMONELLA IN POULTRY PACKING PLANT EFFLUENTS,
Environmental Protection Service, Ottawa (Ontario).
A. B. Tennant, R. Toxopeus, J. A. P. Bastien, M. Beauchamp, and J. Vandewint.
In: A Bacteriological Investigation of Meat and Poultry Packing Plant Effluents, with Particular Emphasis on Salmonella, Economic and Technical Review Report EPS 3-WP-76-9, Ottawa, Canada, December, 1976, 74 p., 3 fig., 47 ref., 30 tab.

Descriptors: *Poultry, *Food processing industry, *Bacteria, *Salmonella, Effluents, Coliforms, Resistance, Chlorination, Disinfection, Wastes, On-site tests, *Canada, *Waste water treatment, Treatment facilities.
Identifiers: Bacteria counts, *Ontario.

Concern that salmonellae associatd with polultry production in Ontario may be recycled through the environment by the discharge of inadequately-treated waste effluents led to the conduct of three case studies of poultry processing plants in 1975. Salmonellae of various serotypes were shown to be present in raw and treated wastes at three large, well-operated plants. Data presented support the need for effective treatment and disinfection of such wastes if the problem of poultry-associated salmonellosis is to be contained. The incidence of antibiotic resistance among fecal coliforms and salmonellae isolated from the waste streams was evaluated. Methods for the isolation of salmonellae, as selected on the basis of comparative data obtained, are proposed for use in waste treatmet and effluent quality case studies of poultry plant operations. (See also W77-07560) (WATDOC)
W77-07561

PROCEEDINGS, WATER POLLUTION ABATEMENT TECHNOLOGY IN THE PULP AND PAPER INDUSTRY, (1975),
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
Economic and Technical Review Report, EPS 3-WP-76-4, March, 1976, 220 p, 38 fig, 18 tab, 202 ref, 6 append.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Waste water treatment, Regulation, *Pollution abatement, Suspended solids, Fishkill, Toxicity, Adsorption, Ion exchange, Absorption, United States, Canada, *Industrial wastes, Dewatering, Biological treatment.
Identifiers: Chemical oxidation, Sludge dewatering.

This publication contains papers from the Proceedings of Seminars on Water Pollution Abatement Technology in the Pulp and Paper Industry held in Ottawa, Ontario, May 1st and 2nd, 1975; Moncton, New Brunswick, May 5th and 6th, 1975; and Prince George, British Columbia, May 21st and 22nd. The siminars were sponsored by Environment Canada, Environmental Protection Service and the Technical Section of the Canadian Pulp and Paper Association. Topics include regulation and waste characterization, suspended solids removal, biological waste treatment, fish toxicity, physical and chemical treatment, and sludge dewatering and handling practices. (WATDOC)
W77-07562

STUDIES ON VIRUS INACTIVATION BY CHLORINE DURING WATER DISINFECTION, (IN GERMAN),
Hygiene Institut Stadt., Nuermberg (West Germany).
For primary bibliographic entry see Field 5F.
W77-07595

5E. Ultimate Disposal Of Wastes

LEACHING CHARACTERISTICS OF POLLUTED DREDGINGS,
Hayward Baker Co., Odenton, Md.
For primary bibliographic entry see Field 5B.
W77-07158

CONVECTIVE-DISPERSION IN PERENNIAL STREAMS,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 5B.
W77-07160

TOXIC WASTE DISPOSAL,
Clyde River Purification Board, Glasgow (Scotland).

LIBRARY U. OF I. URBANA-CHAMPAIGN

For primary bibliographic entry see Field 5G.
W77-07209

INLINE SENSOR TIGHTENS CONTROL ON SLUDGE CONSISTENCY TO WITHIN 1.4-1.5% SOLIDS,
Crown Zellerbach Corp., Port Townsend, Wash.
For primary bibliographic entry see Field 5D.
W77-07214

EVAPORATION OF WASTEWATER FROM MOUNTAIN CABINS,
Colorado State Univ., Fort Collins, Solar Energy Applications Lab.
J. C. Ward.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 712, Price codes: A07 in paper copy, A01 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 77, March, 1977. 123 p, 25 fig, 54 tab, 33 ref. OWRT A-020-COLO(2). 14-31-0001-5006.

Descriptors: *Evaporators, Elevation, *Air temperature, *Solar radiation, *Thermal Radiation, *Heat balance, *Waste water disposal, *Water temperature, Mountains, *Colorado.
Identifiers: *Waste water evaporators, Second homes, Long wave radiation, Average temperature, Latitude, Longitude.

Presented are the results of a study of wastewater evaporation and a comparison of this technique with other alternatives for the disposal of wastewater from second homes located in mountainous areas. The wastewater evaporation unit is covered with a transparent (to solar radiation) precipitation interceptor that also serves to reduce long wave radiation heat losses. Several experimental and 1 full scale wastewater evaporators were installed at 4 elevations ranging from 5,200 to 10,665 feet. These units were observed for a period of 3 years. Following this observational period, the experimental data were analyzed to obtain design and cost data as a function of elevation, latitude, and longitude. Analysis of the experimental data showed that wastewater evaporation is a technical and economically viable alternative for elevations up to abouut 11,000 or 12,000 feet in Colorado. Because of the manner in which the design equations were developed, the results can be applied anywhere in the counterminous United States, although the design and cost data developed for Colorado as an example may not be applicable. The design and cost data for other states can be derived using the equations, presented.
W77-07284

DEEP WELL INJECTION: SWEEPING THE PROBLEM UNDER THE CARPET,
For primary bibliographic entry see Field 5G.
W77-07295

STATUS REPORT ON ABATEMENT OF WATER POLLUTION FROM THE CANADIAN PETROLEUM REFINING INDUSTRY - 1975,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W77-07334

LAND APPLICATION OF DIGESTED SLUDGE UNDER ADVERSE CONDITIONS.
Regional Municipality of Niagara, Niagara Falls (Ontario). Public Works Dept.
For primary bibliographic entry see Field 5D.
W77-07337

DREDGED MATERIAL DISPOSAL EFFECTS AND ALTERNATIVES,
Army Engineers Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W77-07345

CONCEPTS FOR THE RECLAMATION OF DREDGED MATERIAL,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 8D.
W77-07352

AN INVESTIGATION ON THE DISPOSAL OF PIG EXCRETA IN KASUMIGAURA AREA, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W77-07571

5F. Water Treatment and Quality Alteration

USE OF CATION POLYELECTROLYTES FOR WATER PURIFICATION FROM VIRUSES, (IN RUSSIAN),
Academy of Municipal Economy, Moscow (USSR). Research Inst. of Public Water Supply, Water Purification.
Yu I. Veitser, V. A. Ryabchenko, and N. A. Arbuzova.
Gig Sanit 3, p 10-13, 1976.

Descriptors: *Polyelectrolytes, Water purification, Bacteria, *Viruses, Cations, E coli, Bacteriophage, *Coagulation, *Flocculation, *Waste water treatment, *Water treatment.
Identifiers: Picornavirus, Poliovirus.

A search was made new coagulants and flocculants to improve the water purification properties of traditional substances and develop new organic reagents. The cation polyelectrolytes polyvinyl-N-benzyl-trimethylammonium chloride (VA-2), polyethylenimine (PEI-K) and polydimethylamino-methyl-N-acrylamide (KF-4) were tested for removal of T1 and T2 phages of Escherichia coli and the poliomyelitis virus LSC 2ab. Quantitative activity in 3001 tap and river water solutions treated with polyelectrolytes was demonstrated for the coliphages in indicator cultures of E. coli B and for the poliovirus in monkey kidney tissue cultures to be most reduced in 1-2 mg/l and 4-5 mg/l solutions of PEI-K and VA-2, respectively. The virus elimination mechanisms may be interaction of polyelectrolyte amion groups with carboxyl groups of the dicarboxylic acid of viral protein membranes, resulting in viral adsorption of the flocculant molecules, while some parts of the phages may combine with polyelectrolyte macromolecules to form larger 3-dimensional structures easily retained by filters.--Copyright 1977, Biological Abstracts, Inc.
W77-07108

OZONATION IN A BETTER PERSPECTIVE,
For primary bibliographic entry see Field 5D.
W77-07293

PROCEEDINGS OF THE ANNUAL CONFERENCE, APRIL 20-23, 1975, TORONTO, ONTARIO,
American Water Works Association, Toronto (Ontario). Ontario Section.
For primary bibliographic entry see Field 5D.
W77-07329

A STUDY OF ENVIRONMENT SANITATION ON THE WELLS IN JUNGNEUNG-DONG AREA, SEOUL, (IN KOREAN),
Korea Univ., Seoul. Coll. of Medicine.
For primary bibliographic entry see Field 5B.
W77-07475

EVALUATING ALTERNATIVE LEVELS OF WATER AND SANITATION SERVICE FOR COMMUNITIES IN THE NORTHWEST TERRITORIES,
Associated Engineering Services Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 6A.
W77-07557

BACTERIOLOGICAL QUALITY OF POULTRY-FARMS' WATER IN MINAS GERAIS STATE, BRAZIL: 1973, (IN PORTUGESE),
Universidade Federal de Minas Gerais, Belo Horizonte (Brazil). School of Veterinary Medicine.
F. Viana, E. C. Moreira, and M. Barbosa.
Arq Esc Vet Univ Fed Minas Gerais 27(2), p 119-124, 1975.

Descriptors: *Bacteriology, South America, *Farm wastes, Chlorination, *Poultry, Water pollution, *Water quality standards, Potable water, Public health, Sampling, Water supply, Water wells, *Water treatment.
Identifiers: *Brazil(Minas Gerais).

Water samples (80) from poultry farms in 22 countries were bacteriologically examined following the standards recommendation of the American Public Health Association (1971) and the potability standard characteristics for water described in state regulations. The percentages of potability were: superficial wells 12.8%, artesian supplies 18.2%, springs 12.5%, creeks and lakes 7.1%. The water supplies generally are in poor sanitary condition and at least chlorination should be used to treat them. --Copyright 1977, Biological Abstracts, Inc.
W77-07594

STUDIES ON VIRUS INACTIVATION BY CHLORINE DURING WATER DISINFECTION, (IN GERMAN),
Hygiene Institut Stadt., Nuermberg (West Germany).
S. Carlson, U. Haesselbarth, and F. W. Sohn.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Betriebshyg Praev Med, p 320-329. 1976.

Descriptors: *Disinfection, *Bacteria, *Viruses, *Chlorination, Human diseases, Water pollution, Oxidation reduction potential, Water treatment, Waste water treatment.
Identifiers: Adenovirus, *Virus, Inactivation, Picornavirus, Poliovirus.

Water-borne transmission of viral diseases and the problems involved in virus inactivation by water chlorination are discussed. In contrast to the amount of free Cl, the value of the oxidation-reduction potential (ORP) was a criterion of virus inactivation. For virus inactivation, higher ORP values and longer periods of contact than for the killing of bacteria were necessary. To ensure the inactivation of poliovirus in water contaminated with organic substances, an ORP of +750 mV (0.3-0.6 mg/l free Cl) should be maintained for 15-30 min. Adenovirus showed an almost identical resistance to inactivation. Possibilities for utilizing the mechanism of virus inactivation by the action of chemical disinfectants are discussed.--Copyright 1977, Biological Abstracts, Inc.
W77-07595

5G. Water Quality Control

INTERACTIONS OF CUPRIC ION WITH HUMIC ACID,
Missouri Univ. Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-07104

PRESENT AND HISTORICAL SPAWNING GROUNDS AND NURSERIES OF AMERICAN SHAD, ALOSA SAPIDISSIMA, IN THE DELAWARE RIVER,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
For primary bibliographic entry see Field 5C.
W77-07131

NONPOINT SOURCE EFFECTS ON WATER QUALITY,
Florida Technological Univ., Orlando.
For primary bibliographic entry see Field 5B.
W77-07173

DIPHENAMID REMOVAL FROM WATER AND METABOLISM BY AQUATIC PLANTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.
For primary bibliographic entry see Field 5C.
W77-07193

TOXIC WASTE DISPOSAL,
Clyde River Purification Board, Glasgow (Scotland).
R. Gray.
Water Pollution Control, Vol. 76, No. 1, p 30-38, 1977. 2 fig, 1 tab, 4 ref, 1 append.

Descriptors: *Waste disposal, *Metals, Toxicity, Pollutants, *Pollution abatement, Water pollution sources, Soil contamination, Solid wastes, Liquid wastes, *Industrial wastes, *Waste water treatment, Sludge treatment, Heavy metals.
Identifiers: *Toxic waste disposal.

A summary is presented of various methods for the disposal of toxic wastes which would meet British pollution control regulations. The disposal of metals is a prime consideration. The disposal of unneutralized cyanide is totally prohibited, and heavy metals must be precipitated to an insoluble form before land disposal. The reclamation of recoverable resources is especially attractive and applicable for metal wastes such as copper, nickel, tin, and cadmium. Chemical treatment is necessary for unrecoverable constituents of acid pickling wastes to be discharged to sewers and rivers. Chemical fixation and solidification are used to treat sludges and solutions containing heavy metals for land disposal. Disposal by tipping on land should involve total containment of the waste. Other types of pollutants from several industries are considered as well. Methods for their disposal are recommended and discussed. (Collins-FIRL)
W77-07209

REDUCED WATER DEMAND--RESULT OF SWEDISH ANTI-POLLUTION PROGRAM,
For primary bibliographic entry see Field 5D.
W77-07215

A MINI-POLLUTION TANNERY,
Environmental Protection Agency, Kansas City, Mo. Region VII.
For primary bibliographic entry see Field 5D.
W77-07225

P. L. 92-500 V LOCAL PRIORITIES,
Brown and Caldwell, Seattle, Wash.
For primary bibliographic entry see Field 5D.
W77-07229

POLLUTION SUSCEPTIBILITY: AN ENVIRONMENTAL PARAMETER FOR COASTAL ZONE MANAGEMENT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
P. K. Weyl.
Coastal Zone Management Journal, Vol 2, No 4, p 327-43, 1976. 5 fig.

Descriptors: *Tidal effects, *Federal Water Pollution Control Act, *Ocean currents, *Environmental effects, Water pollution, Environment, Diffusion, Currents(Water), Pollutants, Coasts, Tides, Ocean circulation, Dispersion, Movement, Flow, Bays.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Coastal waters, *Coastal zone management, *Non-point sources(Pollution), Pollution susceptibility, Steady state pollution susceptibility, Environmental parameter.

To facilitate compliance with the provisions of the Federal Water Pollution Control Act (FWPCA), a new environmental parameter, pollution susceptibility, has been developed. This parameter will enable the coastal zone manager to relate the concentration of pollutants in coastal water to the rates at which these pollutants are discharged by point and non-point sources. Readily determinable from available data on tidal heights and currents, pollution susceptibility, is a useful device that describes the susceptibility of coastal water to pollution. It allows one to distinguish which coastal areas would be highly affected by a given discharge. In restricted bays, a second parameter, steady state pollution susceptibility, takes into account the recirculation of pollutants. While it does not eliminate the need for site-specific impact studies, pollution susceptibility can be used as a tool for broad planning. However, it must be supplemented by more detailed local studies in order to assess the environmental impact of specific activities. (Petruff-Florida)
W77-07230

CONTROL OF AGRICULTURAL WATER POLLUTION: A CONTINUING REGULATORY DILEMA,
South Carolina Univ., Columbia. School of Law.
J. E. Montgomery.
University of Illinois Law Forum, Vol 1976, No 2, p 533-58, 1976.

Descriptors: *Federal Water Pollution Control Act, *Agricultural runoff, *Feed lots, *Pesticide residues, Erosion control, Erosion, Pesticides, Fertilizers, Agriculture, Pollutants, Pollutant identification, Permits, Animal control, State governments, Programs, Regulation.
Identifiers: *Federal Water Pollution Control Act (FWPCA) Amendments of 1972, Point sources, Nonpoint sources, National Pollutant Discharge Elimination System(NPDES), Environmental Protection Agency(EPA).

The Federal Water Pollution Control Act Amendments of 1972 (FWPCA) establish a comprehensive strategy for ending water pollution. Under the FWPCA, pollution from agricultural sources is divided into point sources (which include animal feeding operations) and nonpoint sources (which include erosion-transported pollutants such as pesticide and fertilizer residues). Discharge of pollutants from a point source into navigable water is illegal without a National Pollutant Discharge Elimination System Permit from EPA. Until 1975, regulation of small animal feedlots was outside the reach of the FWPCA due to exemptions created to protect small farmers. This exemption was challenged in National Resources Defense Council, Inc. v. Train; which held that the EPA did not have the authority to exempt whole categories stricter regulations are now being formulated to regulate all 'concentrated' animal feeding operations. The FWPCA still has no effective plan for regulation of nonpoint sources. Under the act, states must identify nonpoint source water pollutants and develop programs for control. The author suggests using Ohio's nonpoint source plan as a model and establishing federal coordination of state plans for uniformity. (Denker-Florida)
W77-07233

LOOKING AHEAD (FEDERAL WATER POLLUTION CONTROL ACT OF 1972).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-07235

HOUSE COMMITTEE MARKS UP HR 9560,
A. S. Heid.
Journal Water Pollution Control Federation, Vol. 48, No. 5, p. 812-15 (May 1976).

Descriptors: *Regulation, *Financing, *Federal-state water rights conflicts, Administrative regulations, Governments, Legal aspects, Water law, Water resources development, Capital, Grants, Project feasibility, Planning, Governments, Administrative agencies, State governments, Penalties(Legal), Assessments, Law enforcement, Construction, Public health, Legislation.
Identifiers: *FWPCA Amendments of 1972, Environmental Protection Agency(EPA), Environmental emergency fund, Hazardous substances(Pollution).

The recent markup for HR 9560, a bill to amend the Water Pollution Control Act Amendments of 1972 deals with numerous categories of recommended changes. It suggested that general authorizations to the Environmental Protection Agency (EPA) be extended. It also recommended that the federal share of planning costs be reduced from 100% federal financing to 75%. The responsibility for processing grant application should be decentralized in order to reduce duplication of federal-state activities and improved efficiency. This proposal would grant states the money to carry out certification programs. The EPA would be permitted to extend the 1977 deadline on a case-by-case basis up to July 1, 1982. Several proposed amendments would create stiffer civil penalties for discharge of hazardous materials. Additional amendments deal with funding for existing wastewater systems, new allocation formulas to be used in distributing construction grant funds, federal loan guarantees to states having difficulty obtaining commercial financing, allowing state to determine their own priorities in treatment construction projects, and authorization of a $5 million dollar environmental emergency fund for situations that present imminent damages to public health or welfare. (V.C. Rieck-Florida)
W77-07236

NCWQ RECOMMENDS CHANGES IN WATER POLLUTION ACT,
P. S. Ward.
Journal Water Pollution Control Federation, Vol. 48, No. 4, p. 622-27 (April 1976).

Descriptors: *Water quality standards, *Water requirements, Permits, Grants, Monitoring, Water quality control, Pollution, Discharge(Water), Administrative decisions, Construction, Construction costs, Conservation, Resources, State governments, Federal government, Planning, Administration, Irrigation programs.
Identifiers: *National Commission on Water Quality(NCWQ), *Federal Water Pollution Control Act(FWPCA) Amendments of 1972, Irrigated agriculture.

The National Commission on Water Quality recently made recommendations aimed at reaching the ambitious objectives of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. The recommendations were in six major area. (1) Congress should extend the time to meet the 1977 requirements on a case-by-case basis for dischargers where good cause exists. (2) The 'swimmability, fishability' goal should be retained, but the date of achievement of the 1983 requirements should be postponed. (3) Under certain provisions, Congress should certify states to exercise full authority and responsibility for planning and aministration of permit and grant programs.

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(4) The construction grant program should be funded between $5 billion and $10 billion per year at 75% of the cost of construction. (5) The goal of elimination of discharge of pollutants should be redefined to stress conservation and reuse of resources. (6) There should be flexibility in the irriated agriculture category with discretionary authority to exempt certain dischargers from monitoring and permit requirements. It has not yet been determined whether the Commission's report will change any minds. However, it has gained the attention of many experts. (Rieck-Florida)
W77-07237

THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 AS APPLIED TO THE SURFACE MINE IN WEST VIRGINIA - POLLUTANT DISCHARGE PERMIT REQUIREMENTS,
L. W. Marquess.
West Virginia Law Review, Vol. 78, p. 213-29 (1976).

Descriptors: *West Virginia, *Federal Water Pollution Control Act, *Coal mine wastes, *Strip mine wastes, Water pollution sources, Wastes, Mining, Coal mines, Legal aspects, Permits, Discharge(Water), Mine wastes, Industrial wastes, Water quality, Water pollution, Streams.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *National Pollutant Discharge Elimination System(NPDES).

The policy of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972 provides the impetus for the prevention of the destruction of one of West Virginia's greatest natural resources, its clean mountain streams. The heart of the FWPCA insofar as it attempts to control and eventually eliminate the discharge of pollutants into the nation's waters is the National Pollutant Discharge Elimination System (NPDES) permit program. The conditions imposed on mine owners by the permit program have increased the difficulty of opening and operating a surface mine in West Virginia. The sections of the act which are pertinent to surface mines are discussed. The sections which apply to West Virginia surface mines in particular are explained. The article also provides a guide to the procedure by which the surface mine operator may obtain a discharge permit. Specific technical requirements may vary from mine to mine. Finally, the legal ramifications of noncompliance with the requirements of the act are examined in terms of government action, both criminal and civil, and of citizens' actions for civil remedies. (Rieck-Florida)
W77-07240

RESEARCH AND THE QUEST FOR CLEAN WATER,
Water Pollution Control Federation, Washington, D.C. Board of Control Research Committee.
Journal Water Pollution Control Federation, Vol. 47, No. 2, p. 240-51 (1975).

Descriptors: *Water Pollution Control Federation, Research priorities, *Decision making, *Federal Water Pollution Control Act of 1972, Analytical techniques, Water pollution control, Research and development, Monitoring, Environmental effects, Waste water treatment, Management, Legal aspects, Economics, Social needs, Systems analysis, Ethics, Aesthetics, Public health.
Identifiers: Residual disposal.

Available technological and analytical tools are unable to cope with water pollution control challenges set forth in the Federal Water Pollution Control Act (FWPCA) of 1972. The Water Pollution Control Federation (WPCF) is concerned over the current, inadequate federal effort in the area of research. The WPCF Board of Control considered four categories of research needs: (1) analytical techniques with more complete and accurate monitoring systems of information concerning the chemical, biological and physical characteristics of water; (2) wastewater treatment with a consideration of the entire treatment sequence of collection, treatment and residual disposal in municipal and industrial systems; (3) environmental effects concerning ecological, aesthetic and public health effects; and (4) management strategies with major research need for policy modeling to understand links between technology and microeconomic aspects in conjunction with social and ethical considerations. Water pollution control, as a public policy problem, is a proper area for research in law, economics, sociology, systems analysis and other disciplines related to decision making. (Rieck-Florida)
W77-07243

THE 1973 IMCO CONVENTION: TIGHTENING THE CONTROLS ON OPERATIONAL OIL POLLUTION FROM TANKERS,
R. J. Skocypec.
UCLA-Alaska Law Review, Vol 5, No 2, p 353-80, (1976).

Descriptors: *Oil pollution, *Oil wastes, *Oil spills, *Ships, Water pollution sources, Oil, Petroleum, International waters, Oily water, Chemical wastes, Fuels, Oil industry, Water pollution, International law, Treaties, Legal aspects, International commissions, Federal government, Conferences, Foreign countries, Governments, United Nations.
Identifiers: *International Conference on Marine Pollution, *Oil Pollution Act, Coastal waters, Contiguous zone, Territorial seas(Jurisdiction), Coastal zone management.

In 1973 the International conference on Marine Pollution proposed a new and more stringent set of regulations to control oil pollution from tankers. The new convertion deals primarily with 'intentional', or operational, oil pollution sources. Pertinent provisions from the new regulations include the expanded definition of 'oil' to include petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products. Dischrge standards are strengthened to prevent any discharge within 50 nautical miles of land, and the rate of discharge must not exceed 60 liters per nautical mile. New tankers may not discharge more than 1/30,000 of their previous cargo. A new discharge monitoring and control system will be reguired on all tankers to detech violations. Shoreside treatment facilities will become mandatory in order to reduce the necessity of discharging at sea. Additionally any new tanker exceeding 70,000 DWT will be required to have a segregated ballast tanker, thereby eliminating dirty ballast entirely. The major drawback of the new regulations is in enforcement. Coastal nations can only take action against violations within their twelve mile jurisdictional limits. Violations committed on the high seas must be dealth with by the flag state. Experience has proved this ineffective. (Moorhouse-Florida)
W77-07244

THERMAL POLLUTION AND ITS CONTROL,
Washington Univ., St. Louis, Mo. Dept. of Chemical Engineering; and Washington Univ., St. Louis, Mo. Program in Technology and Human Affairs.
C. T. Hill.
Environmental Affairs, Vol. 2, No. 2, p. 406-20 (Fall 1972). 2 tab.

Descriptors: *Cooling, *Thermal pollution, *Heat, *Cooling tower, Powerplants, Electric power, Technology, Cooling water, Water pollution, Heated water, Water temperature, Water cooling, Thermal properties, Reasonable use, Temperature, Heat transfer, Heat flow, Environment, Waste water(Pollution), Heat treatment, Electric powerplants.
Identifiers: *Cooling ponds.

Thermal pollution is waste heat released to the environment as a by-product of the generation of electricity in steam power plants. Rapid growth of electric power generation and increasing size of individual power plants will cause the national average heat rate to expand in the future. Adequate and reliable technology for thermal pollution control currently exists. Cooling towers or cooling ponds can be used to transfer waste heat to the atmosphere. Because of the large amount of land reguired for cooling ponds, their use is restricted to regions where land is both available and cheap. Loss of water by evaporation and drift, discharge of treatment chemicals and adverse effects of moist heated air plumes are major environmental problems connected with wet cooling towers. The author presents suggestions for the beneficial utilization of waste heat. However, most of the ideas are still in the planning stage. Furthermore, even if employed for beneficial purposes, all heat is eventually released. A limit will be reached on overall thermal discharge due to global heating. Therefore, the ultimate problem of a limit to global thermal discharge cannot be avoided by using waste heat beneficially. (Rieck-Florida)
W77-07245

RULES FOR THE PROTECTION OF THE MARINE ENVIRONMENT RELATING TO TANK VESSELS CARRYING OIL IN BULK,
Coast Guard, Washington, D.C.
Federal Register, Vol 41, No 240, p 54177-80, December 13, 1976.

Descriptors: *Regulation, *Coast Guard regulations, *Oil industry, *Oil wastes, Oil pollution, Waste water(Pollution), Legal aspects, Federal government, Oily water, Ships, Control, Governments, Inspection, Law enforcement, Foreign trade, Foreign countries.
Identifiers: *Coastal waters, Territorial seas(Jurisdiction), Administrative regulations, Marine environment.

Amendments have been added to the oil vessel pollution regulations imposing design, equipment and operation requirements for seagoing U.S. flag tank vessels of 150 gross tons or more and equally heavy foreign flag vessels that enter U.S. navigable waters. Slop tanks must have a slop retention capacity of three percent of the vessel's oil carrying capacity. A two percent capacity is allowed under limited circumstances. Before a vessel enters U. S. waters the owner, builder or designer must submit calculations to substantiate compliance with the tank size requirements. The required calculations are explictly delineated in the regulations. The amendments also provide the conditions under which clean and segregated ballast may be discharged. The amendments become effective April 1, 1977. Sections 157.11, 157.15, 157.17(a), (b) and 157.19(a)(2), (a)(3) become effective at different times depending on varying characteristics of the vessel concerned. (Moorhouse-Florida)
W77-07251

GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5A.
W77-07252

RULES AND REGULATIONS FOR PROTECTION OF THE MARINE ENVIRONMENT RELATING TO TANK VESSELS CARRYING OIL IN DOMESTIC TRADE,
Coast Guard, Washington, D.C.
Federal Register, Vol 41, No 5, p 1479-82, January 8, 1976.

Descriptors: *Coast Guard regulations, *Oil pollution, *International waters, *Oil spills, Storage tanks, Oily water, Disasters, Water pollution sources, Transportation, Boats, Federal government, Ships, International commissions, Oil-water interfaces, Oceans, Pollutants.
Identifiers: *Hazardous substances(Pollution), Tankers, Vessels, Ballast tanks.

Coast Guard regulations provide for the placement of ballast tanks on oil-carrying vessels of over 70,000 DWT in order to minimize oil loss incase of accidental leakage from tankers. When accidental penetration of the side or bottom of a tanker occurs, side penetrations are both more likely to result, and more apt to release all the contents of the ruptured tank. The higher degree of built-up protection possible through insulating the tanks from the hull with ballast storage tanks is utilized within the parameters of maintaining longitudinal stress, draft and trim requirements. Additionally, the presence of ballast tanks will make unnecessary the practice of putting ballast water in the oil tanks when they are empty; the release of this oily water sludge is a major source of water pollution in itself. While there is some belief that the cost of segregated balance is too great, the Coast Guard believes that segregated ballast is needed as a measure to improve the environmental quality of the oceans. (Molloy-Florida)
W77-07254

A SCIENTIFIC AND LEGAL LOOK AT THERMAL POLLUTION,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07256

FLORIDA STATUTES, CHAPTER 253--THE 1969 AMENDMENTS AND PROPOSED LEGISLATION,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07258

ECONOMIC ASPECTS OF POLLUTION ABATEMENT, PART 1,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07260

LEGAL ASPECTS OF CHANGES BROUGHT ABOUT BY BUCKEYE'S POLLUTION ABATEMENT PROGRAM, PART II,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07261

PECOS RIVER COMPACT.
For primary bibliographic entry see Field 6E.
W77-07262

APPROPRIATION OF WATER--PERMITS, CERTIFICATES AND LICENSES--SURVEY.
For primary bibliographic entry see Field 6E.
W77-07265

UNITED STATES V ASHLAND OIL AND TRANSPORTATION COMPANY (USE OF THE WORD 'NAVIGABLE WATERS' IN THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 HELD TO MEAN 'WATERS OF THE UNITED STATES').
For primary bibliographic entry see Field 6E.
W77-07273

UNITED STATES V CUTTER LABORATORIES, INC (CIVIL LIABILITY OF A PERMITTEE FOR WHOM NO INDUSTRIAL EFFLUENT LIMITATIONS OR GUIDELINES EXIST).
For primary bibliographic entry see Field 6E.
W77-07274

UNITED STATES V DIAMOND (PERMANENT INJUNCTION DURING ADMINISTRATIVE PROCEDURES JUSTIFIED BY DEVELOPERS FILL OF MARSHLAND WITHOUT REFUSE ACT PERMIT),
For primary bibliographic entry see Field 6E.
W77-07275

COMMITTEE FOR THE CONSIDERATION OF THE JONES FALLS SEWAGE SYSTEM V TRAIN (FEDERAL COMMON LAW CONCERNING WATER POLLUTION APPLICIABLE TO INTERSTATE CONTROVERSEY ONLY),
For primary bibliographic entry see Field 6E.
W77-07276

GEOLOGISTS CLAIM HEALTH CAN BE TRACED TO ROCKS,
For primary bibliographic entry see Field 5B.
W77-07290

DEEP WELL INJECTION: SWEEPING THE PROBLEM UNDER THE CARPET,
P. J. Kendrick.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 187-189, February, 1977.

Descriptors: *Injection wells, *Waste disposal, Aquifers, Legislation, Water pollution control, Pollution abatement, Deep wells.
Identifiers: Safe Drinking Water Act.

Although deep well injection as a means of waste disposal is thought to be feasible for some areas of the country, it remains a little-understood practice. Introducing toxic materials into confined geologic strata having no other potential use may pose threats to future drinking water sources, mining operations and the subsurface environment in general. Not only would decontamination be impossible to effect, but possible geologic changes resulting from high-pressure injection such as fracturing of strata and the triggering of seismic activity would also have irreversible consequences. State legislation to regulate subsurface injection has existed as early as 1934; federal interest in injection well control began in 1970, culminating with the Safe Drinking Water Act of 1974 and its accompanying inspection, monitoring, record-keeping and reporting regulations now being finalized by the EPA. In the past, legal proceedings concerning well injection have dealt with the issue from various standpoints and with rather confusing results. Current interpretation frequently hinges upon nuisance or strict liability doctrine. (Eberle-NWWA)
W77-07295

FIRE EFFECTS ON WATER SUPPLY, FLOODS, AND SEDIMENTATION,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
For primary bibliographic entry see Field 4C.
W77-07318

STATUS REPORT ON ABATEMENT OF WATER POLLUTION FROM THE CANADIAN PETROLEUM REFINING INDUSTRY - 1975,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
Economic and Technical Review Report, EPS 3-WP-76-11, December, 1976, 54 p., 5 fig., 6 tab, 2 append.

Descriptors: *Oil wastes, *Oil industry, Water pollution control, Regulation, Effluents, Toxicity, Chemical wastes, Discharge measurement, *Canada, Oil wastes, Oil pollution, Oily water, Costs, Phenols, Sulphides, Ammonia, Suspended solids, *Water quality standards, Waste disposal, *Pollution abatement.
Identifiers: *Refineries.

Effluent regulations and guidelines to limit the discharge of pollutants from the petroleum refining industry were issued under the Federal Fisheries Act in November 1973. This report presents an asessment of the progress to the end of 1975 in meeting the discharge objectives, and provides projections of the anticipated status through to 1980. (WATDOC)
W77-07334

OCCURRENCE AND DETERMINATION OF A HERBICIDE BENTHIOCARB IN RIVERS AND AGRICULTURAL DRAINAGES,
Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
For primary bibliographic entry see Field 5A.
W77-07361

SPILLWAY REDESIGN ABATES GAS SUPERSATURATION IN COLUMBIA RIVER,
Army Engineer District, Portland, Oreg., North Pacific Div.
H. A. Smith, Jr.
Civil Engineering, ASCE, Vol. 44 (9), p. 70-73, September 1974, 4 fig.

Descriptors: *Columbia River, *Supersaturation, Anadromous fish, *Dams, Dam sites, Spillways, *Engineering structures, *Salmon, Hydraulics, Fish passage, Fish migration, Nitrogen, Mortalities.
Identifiers: *Gas bubble disease, *Spillway deflectors, Nitrogen supersaturation, *Fish transport, Fish trucking.

The Corps of Engineers and other agencies are exploring several possible solutions to the gas supersaturation problem. These include more headwater storage, installation of additional power units to reduce the amount of spilling, new spillway stilling basin designs and collection and transportation around the supersaturated stretches of Columbia and Snake River Basins. Spillway deflectors seem to be the most promising solution. (Katz)
W77-07432

REPORT OF A STUDY OF CONTROL AGENCY REVENUE FEES,
Environmental Protection Agency, Washington, D. C. Office of Planning and, Management.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 668, Price codes: A04 in paper copy, A01 in microfiche. July 1974. 65 p. 5 tab.

Descriptors: *Governmental interrelations, Federal government, *Local governments, *State governments, *Government supports, Pollution taxes(Charges, *Income, Grants, Water pollution control, Air pollution, Pollutant identification, Government finance.
Identifiers: Fees, *Pollution control agency grants.

Revenues potentially available to state and local governments from fees charged in permitting, inspecting, monitoring, or otherwise regulating air and water pollution are studied to indicate the possibility and problems associated with their use as a replacement for federal control agency grants. An estimate of the nationwide revenue potential showed that as much as 30% of the funding required by stat and local control agencies could be derived from fees. However, during FY 1974, fee receipts amounted to only 3% of the estimated $240 million expenditure. The largest obstacle to be overcome was shown to be the generally negative attitude of state and local officials. Implications are that; (1) States and localities will not take over federal responsibilities nor support a variety of federally required activities if the federal government does not pay its fair share, (2) a shift from the grant program toward fees would be seen as a shift in federal commitment from the current

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federal/state partnership arrangement, and (3) most state and local governments would not turn to fees in the event of a grant phase-out, and reductions in federal funding would only slowly be made up by increased state and local appropriations. It was recommended that the current grant programs be continued and that no formal encouragement of fees be undertaken. (Luedtke-Wisconsin).
W77-07435

LEGAL DECISIONS AND OPINIONS IN POLLUTION CASES,
Messenger, Lynch, Hills and Miller, Beltsville, Md.
J. P. Hills.
Environmental Science and Technology, Vol. 10, No. 3, p. 234-238, 1976.

Descriptors: *Water pollution, *Air pollution, *Legal aspects, *Judicial decisions, *Risks, *Court decisions, Common law, Legal review, Negligence, Public health, Regulation, Cases, Water law, Asbestos, Water pollution sources, Lake Superior, Lead, Toxicity, Pollutants, Aldrin, Pesticides, Dieldrin.
Identifiers: *Burden of Proof(Legal), Polyvinyl chloride.

A study of legal trends in connection with court decisions based on litigation related to water and air pollution finds that in cases dealing with frontier areas of scientific knowledge, U.S. courts are waiving traditional burdens of proof, giving increased weight to expert opinions and/or lowering their standard of necessary proof. The law has traditionally dealt with a single plaintiff who sues a defendant was more likely than not responsible for the injury. It has traditionally required a showing that the defendant was more likely than not responsible for the injury. In pollution cases, however, and especially in those that relate to public health, large numbers of persons stand to be injured if the cited activity is not stopped. This is where the reciprocal relationship between risk and harm becomes important in legal remedies. Four typical cases are reviewed: (1)the Reserve Mining Company (Lake Superior) area) litigation over asbestos pollution in drinking water sources; (2) lead in gasoline; (3) the manufacture and use of polyvinyl chloride products; and (4) the Environmental Protection Agency ban on the pesticide aldrin/dieldrin. An ordinal scale is given in the text which relates measure of proof (in 10% increments) to purposes for which the proof was used by courts. According to the scale, courts are now permitting administrative determinations in pollution-related cases where as little as 27% certainty is sufficient to initiate certain kinds of actions. (Harris-Wisconsin).
W77-07436

THE ECONOMICS OF NATURAL ENVIRONMENTS, STUDIES IN THE VALUATION OF COMMODITY AND AMENITY RESOURCES.
Resources for the Future, Inc., Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-07437

THE ENVIRONMENTALLY CONCERNED CITIZEN: SOME CORRELATES,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 6G.
W77-07438

PREDICTING THE IMPACTS OF PHOSPHORUS MANAGEMENT POLICIES ON THE EUTROPHICATION OF SKAHA LAKE, BRITISH COLUMBIA, CANADA,
For primary bibliographic entry see Field 5C.
W77-07446

LAKE RESTORATION THROUGH MECHANICAL HARVESTING OF AQUATIC VEGETATION,
I. Wile.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 660-671, 1975. 7 fig., 3 tab., 11 ref.

Descriptors: *Lakes, *Reclamation, *Harvesting, Mechanical control, Economics, Waste disposal, Aquatic plants, *Canada, Weeds, *Aquatic weed control.
Identifiers: *Lake restoration, Southern Chemung Lake(Ontario), *Kawartha Lakes(Ontario).

As a potential corrective measure, mechanical harvesting of nuisance vegetation is being evaluated on a pilot-scale basis in Southern Chemung Lake, one of the more seriously-afflicted lakes in the Kawartha Lakes area of Ontario, Canada. Detailed studies are currently underway to assess the impact of extensive plant removal on water quality, macrophyte and phytoplankton dynamics and on fisheries. Although no major conclusions regarding the practical and biological implications of weed harvesting can be reached on the basis of a single year's data, initial results are encouraging. To date no significant changes have been noted in fish and algal populations. Due to the late start in operations, the extent of plant regrowth in areas which were harvested was not properly assessed. While the use of mechanical harvesting as a management technique holds considerable promise, many problems remain unsolved. The low operating speeds of existent machinery coupled with continuous breakdowns resulted in a harvesting rate of 0.27 hectares per hour, a most unproductive rate when compared with agricultural operations. A secondary problem relates to the disposal of large quantities of plant material generated by the harvesting operation. Although nearby farm disposal sites were provided, the economics of weed harvesting could be considerably improved if harvested material could be profitably utilized. (Harrison-Wisconsin)
W77-07451

INFLUENCE OF THE DRAINAGE BASIN ON THE EUTROPHICATION OF THE A-MESOTROPHIC LAKE PIASECZNO AND DIS-EUTROPHICATION OF THE POND LAKE BIKCZE,
Instytut Przyrodniczych Podstaw, Lublin (Poland). Produkeji Roslinnej AR.
For primary bibliographic entry see Field 5C.
W77-07452

APPLICATION OF VASCULAR AQUATIC PLANTS FOR POLLUTION REMOVAL, ENERGY AND FOOD PRODUCTION IN A BIOLOGICAL SYSTEM,
National Space Technology Labs., Bay St. Louis, Miss.
For primary bibliographic entry see Field 5D.
W77-07474

HYDROLOGY,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-07494

WIND CONTROL OF ALGAE GROWTH IN EUTROPHIC LAKES,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
H. Stefan, T. Skoglund, and R. O. Megard.
Journal of the Environmental Engineering Div., Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE6, p. 1201-1213, 1976. 7 fig., 15 ref.

Descriptors: *Mechanical control, *Algal control, Wind velocity, *Eutrophication, Mathematical models, Light penetration, Water temperature, Epilimnion, Mixing, Euphotic zone, Lakes.
Identifiers: Air bubbling, Wind control(Algal growth).

While nutrient levels, grazing, and other processes are important to algae biomass, the contention is that because algal growth is confined to the photic zone, wind induced dynamics of the mixed layer in a medium-sized eutrophic lake will catalytically control the actual primary productivity. This theory is explained and mathematically defined by analysis of a water column's equilibrium concentrations as a function of the light attenuation coefficient and depth. For a real, lake, the phytoplankton growth was computed on a daily basis throughout a season as a function of daily variations in water temperature distributions, mixed layer depths, and illumination, each calculated separately, and used as input for the phytoplankton growth analysis. The computations indicated that periods of warm, calm weather result in higher near surface water temperature and smaller mixed layer depths and are usually accompanied or followed within a few days by strong increases in epilimnetic phytoplankton concentrations. Populations were found to decrease due to increased shading when mixed layer depths increased. Artificial algal control by air bubbling can thus control phytoplankton growth by varying the mixed layer depth. The analytical method presented can be used to evaluate the effectiveness of changes in the mixed layer depth in a lake as a green and blue-green algae control method. (Auen-Wisconsin).
W77-07497

WATER QUALITY CRITERIA AND WASTE WATER TREATMENT,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5D.
W77-07522

ECONOMIC VALUE OF LOW FLOW DATA,
Technical Univ. of Denmark, Copenhagen.
For primary bibliographic entry see Field 5D.
W77-07537

POWER PLANT SITE EVALUATION: THE CASE OF THE SHARON PLANT IN ISRAEL,
Technion - Israel Inst. of Tech., Haifa. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6G.
W77-07546

WATER QUALITY AND AQUITARD PERMEABILITY,
Idaho Univ., Moscow. Dept. of Civil Engineering.
J. H. Hardcastle, and J. K. Mitchell.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. IR2, Proceedings paper No. 12203, p 205-220, June 1976. 8 fig, 1 tab, 15 ref.

Descriptors: *Water quality, *Absorption, *Aquitards, *Clays, *Drainage, *Groundwater, *Permeability, *Saline water intrusion, *Sodium, Dispersion, Aquifers, Electrolytes, Dissolved solids, Groundwater recharge, Leaching, Illite, Silts, Salinity, *Sediments, Soils.

Flow tests on artificially sedimented illite-silt mixtures designed to simulate aquitard soils show that permeability changes accompanying changes in pore water dissolved salt concentration depend upon the exchangeable sodium percentage and the structural state of the clay. The dissolved salt concentration at which clay swelling causes permeability reductions and the concentration that causes clay dispersion both vary directly with exchangeable sodium percentage. Comparisons suggest that at equal exchangeable sodium percentages, flocculated-disaggregated illite particles swell more and

disperse at slightly higher dissolved salt concentrations than when the particles have been previously aggregated into domains by drying. Permeability increases accompanying increases in dissolved salt concentrations are small. When the clay is not dispersed, permeability increases are proportional to the degree of clay swelling existing prior to the increase. Permeability increases in completely dispersed clays are inversely related to exchangeable sodium percentage. (Bell-Cornell)
W77-07551

SUBJECT KEYWORD LIST, (ESTUARINE AND COASTAL MARINE SCIENCE),
For primary bibliographic entry see Field 2L.
W77-07564

RELATION BETWEEN THE AMOUNTS OF FERTILIZATION AND LIVESTOCK WASTE ON FIELDS AND THE POLLUTION OF STREAMS FLOWING INTO LAKE KASUMIGAURA: 1. ON THE RELATION BETWEEN THE AMOUNT OF FERTILIZER APPLICATION AND THE SPECIFIC POLLUTION LOADS OF NITROGEN AND PHOSPHORUS IN MAIN STREAMS FLOWING INTO LAKE NISHIURA, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W77-07568

RELATION BETWEEN THE AMOUNTS OF FERTILIZER AND LIVESTOCK WASTE ON FIELDS AND THE POLLUTION OF STREAMS FLOWING INTO LAKE KASUMIGAURA: II. ON THE RELATION BETWEEN LIVESTOCK WASTE PER UNIT AREA OF BASIN AND THE SPECIFIC LOAD OF POLLUTANTS IN MAIN STREAMS FLOWING INTO NISHIURA LAKE BASIN, (IN JAPANESE),
Ibaraki Univ. Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W77-07569

LAKE RESTORATION BY BOTTOM WATER SIPHONING, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland).
R. Gaechter.
Schweiz Z Hydrol 38(1), p 1-28, 1976.

Descriptors: Siphons, *Eutrophication, Lakes, Nutrients, Drainage, Trophic levels, Water pollution control, *Pollution abatement, *Hypolimnion.
Identifiers: *Lake restoration, *Siphoning(Bottom water).

It is possible to restore a highly eutrophic lake by the mean of bottom water siphoning. The main effects of the hypolimnion drainage, e.g., erosion of the hypolimnion and increase of the nutrient export out of the lake are discussed. From mass balance calculations it is deduced that in eutrophic shallow lakes the nutrient supply to the trophogenic layer by the sediments can temporarily exceed the external loading by more than a hundredfold. The process of self-maintaining autoeutrophication is described. --Copyright 1977, Biological Abstracts, Inc.
W77-07577

MACROPHYTES AND PHOSPHORUS IN LAKE ANDSJON, CENTRAL SWEDEN, (IN SWEDISH),
For primary bibliographic entry see Field 5C.
W77-07582

OUTBREAK OF CHIRONOMID MIDGE IN A POLLUTED RIVER AND THE CHEMICAL CONTROL OF THE LARVAE, (IN JAPANESE),
Kagoshima Univ. (Japan). Dept. of Medical Zoology.
Y. Tabaru.
Jpn J Sanit Zool 26(4), p 247-252, 1975.

Descriptors: *Chemcontrol, Carp, *Diptera, Larvae, Water pollution, Rivers, *Midges, Aquatic insects, *Insecticides, Pollution abatement.
Identifiers: *Temephos, *Suimon River(Japan).

Investigations on the chemical control of chironomid larvae were carried out in the Suimon river which runs through the center of Ohgaki City, Gifu Prefecture (Japan). The river was so heavily polluted due to drainage from the factories that no midge larvae could breed there before the Water Pollution Control Law was enforced in 1971. The midge-swarm problems arose in autumn 1973, because of the enforcement of regulation of the drainage from the factories which improved the biological oxygen demand in the water from 85 ppm in 1970 to 12 ppm in 1974. The density of the larvae per 40 cu cm (20 sq cm x 2 cm in depth) of the bottom mud was estimated from 126 to 186 before the river was treated with temephos. In the laboratory test, 45% of the tested larvae were killed and the survivals were intoxicated at 12 h after treatment when they were dipped into 0.8 ppm active ingredient (AI) of temephos WP (wettable powder) for 60 min. In the field test, the river was treated with the temephos WP for 60 min at 1 ppm of the flowing water volume. At 9 days after treatment, no midge larvae were found at about 1.6 km downstream from the application spot. Temephos showed no poisonous effects on a loach up to 10 ppm in the laboratory test. A loach, carp, crucion and top minnow habitating the river were not affected by the temephos treatment.--Copyright 1977, Biological Abstracts, Inc.
W77-07585

LITERATURE ON ENVIRONMENTAL PROTECTION, MANAGEMENT AND HYGIENE IN SWEDEN 1952-1971: BIBLIOGRAPHY AND ANALYSIS, (IN SWEDISH),
For primary bibliographic entry see Field 6G.
W77-07586

HYGIENIC STANDARDIZATION OF DISODIUM SALTS OF META-AND PARA-DIISOPROPYLBENZENE IN WATER BODIES, (IN RUSSIAN),
Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR). Div. of Public Hygiene.
For primary bibliographic entry see Field 5C.
W77-07590

ASSAY OF DETERGENT RESIDUES IN FRESH WATER, SEA WATER AND WASTE WATERS: METHOD OF EXTRACTION AND CONCENTRATION OF SURFACTANTS BY ADSORPTION ON LIQUID-LIQUID INTERFACE, (IN FRENCH),
Tours Univ. (France). Laboratoire de Chimie Minerale et d'Hydrologie.
For primary bibliographic entry see Field 5A.
W77-07591

SELF-PURIFICATION IN THE COASTAL WATERS OF THE BLACK SEA, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-07592

BACTERIOLOGICAL QUALITY OF POULTRY-FARMS' WATER IN MINAS GERAIS STATE, BRAZIL: 1973, (IN PORTUGESE),
Universidade Federal de Minas Gerais, Belo Horizonte (Brazil). School of Veterinary Medicine.
For primary bibliographic entry see Field 5F.
W77-07594

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE EVALUATION OF SIMPLE AND OPTIMAL DECISION RULES WITH MISSPECIFIED WELFARE FUNCTIONS,
Australian National Univ., Canberra. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W77-07439

EVALUATION OF FLOOD FORECASTING-RESPONSE SYSTEMS,
Princeton Univ., N.J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07524

PUMPED STORAGE OPTIMIZATION IN GENERATION SYSTEMS,
Natal Univ., Durban(South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07525

VALUE OF LANDSAT IN URBAN WATER RESOURCES PLANNING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
T. J. Jackson, and R. M. Ragan.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12906, p 33-46, May 1977. 5 fig, 3 tab, 20 ref.

Descriptors: *Water resources, *Planning, *Decision making, *Watersheds(Basins), *Economic efficiency, *Remote sensing, Hydraulics, Hydrology, Hydrologic data, Economics, Value, Simulation analysis, Optimization, Flood frequency, Flood control, Flood damage, Equations, Mathematical models, Systems analysis, Probability, Risks, Virginia.
Identifiers: *Urban areas, *Economic analysis, *Bayesian decision theory, Information theory, Opportunity loss matrix, Cost-effectiveness, Benefit maximization, *Fourmile Run watershed(Va), *Landsat data.

Bayesian decision theory was used to study the economic value of Landsat data in urban water resources planning. The investigation focused upon a case study of the Fourmile Run watershed in the Virginia suburbs of Washington, D. C. Land cover data were required to aid in the selection of an optimal level of onsite detention storage to mitigate flood damages. The problem was to determine the level of flood control that maximized the difference between annual benefit and annual cost, the difference being the annual net benefit which was used in calculating the opportunity losses. An estimate of the percentage of impervious area was needed to determine theparameters of the hydrologic simulation model utilized in generating the flood frequency information. Preposterior Bayesian analysis indicated that computer-aided analysis of Landsat data was a highly cost-effective method for determining the percentage of impervious area.(See also W77-07528), (Bell-Cornell)
W77-07527

TEST OF LANDSAT-BASED URBAN HYDROLOGIC MODELING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
T. J. Jackson, R. M. Ragan, and W. N. Fitch.
Journal of the Water Resources Planning and Management Division, Proceedings of the Amer-

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ican Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12950, May 1977, p 141-158. 8 fig, 6 tab, 18 ref.

Descriptors: *Watersheds(Basins), *Areial photography, *Computer models, *Remote sensing, Hydraulics, Hydrology, Water resources, Systems analysis, Planning.
Identifiers: Urban planning, Urban development, Cost-effectiveness.

Many of the models designed to support the hydrologic studies associated with urban water resources planning require input parameters that are defined in terms of land cover. Estimating the land cover is a difficult and expensive task and any innovation that can reduce these problems should be of significant value to the water resources planning community. The purpose of the reported investigation was to compare conventional and Landsat-based methods for determining the land cover inputs of hydrologic planning and design models. Comparisons were based on a case study of the Fourmile Run Watershed in Virginia. Results of the study indicated that for planning model studies, the Landsat-based approach is highly cost-effective. However, in the design model investigations, the errors encountered when the Landsat data are used were unacceptable. (See also W77-07527) (Bell-Cornell)
W77-07528

MANAGEMENT MODEL FOR GROUND WATER DEVELOPMENT,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-07529

MODELING MULTIPLE-USE IN NATURAL AREAS: PART I -- THE BASIC FORMULATION,
Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo.
D. W. York, B. C. Dysart, III, and L. W. Gahan.
Water Resources Bulletin, Vol. 13, No. 1, p 13-24, February 1977. 3 fig, 1 tab, 14 ref.

Descriptors: *Environment, *Assessment, *Cost-benefit analysis, *Optimization, Water resources, Planning, Economics, Constraints, Mathematical models, Systems analysis, Recreation.
Identifiers: *Natural areas, *Multiple use, *Environmental planning, Compatibility constraints.

Presented is a mathematical model of multiple-use in natural areas. The model represents a unified system for the assessment of cases where some form of development is proposed for relatively natural areas. The focus of the model system is a cost-benefit analysis. Provisions for the full consideration of easily measured monetary costs and benefits as well as semitangible benefits accruing from environment-related activities such as outdoor recreation are contained in the model. Means for incorporating desirability as a measure of aesthetics, uniqueness, and environmental quality into the evaluation are provided. Several types of constraints have been imposed on the system to increase model realism. A family of compatibility constraints has been designed to limit inter-use conflicts arising from incompatible activities. A form of the gradient optimization algorithm is utilized to facilitate the evaluation. The decision making process involves the selection of the management scheme that maximizes total net benefits accruing within the area of economic influence. The model system has application in a wide range of problems frequently encountered in environmental planning and assessment as well as in natural resources management. (Bell-Cornell)
W77-07530

GAINS FROM JOINT OPERATION OF MULTIPLE RESERVOIR SYSTEMS,
Johns Hopkins Univ., Baltimore, Mo. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-07533

THE ECONOMIC BASIS OF RESOURCE INFORMATION SYSTEMS: THE CASE OF STREAMFLOW DATA NETWORK DESIGN,
Geological Survey, Reston, Va. Geologic Div.
For primary bibliographic entry see Field 7A.
W77-07534

RELIABILITY-CONSTRAINED DYNAMIC PROGRAMING AND RANDOMIZED RELEASE RULES IN RESERVOIR MANAGEMENT,
Worcester Polytechnic Inst., Mass. Dept. Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07535

RESERVOIR OPERATION UNDER CONFLICTING OBJECTIVES,
Politecnico di Milano (Italy). Instituto di Elettrotecnica ed Elettronica.
For primary bibliographic entry see Field 4A.
W77-07536

ECONOMIC VALUE OF LOW FLOW DATA,
Technical Univ. of Denmark, Copenhagen.
For primary bibliographic entry see Field 5D.
W77-07537

CAPACITY EXPANSION AND OPERATIONAL PLANNING FOR REGIONAL WATER-RESOURCE SYSTEMS,
General Motors Corp., Cleveland, Ohio. Fisher Body.
For primary bibliographic entry see Field 6B.
W77-07538

SCHEDULING MODELS FOR WILDERNESS RECREATION.
Utah State Univ., Logan. Dept. of Forest Science.
For primary bibliographic entry see Field 6B.
W77-07541

DECISION-MAKING FOR ENVIRONMENTAL RESOURCES MANAGEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W77-07542

TOWARDS SYSTEM MODELS FOR WATER RESOURCE MANAGEMENT,
Leeds Univ. (England). Dept. of Geography.
A. G. Wilson.
Journal of Environmental Management, Vol. 1, No. 1, p 65-81, January 1973. 2 fig, 14 ref, append.

Descriptors: Water resources development, *Management, *Model studies, *Planning, Linear programming, Optimization, Economic feasibility, Costs, Equations, Systems analysis.
Identifiers: *System models, *Model building, *Spatial analysis techniques, Cost minimization, Benefit maximization, Nonlinear programming.

Explored are some of the problems associated with the task of building system models which would help in water resource management. Examined are the kinds of progress in management which would be expected if some of these problems could be solved. The main conclusion drawn is that there is every reason why fairly rapid development should be possible in improvements in water resource management using model based spatial analysis skills, and it is expected that geographers will need to play a leading role in such developments, in association with a variety of skills from other disciplines. First, a water resources system is defined along with characterization of the system state. This provides a basic framework within which different types of model could be developed for different purposes and scales of analysis. Next, the nature of management objectives for the system is discussed; associated decision areas are considered. The system is characterized by source variables, delivery variables, and sink variables. Considered are cost minimization and benefit maximization. Next, the nature of possible models is explored. An example cost minimization problem, formulated using both linear and nonlinear programming, is presented to illustrate model use. Finally, how the models can be used to achieve management objectives is explored, and the possibility of empirical tests examined. A summaray of conclusions is given. ti(Bell-Cornell)
W77-07544

BROADENING THE APPROACH TO EVALUATION IN RESOURCES MANAGEMENT DECISION-MAKING,
Victoria Univ. (British Columbia). Dept. of Geography; and Victoria Univ. (British Columbia). Dept. of Economics.
For primary bibliographic entry see Field 6B.
W77-07545

POWER PLANT SITE EVALUATION: THE CASE OF THE SHARON PLANT IN ISRAEL,
Technion - Israel Inst. of Tech., Haifa. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6G.
W77-07546

REDUCING POWER CONSUMPTION IN IRRIGATION SYSTEMS WITH THE AID OF A MATHEMATICAL MODEL FOR PIPE DIMENSIONING,
Academia de Studii Economice, Bucharest (Rumania). Dept. of Economic Cybernetics.
For primary bibliographic entry see Field 3F.
W77-07547

IMPERATIVES OF WATER RESOURCES PLANNING IN THE DEVELOPING ECONOMY OF INDIA,
Bihar Coll. of Engineering, Patna (India).
T. Prasad.
Indian Journal of Power and River Valley Development, Vol 24, No 7, p 211-213, July 1974. 4 ref.

Descriptors: *Water resources development, *Comprehensive planning, *Economic efficiency, River basins, Projects, Mathematical models, Hydrologic aspects, Data collections, Competing uses, Water demand, Water supply, Water allocation(Policy), Alternative planning, Behavior, Simulation analysis, Optimization, Computers, Systems analysis.
Identifiers: *India, *Developing countries, Systems engineering, Hydrometeorological features, Physical features.

Water continues to play a significant and critical role in the Indian economy. Although India is adequately endowed with water resources, their non-uniformity in spatial as well as temporal distribution does not correspond with the pattern of diverse uses to which they can be allocated. This leads to the necessity of conservation and allied water resources projects. Since there are competing demands on the financial resources of the developing economy of India, the need for efficiency and optimality in planning these projects cannot be overemphasized. Such efficiency and optimality can be achieved through integrated, flexible, comprehensive planning of the entire river basin, applying the modern concepts of

mathematical modeling and systems engineering. Valid mathematical models utilizing simulation analysis, linear programming, and dynamic programming, for example, need to be formulated and applied. Scientific collection of hydroeconomic information on the basin and the use of a high speed electronic computer for data processing, modeling, and other conputational purposes have become necessary. (Bell-Cornell)
W77-07555

SYSTEMS APPROACH AND WATERSHED MODELS,
Regional Engineering Coll., Rourkela (India).
For primary bibliographic entry see Field 2A.
W77-07556

EVALUATING ALTERNATIVE LEVELS OF WATER AND SANITATION SERVICE FOR COMMUNITIES IN THE NORTHWEST TERRITORIES,
Associated Engineering Services Ltd., Edmonton (Alberta).
D. J. Gamble, and C. T. L. Janssen.
Canadian Journal of Civil Engineering, Vol 1, No 1, p 116-128, September 1974. 2 fig, 3 tab, 7 ref.

Descriptors: *Canada, *Evaluation, *Water supply, *Sewers, *Methodology, Water delivery, Capital costs, Operating costs, Alternative planning, Optimization, Data collections, Economics, Decision making, Equations, Mathematical models, Systems analysis.
Identifiers: *Northwest Territories(Canada), Developing regions, Vehicular delivery, Garbage collection, Deterministic model.

Most communities in the Northwest Territories lack the water, sewage, and garbage facilities available in southern Canada. Recently, the Government of the Northwest Territories proposed a multimillion dollar ten-year program to improve the water and sanitation services of the communities under its jurisdication. An ongoing project to upgrade these facilities in settlements of the Territories is described. Presented is a methodology whereby the total cost (operating and capital) of the alternative water, sewage, and garbage systems for each community is evaluated by means of a deterministic model. The analysis defines the level of service to be recommended in each community. Cost data for sanitary installations in the north are generally not available and thus need to be estimated. The costs associated with alternative system are assessed as a function of some one hundred variables, including population, water demand, distance to water source, topography, terrain, weather conditions, severity of climate, existence of roads, availability and cost of gravel, general remoteness of the community, freight rates, etc. The basis for comparison of the various levels of service alternatives is the net present value of the investment required over the duration of the program, including capital as well as operating expenditures. Actual data for some forty-five communities are used in the calculations. (Bell-Cornell)
W77-07557

6B. Evaluation Process

FEDERAL RIVERBASIN PLANNING IN THE COASTAL ZONE: THE LONG ISLAND SOUND STUDY,
Yale Univ., New Haven, Conn. School of Forestry and Environmental Studies.
For primary bibliographic entry see Field 2L.
W77-07232

PUBLIC PARTICIPATION TECHNIQUES AND METHODOLOGIES: A RESUME,
Department of the Environment, Ottawa (Ontario). Water Planning and Management Branch.
D. Vindasius.
Social Science Series No. 12, 1974, 30 p., 9 fig., 53 fig., 1 tab. Also available in French.

Descriptors: *Planning, *Methodology, Water resources, Technology, Management, *Reviews, *Canada, United States, Analytical techniques, Model studies, *Social participation.
Identifiers: *Public participation, Case studies.

Discussions are presented of a key preliminary phase of research and action projects concerning public participation in the planning process. A review of past experience in stimulating and using public participation in various forms of planning is considered to identify the lessons which can be learned from this experience so that a viable public participation programme can be formulated. Twelve cases are reviewed; where possible, successful and less successful public participation programmes are compared and contrasted. The role of public participation in planning and what public participation involves, i.e., various techniques and mechanisms and how they should be employed, are examined. Subsequently a general model for public participation programmes is presented. (WATDOC)
W77-07332

THE ECONOMICS OF NATURAL ENVIRONMENTS, STUDIES IN THE VALUATION OF COMMODITY AND AMENITY RESOURCES.
Resources for the Future, Inc., Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-07437

THE ENVIRONMENTALLY CONCERNED CITIZEN: SOME CORRELATES,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 6G.
W77-07438

THE EVALUATION OF SIMPLE AND OPTIMAL DECISION RULES WITH MISSPECIFIED WELFARE FUNCTIONS,
Australian National Univ., Canberra. Dept. of Economics.
E. Burmeister, J. Jackson, and S. A. Ross.
Working Paper No. 28, April 1975. 27 p. 2 tab., 19 ref.

Descriptors: *Theoretical analysis, *Economics, *Welfare(Economics), *Mathematical models, Optimization, Model studies, Evaluation, Capital.
Identifiers: *Misspecified welfare functions(Economics).

A simple dynamic model is constructed to overcome analytical problems faced by economic planners in cases where technological development and the welfare criteria have introduced uncertainty into the implementation of optimal growth policy problems. The paper introduces the problem of planning for an economy whose preference structure is unknown, and puts this problem into a simple dynamic context where the personification of social preferences is a common feature. Numerical techniques are used to explore the sensitivity of a range of additive utility indices to alternative policies, including the simple modified 'golden rule' policy. To avoid some of the difficulties with the use of ordinal utility indices, an opportunity cost index in terms of the initial capital requirement is defined and its sensitivity also explored. The capital index is invariant to ordinal utility transforms and has the advantage of making the cost of misspecification of the social welfare function explicit. Three sections of the paper deal with: (1) a description of the basic model and the development strategies used in this approach; (2) a discussion of the numerical techniques for computing and evaluating both optimal and simple policies; and (3) an introduction of the planner's problem and numerical results from using the model.(Ha
W77-07439

WATER RESOURCES PLANNING AND MANAGEMENT GOALS,
Corps of Engineers, Washington, D.C. Central Reports Management Branch.
C. H. Gaum.
Journal of the Water Resources Planning and Management Division, Proceedings of the Society of Civil Engineers, Vol. 103, No. WR1, Proceedings Paper No. 12941, p 73-82, May 1977. 2 fig, 4 tab.

Descriptors: Water resources development, *Planning, *Decision making, *Priorities, Water management(Applied), Environmental effects, Regions, Projects, *Management.
Identifiers: *Government policies, Federal budget, Regional planning.

The goal of water resources planning and management is to utilize water related sources for national economic gain, regional development, enhancement of the environment, and the provision of social betterment. It must be recognized that because of great demands, the resources, including dollars, must be economically managed. Only those projects having high justification will be placed in the budget cycle for implementation. Water resources planners must develop new techniques to shorten the time required to plan and foreset priorities. They must improve reporting methods and present all relevant factors. By doing so, they will be playing more decisive role in the decision-making process. (Bell-Cornell)
W77-07523

PUBLIC PARTICIPATION IN WATER RESOURCE DEVELOPMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydr. lab.
E. Silberman.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12952, p 111-123, May 1977. 15 ref.

Descriptors: *Water resources development, *Social participation, *Public benefits, Planning, Social needs, Flood control, *Minnesota.
Identifiers: *Public opinion, *Public works, Social perception, Urban areas, *Public participation, *Bassette Creek Flood Control Commission(Minn), *Minneapolis area(Minn).

The objectives of a public participation program should be to assure that planners and public have similar concepts of what the problems are and that the proposed solutions are perceived as solutions by both planners and public. Elements of a public participation program are identifying the public, reaching the public, and determining what the public wishes are. These elements are analyzed by recounting the experience of the Bassett Creek Flood Control Commission in establishing a flood control plan for an urbanized and urbanizing area in Minneapolis metropolitan area. The Commission is composed of nine volunteer commissioners, one appointed by each of the nine cities in the basin. The Commission (with the aid of its consulting engineers) was very effective in melding bureaucratic and public input into an acceptable plan where a previous plan prepared under the auspices of a bureaucratic organization was practically shouted down.(Bell-Cornell)
W77-07526

VALUE OF LANDSAT IN URBAN WATER RESOURCES PLANNING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-07527

LIBRARY U. OF I. URBANA-CHAMPAIGN

TEST OF LANDSAT-BASED URBAN HYDROLOGIC MODELING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-07528

MODELING MULTIPLE-USE IN NATURAL AREAS: PART I -- THE BASIC FORMULATION,
Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo.
For primary bibliographic entry see Field 6A.
W77-07530

CAPACITY EXPANSION AND OPERATIONAL PLANNING FOR REGIONAL WATER-RESOURCE SYSTEMS,
General Motors Corp., Cleveland, Ohio. Fisher Body.
D. E. Kolo, and Y. Y. Haimes.
Journal of Hydrology (Amsterdam), Vol. 32, No. 3/4, p 363-381, February 1977. 7 fig, 2 tab, 23 ref, append.

Descriptors: *Water resources development, *Planning, *Regional economics, *Water allocation(Policy), *Water supply, *Optimization, Mathematical models, Projects, Dynamic programming, Regression analysis, Freshwater, Irrigation water, Decision making, Prices, Costs, Water demand, Cost-benefit analysis, Management, Systems analysis, Equations, Operations research.
Identifiers: *Capacity expansion, *Hierarchical approach, *Benefit maximization, Net benefits, Cost minimization, Power demands, Lagrange multipliers

Presented is an hierarchical approach aimed at coordinating several different mathematical models in order to achieve the economically optimal regional management of water resources and related land. The overall hierarchical model is based on the assumption that projects have two different types of water (fresh and irrigation) and a power capacity. The system objective is to meet freshwater, irrigation water and power demands while maximizing the present value of the net benefits for the entire region. The hierarchical model structure consists of two levels, and the following decisions are made: (1) a supply model determines a project construction sequence which meets given water and power demands at least cost for a planning time horizon of 30 years; and (2) a demand model finds resource allocation policies which yield the greatest return while meeting all demands. Water and power demands are assumed to be functions of water and power prices, respectively, Thus, the return and cost will be functions of water and power prices. The lower level of the model uses dynamic programming to generate the return and cost of various values of the water and power prices. The regression analysis yields the return and cost as explicit functions of the water and power prices; and irrigation demand sumbodel allocates water, dollars, and crops to each farmed subregion. At the higher level, the empirical functions, generated by the lower level, are solved for the optimal prices. (Bell-Cornell)
W77-07538

SCHEDULING MODELS FOR WILDERNESS RECREATION.
Utah State Univ., Logan. Dept. of Forest Science.
H. C. Romesburg.
Journal of Environmental Management, Vol. 2, No. 2, p 159-177, April 1974. 5 fig, 6 tab, 4 ref.

Descriptors: *Recreation, *Decision making, *Mathematical models, *River systems, Constraints, Camp sites, Canada, Parks, Demand, Equations, Linear programming, Systems analysis.
Identifiers: *Scheduling, *Wilderness areas, Float trips, Hiking trails, Social constraints, Environmental constraints, Minimization, Quadratic programming, Goal programming.

The scheduling of recreation in wilderness areas is explored through mathematical decision modeling. Two hypothetical systems are studied: a system of hiking trails, where the solution is found using quadratic programming; and a river system for recreational float trips, where solutions are derived utilizing quadratic programming, linear programming, and goal programming. Trips are allocated to a known user demand which minimizes the encounters among users, subject to campground capacity constraints. The allocation schedules give information for camp-ground or trail expansion which leads to the greatest reduction in encounters, and the solutions provide upper and lower boundaries for encounters. Attention is given to incorporating these models into decision making, pointing out incompleteness within the models and how this restricts the conclusions which can be drawn. The major difficulty is that people are hostile to the idea of having natural experiences so rigidly programmed. Yet, with increasing demand for recreation from a limited resource base, trade-offs involving freedom of choice must be expected. (Bell-Cornell)
W77-07541

DECISION-MAKING FOR ENVIRONMENTAL RESOURCES MANAGEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W77-07542

ACCOUNTING FOR NON-ECONOMIC GOALS IN BENEFIT-COST ANALYSIS,
Michigan Univ., Ann Arbor. School of Natural Resources.
G. Schramm.
Journal of Environmental Management, Vol. 1, No. 2, p 129-150, April 1973. 1 fig, 5 tab, 27 ref.

Descriptors: *Water resources development, *Cost-benefit analysis, *Planning, *Multiple-purpose projects, Methodology, Resource allocation, Evaluation, Cost-benefit ratio, Constraints, Environment, Rivers, Projects.
Identifiers: *Multiple objectives, Accounting framework, *Non-efficiency goals, *National income maximization, Value judgements, Nonmonetary objectives, Marginal tradeoff ratios, Societal objectives, Net income losses, Impact analysis, Social welfare functions.

Benefit-cost analysis has long been accepted as the major method for assessment of alternative water resource projects throughout the world. Little attention was given to who actually received the benefits and who paid the costs, and little regard was paid to goals other than economic efficiency. Major attempts are underway to develop multiple-goal objective functions that rank other, nonmonetary objectives, such as environmental quality or income distribution, as explicitly as economic efficiency. But there are considerable difficulties. Nonmonetary objectives can be incorporated into single-dimension efficiency functions or imposed as constraints onto the efficiency functions. Neither of these approaches allows for the evaluation of marginal tradeoff ratios between different objectives. It appears more useful to develop for each case several alternative resource allocation plans which emphasize the different objectives in turn. Additionally, a methodology which makes it possible to reduce the scope of the inevitable value judgements consists of the development of an unconstrained income maximization plan first which then can be used to measure the costs, in terms of foregone income gains, of emphasizing other societal objectives. Each of the alternative plans must be accompanied by an impact analysis of the various positive and negative project effects on different societal groups. This paper develops a representative evaluation and accounting framework. It is shown why such commonly used pre-set constraints as minimum benefit-cost ratios, or maximum allowable environmental damages, etc., make little sense in a multiple-objective world. (Bell-Cornell)
W77-07543

TOWARDS SYSTEM MODELS FOR WATER RESOURCE MANAGEMENT,
Leeds Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 6A.
W77-07544

BROADENING THE APPROACH TO EVALUATION IN RESOURCES MANAGEMENT DECISION-MAKING,
Victoria Univ. (British Columbia). Dept. of Geography; and Victoria Univ. (British Columbia). Dept. of Economics.
W. R. D. Sewell.
Journal of Environmental Management, Vol. 1, No. 1, p 33-60, January 1973. 2 fig, 4 tab, 86 ref.

Descriptors: *Water resources development, *Decision making, *Evaluation, *Project planning, Methodology, Management, Cost-benefit analysis, Systems analysis, Economics, Social aspects.
Identifiers: *Policy-making process, Goals achievement matrix, Engineering economic analysis, Intangibles, Weaknesses, Social sciences, Resources management.

The failure of flood control and river development schemes in British Columbia has illuminated the need for comprehensive evaluation which considers broad social, environmental, and institutional consequences as well as economic and financial effects of proposed projects. Increasingly, the region or nation rather than the local area is the appropriate areal unit for evaluation. Using a descriptive model of the policy-making process, the extent to which present procedures for evaluation (Cost-benefit analysis, systems analysis, goals-achievement matrix, and engineering economic analysis) are able to provide the data that decision makers require at various stages of that process is examined. While progress has been made in developing tools for evaluation, there remain important weaknesses which stem in part from the incapacity to identify and measure certain effects (e.g., aesthetics, future values), and in part from institutional biases towards some strategies rather than others. Many of these weaknesses might be overcome through acceleration of social science research in the resources management field, particularly in: identification of the nature and magnitude of resources problems and of the demands for resources-related goods and services; delineation of alternative strategies; hindsight reviews of projects and policies; examination of alternative ways of identifying public views; and development of more sophisticated techniques for considering multiple objectives, multiple strategies, and a wide range of values. A list of specific types of studies that might be undertaken in connection with each of these areas is given. (Bell-Cornell)
W77-07545

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

REPORT OF A STUDY OF CONTROL AGENCY REVENUE FEES,
Environmental Protection Agency, Washington, D. C. Office of Planning and, Management.
For primary bibliographic entry see Field 5G.
W77-07435

6D. Water Demand

REDUCED WATER DEMAND--RESULT OF SWEDISH ANTI-POLLUTION PROGRAM,
For primary bibliographic entry see Field 5D.
W77-07215

ASSESSMENT OF GEOTHERMAL RESOURCES OF THE UNITED STATES--1975.
Geological Survey, El Paso, Tex.; and Geological Survey, Albany, N.Y. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07476

HYDROLOGY,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-07494

6E. Water Law and Institutions

REDUCED WATER DEMAND--RESULT OF SWEDISH ANTI-POLLUTION PROGRAM,
For primary bibliographic entry see Field 5D.
W77-07215

P. L. 92-500 V LOCAL PRIORITIES,
Brown and Caldwell, Seattle, Wash.
For primary bibliographic entry see Field 5D.
W77-07229

POLLUTION SUSCEPTIBILITY: AN ENVIRONMENTAL PARAMETER FOR COASTAL ZONE MANAGEMENT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5G.
W77-07230

SCIENTIFIC AND SCENIC RIVERS ACT: COMMENTARY AND MODEL STATUTE,
Natural Resources Defense Council, Washington, D.C.
For primary bibliographic entry see Field 6G.
W77-07231

FEDERAL RIVERBASIN PLANNING IN THE COASTAL ZONE: THE LONG ISLAND SOUND STUDY,
Yale Univ., New Haven, Conn. School of Forestry and Environmental Studies.
For primary bibliographic entry see Field 2L.
W77-07232

CONTROL OF AGRICULTURAL WATER POLLUTION: A CONTINUING REGULATORY DILEMA,
South Carolina Univ., Columbia. School of Law.
For primary bibliographic entry see Field 5G.
W77-07233

LOOKING AHEAD (FEDERAL WATER POLLUTION CONTROL ACT OF 1972).
Environmental Protection Agency, Washington, D.C.
R. E. Train.
Water and Sewage Works, Vol 121, No 7, p cover, 4 (July 1974).

Descriptors: *Federal-state water conflicts, *Permits, *Construction, *Grants, Coordination, Monitoring, Law enforcement, Planning, State governments, Federal government, Water pollution control, Administrative agencies, Industrial wastes, Municipal wastes, Discharge(Water), Penalties(Legal), Governmental interrelations, Local governments.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Decentralization.

In fiscal year 1975 the Environmental Protection Agency's (EPA) two priorities, permits and construction grants programs, represent the quickest route to water quality improvement. A second level priority is enforcement, monitoring and planning. Nonpoint source control will be a matter of regional or state initiative. The priority in the permit program is major industrial and municipal dischargers. Construction grants are expected to total $4.1 billion for fiscal year 1975. In the enforcement program, emphasis will be on the completion of pending actions and on dischargers failing to apply for a permit under the 1972 Amendments to the Federal Water Pollution Control Act (FWPCA). Unquestionably, in the future there will be a steady decentralization of responsibility for meeting the requirements rests with state and local governments. Agencies close to the origins of the pollution must provide direction for abatement and control of water pollution. The challenge of cooperation may be the single, most important facet of the Clean Water Act in order to successfully combat water pollution. (Rieck-Florida)
W77-07235

HOUSE COMMITTEE MARKS UP HR 9560,
For primary bibliographic entry see Field 5G.
W77-07236

NCWQ RECOMMENDS CHANGES IN WATER POLLUTION ACT,
For primary bibliographic entry see Field 5G.
W77-07237

SUBSIDENCE: SETTLING DOWN WITHIN THE LAWS OF ACCRETION, RELICTION, EROSION, AND SUBMERGENCE,
L. E. Davis.
Baylor Law Review, Vol. 28, No. 2, p. 319-37 (1976).

Descriptors: *Texas, *Subsidence, *Avulsion, *Boundaries(Property), *Submergence, Legal aspects, State governments, Judicial decisions, Water law, Water rights, Equity, Real property, Competition, Remedies, Alluvium.
Identifiers: Avulsive change rule, Non-avulsive change rule, Private property.

The inundation of certain lands of subsidence has raised important questions about the legal effects of the change. From court decisions in Texas and other jurisdictions certain principles have been formulated dealing with the loss of land. Where the change is avulsive, the title generally remains in the original owner. However, where change is non-avulsive, the title generally passes to the state subject to certain restrictions. Equitis and reasonable time are influential factors to determine who should be the owners. In keeping with the idea some of the more difficult Texas decisions have proceded on the theory that as long as submerged lands can be identified, the original owner will not lose his title. Under this Avulsive Change Rule, the original owner retains title subject to divesture in favor of the state should the land not be claimed within a reasonable time. The Non-avulsive Change Rule passes title to the state unless the land is restored within a reasonable time. These rules are the current governing principles. However, since the subsidence problem is social in origin, it would be more appropriate for the legislature to provede a solution for those injured. (Rieck-Florida).
W77-07238

PROPERTY-COASTAL SHORES-PRIVATE PROPERTY RIGHTS UPHELD OVER CLAIMED PUBLIC RIGHT TO RECREATIONAL USE OF BEACH-IMPLIED DEDICATION, EASEMENT BY PRESCRIPTION, PUBLIC TRUST THROUGH CUSTOM AND GRANT, AND DOCTRINE OF SUBMERGENCE NOT APPLICABLE. DEPARTMENT OF NATURAL RESOURCES V. MAYOR AND COUNCIL OF OCEAN CITY, 274 MD. 1, 332 A.2D 630 (1975).
J. J. Nolan, Jr.
Baltimore Law Review, Vol. 5, No. 2, p. 349-72 (1976).

Descriptors: *Maryland, *Beaches, *Recreation, *Public rights, Regions, Seashores, Shores, Judicial decisions, Recreation facilities, Construction, Sands, State governments, Legal aspects, Public access, Competing uses, Public benefits.
Identifiers: Foreshore, Dry sand, Private property.

Faced for the first time with the rights of private property owners versus the rights of the public in the dry sand portion of the beaches, the Maryland Court of Appeals resolved several recent cases in favor of private property rights. In one case the majority upheld the right of developers to construct a condominium on the dry sand portion of the beach. In a companion case the court upheld the landowners's right to erect a house on the dry sand. In its discussion of leagal principles the court observed the power of the state to hold the foreshore for the benefit of the public. However, in considering the dry sand portion of the beach the court rejected various legal theories favoring public rights. Although the majority considered the law of implied dedication, it failed to find a sufficiently clear and unequivocal manifestation of intent that is crucial to the doctrine. In view of the court's reluctance to acknowledge the public's right to the beaches, the ultimate solution lies in legislative articulation of an assumed public policy and the enactment of a comprehensive legislative program. (Rieck-Florida)
W77-07239

THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 AS APPLIED TO THE SURFACE MINE IN WEST VIRGINIA - POLLUTANT DISCHARGE PERMIT REQUIREMENTS,
For primary bibliographic entry see Field 5G.
W77-07240

RESEARCH AND THE QUEST FOR CLEAN WATER,
Water Pollution Control Federation, Washington, D.C. Board of Control Research Committee.
For primary bibliographic entry see Field 5G.
W77-07243

THE 1973 IMCO CONVENTION: TIGHTENING THE CONTROLS ON OPERATIONAL OIL POLLUTION FROM TANKERS,
For primary bibliographic entry see Field 5G.
W77-07244

THERMAL POLLUTION AND ITS CONTROL,
Washington Univ., St. Louis, Mo. Dept. of Chemical Engineering; and Washington Univ., St. Louis, Mo. Program in Technology and Human Affairs.
For primary bibliographic entry see Field 5G.
W77-07245

HOW THE ARMY DOES A BANG-UP JOB OF TREATING EFFLUENTS,
Picatinny Arsenal, Dover, N.J. Modernization and Special Technology Div.
For primary bibliographic entry see Field 5D.
W77-07247

THE EVOLUTION OF APPROACHES TO FLOOD DAMAGE REDUCTION,
Oregon State Univ., Corvallis. Dept. of Geography.

LIBRARY U. OF I. URBANA-CHAMPAIGN

For primary bibliographic entry see Field 6F.
W77-07248

EVOLUTION AND OBJECTIVES OF RIVER BASIN COMMISSIONS IN THE UNITED STATES,
Department of Justice, Washington, D.C. Land and Natural Resources Div.
W. Kiechel, Jr.
In: Proceedings of the International Conference on Global Water Law Systems, International Association for Water Law, September 1-9, 1975, Valencia Spain; Published by Colorado State University, Ft. Collins, Colorado 80523, p. 1251-56, 1976.

Descriptors: *Water resources development, *River basins, *River basin commissions, *Water Resources Planning Act, Water conservation, Planning, Comprehensive planning, Federal government, State governments, Local governments, Governmental interrelations, Decision making, Water resources, Water policy, Water utilization.
Identifiers: *Great Lakes Basin Commission

The Water Resources Planning Act was enacted by Congress on July 22, 1965, in response to a need for an improvement of planning in development of water resources. Its policy was to encourage the conservation, development and utilization of water resources by involving federal, state, and local governments, and others, in the regional planning. The Act authorized creation of river basin commissions at the initiative of state governments. The work of preparing a comprehensive plan for development of water resources is given to the commissions, whose progress and effectiveness are analyzed here by the author, a member of the Great Lakes Basin Commission. The work of the commissions has been disappointing for the following reasons: (1) the stress placed upon achieving consensus, where the members are representatives of federal, state and interstate agencies, has diluted the commissions' decision-making capabilities; (2) their procedure of quarterly meetings has facilitated postponement of difficult issues. The author concludes that the commissions have not proved suitable as decision-making vehicles, but that, because of their broad base, they are outstanding vehicles for discussion and debate among federal, state and local interests, of planning for development of water resources on a regional level. (Jones-Florida)
W77-07249

SOME SUGGESTIONS FOR THE MANAGEMENT OF INTERNATIONAL RIVER BASINS,
New Mexico Univ., Albuquerque. School of Law.
A. E. Utton.
In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; published by the Commission for the National Water Resources Development Plan (COPLANARH), Caracas, Venezuela, p. 914-928, 1976. 13 ref.

Descriptors: *International Boundary and Water Commission, *Riparian rights, *River basin commissions, *International law, Water rights, River basins, Judicial decisions, Treaties, Water policy, Basins, Riparian waters, Legal aspects, Water law, Relative rights, Comprehensive planning, International commissions, Rivers, Political aspects.
Identifiers: *Comparative law, *Sovereignty, Equitable utilization, Territorial sovereignty, Coriparian rights, Cobasin states, Helsinki Rules.

International practice concerning water use of coriparians has not followed the theory of absolute sovereignty, but has adhered to the principles of limited territorial sovereignty. Under the latter theory, a state may make use of water flowing through its territory as long as the use does not interfere with the reasonble use by coriparians. Currently, international water policy is based on treaties, the Helsinki Rules, national judicial decisions, and the equitable utilization doctrine. In place of these, an international commission that uses persuasion, rather than coercion, to formulate water policy should be developed. A suggested design is a hierarchical two-tier approach in which the commission acts as a catalyst by acquiring information, formulating policy recommendations, and disseminating both to the cobasin states. The commission would focus on policy planning and review, and would maintain an ongoing overview of the activities of all basin states. The commission would need to be supported by a scientific component that would supply unbiased data. Policy execution and regulation of the resources would remain in the hands of the cobas in states under this plan. The commission must maximize the political response by the states in carrying out coordinate basin policies. (Petruff-Florida)
W77-07250

RULES FOR THE PROTECTION OF THE MARINE ENVIRONMENT RELATING TO TANK VESSELS CARRYING OIL IN BULK,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-07251

PROPOSED TOXIC POLLUTANT EFFLUENT STANDARD FOR POLYCHLORINATED BIPHENYLS,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 41, No. 143, p. 30468-77, July 23, 1976.

Descriptors: *Polychlorinated biphenyls(PCB's), *Aroclors, *Industrial wastes, *Pollutant identification, Water pollution sources, Public health, Pollutants, DDT, Chemical analysis, Water pollution control, Water quality, Water law, Regulations, Standards, Legal aspects, Social aspects, DDD, DDE, Aquatic algae, Aquatic life.
Identifiers: *Administrative regulations, *Effluent limitations, Hazardous substances.

In view of recent studies revealing polychlorinated biphenyls (PCB's) as highly toxic and dangerous pollutants the Environmental Protection Agency (EPA) has proposed new standards controlling PCB discharge. Monsanto, the only PCB manufacturer in the United States and manufacturers of electrical transformers and electrical capacitors which use PCB compounds for part of the dielectric are the major sources of PCB pollution. Water is unnecessary to the processes carried out by any of the above manufacturers. Therefore, the proposed effluent standards prohibit any PCB discharge, except in the very specialized circumstances set forth herein. Extensive background information is presented on the composition and properties of PCB's, their importance in several industries, and their toxic effects. The toxicity of the pollutant, its persistance, degradability, the usual or potential presence of affected organisms in any waters, the importance of the affected organisms, and the nature and effect of the toxic pollutant on such organisms are the factors which were considered in formulating the proposed rules. In light of the grave dangers PCB's pose to aquatic life and human health at very low concentration levels any further contamination must be avoided. (Moorhouse-Florida)
W77-07253

RULES AND REGULATIONS FOR PROTECTION OF THE MARINE ENVIRONMENT RELATING TO TANK VESSELS CARRYING OIL IN DOMESTIC TRADE,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-07254

AMEND THE FEDERAL BOAT SAFETY ACT OF 1971 (HEARINGS ON S. 3214 TO DECLARE CERTAIN WATERS OF NEW HAMPSHIRE TO BE NON-NAVIGABLE FOR CERTAIN PURPOSES).
Hearings--Committee on Commerce, United States Senate, April 9, 1976, Serial No 94-76. 121 p.

Descriptors: *New Hampshire, *Federal-state water rights conflicts, *Non-navigable waters, *Boating regulations, Income, Legal aspects, Federal jurisdiction, State jurisdiction, Water rights, Legislation, Bodies of water, Political aspects, Water pollution, Lakes, Governmental interrelations, Navigable waters.
Identifiers: *Congressional hearings, Navigability.

A hearing held by the United States Senate Committee on Commerce on April 9, 1976, was concerned with several issues. The initial one was one of navigability. 'Are the New Hampshire Lakes Winnisquam and Winnipesaukee and the Merrimack River which flows from them, a part of a federal waterway for purposes of interstate commerce, and therefore under Federal jurisdiction.' The plethora of tests and precedents on the issue of navigability makes the question a difficult one. The second issue dealt with money. Federal officials predict the state will gain if the water in question is put under federal jurisdiction. On the other hand, state officials have estimated a revenue loss. Another issue concerned an attempt by the federal government to lower New Hampshire standards for clean water, boating safety and legal liability. A fourth issue questioned how federal jurisdiction might affect the law suits arising from boating accidents on the lakes. Finally, a less precise, but in many ways more important, issue is the aspect of states' rights and centralized government. (Rieck-Florida)
W77-07255

A SCIENTIFIC AND LEGAL LOOK AT THERMAL POLLUTION,
Florida Univ., Gainesville. Coll. of Law.
W. D. Anderson.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida 32611, $1.15. March 28, 1970, 22 p.

Descriptors: *Thermal pollution, *Electric power industry, *Florida, *Heated water, Nuclear powerplants, Pollutant identification, Pollutants, Pollution abatement, Temperature, Water cooling, Water pollution sources, Water temperature, Cooling towers, Cooling water, Water Quality Act, Upwelling, Irrigation.

It is necessary to balance man's need for electrical power with the resulting thermal pollution. Whether a fossil-fueled or a nuclear generator is used, water is necessary for cooling purposes. The National Technical Advisory Committee has published its Report on Water Quality Criteria with its recommendations regarding water temperature for both fresh water, marine and estuarine organisms. However, not all scientists agree with these recommended temperature standards. Nevertheless, it has been suggested that the heated effluent may be used for beneficial purposes. Such ideas include de-icing waterways, 'upwelling' to increase fish population, and warm water irrigation. Possible solutions to thermal pollution are cooling towers or cooling ponds. The primary legal weapon to control water pollution is based on the Water Quality Act of 1965. The report's conclusion focuses on a recent case involving a Florida power company's discharge which purportedly caused ecological damage. In the final analysis, careful planning in the creation of electricity could produce both fish and power. (Rieck-Florida)
W77-07256

CONSUMPTIVE USE OF GROUND WATER,
Florida Univ., Gainesville. Coll. of Law.
R. Watson, and J. Merritt.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida 32611, $1.50. (1970), 29 p.

Descriptors: *Artificial recharge, *Groundwater recharge, *Groundwater, *Water wells, Water supply, Water reuse, Surface-groundwater relationships, Water storage, Permits, Regulation, Legal aspects, Well permits, Cost analysis, Water storage, Water management(Applied).
Identifiers: Incidental recharge, Applied recharge, Induced recharge, Water Resources Act.

An increasing incidence of water shortage has prompted measures to preserve the supply of ground water. One approach to preservation is regulating the use of water through a well permit system. however, a more positive solution may be a process known as artificial recharge. Incidental recharge, induced recharge and applied recharge are three artificial means to augment water supplies. Each application of artificial recharge must be evaluated to see if it is feasible both in cost and physical terms. The criteria for evaluation could vary from one district of the state to another. There should be flexibility in the outlook for storage and recharge, and new legislation must contemplate future decision-making in the area of underground storage and artificial recharge. To enable each district to meet its specific problems to be remedied by artificial recharge, the Water Resources Act should provide for a specific delegation of legislative authority authorizing each Water Management District to implement rules and regulations dealing with artificial recharge as each district sees fit subject to the supervisory power of the Water Resources Board. (Rieck-Florida)
W77-07257

FLORIDA STATUTES, CHAPTER 253--THE 1969 AMENDMENTS AND PROPOSED LEGISLATION,
Florida Univ., Gainesville. Coll. of Law.
E. Dunwody.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida 32611, $1.25. 1970, 24 p.

Descriptors: *Florida, *Freshwater, *Dredging, *Navigable waters, Management, Lake beds, Rivers, Streams, Boundary disputes, Boundaries(Property), Water rights, Protection, Administration, Legal aspects, Permits, Regulation, Water law, Beds, Estuaries, Legislation, Estuarine environment.
Identifiers: Trustees Internal Improvement Trust Fund, *Fill permits, *Submerged lands.

Indiscriminate filling and dredging of navigable fresh water submerged lands is as detrimental as indiscriminate filling and dredging of tidal submerged lands. Legislation designed to more uniformly manage Florida's subaqueous lands has been passed in an effort to manage lands underlying navigable fresh water lakes, rivers and streams. Private owners and conservationists continue to demand legislative enactments which will simplify and promote public interests, but still adequately protect private rights. The 1969 Act enables the Trustees of the Internal Improvement Trust Fund to regulate navigable freshwater rivers and streams, thereby giving them a means to protect estuarine areas from indiscriminate filling and dredging. Future proposed legislation designed to address the problems of boundary disputes may be subject to legislative resistance due to the method chosen to establish the boundary line. The proposed bill also contains a provision which will add a degree of certainty to the rights of future purchaser to dredge and fill. These are but a few of the continuing problems encountered in managing the state's submerged lands. Therefore, future legislative enactments must be responsive to future problems. (Rieck-Florida)
W77-07258

THE FEASIBILITY OF A WATER IMPORTATION PROJECT FOR SOUTH FLORIDA,
Florida Univ., Gainesville. Coll. of Law.
S. C. Frasier.
Available from Easternm Water Law Center, University of Florida, Gainesville, Florida 32611. $1.25. 1969, 22 p.

Descriptors: *Florida, *California, *Potential water supply, *Imported water, *Desalination, Water supply, Dependable supply, Pipelines, Water allocation(Policy), Water costs, Water delivery, Water demand, Water distribution(Applied), Water importing, Water management(Applied), Water resources, Water shortage, Watersheds(Basins), Legal aspects, Regulation, Financial feasibility.

Additional supplies of water may be necessary in order to supply adequate amounts of water to Florida's growing population. This paper deals with the feasibility of transferring water from an area of surplus to an area of great demand. The financial feasibility, legal problems, allocation problems, and administrative problems are all considered. The California water plan is studied as a model, with a comparison of Florida's and California's geographical similarities. However, if financial feasibility is the determinative factor, desalination may be more desirable. The constitutionality of water regulatory statutes is a major legal problem to consider. This issue may rest on the degree to which riparian rights are altered. In regard to allocation, equitable assurances of adequate supplies must be made to both the water transfer and water basin areas. Finally, reasonable regulations regarding administration has generally been upheld, with state water regulatory agencies being held constitutional. (Rieck-Florida)
W77-07259

ECONOMIC ASPECTS OF POLLUTION ABATEMENT, PART 1,
Florida Univ., Gainesville. Coll. of Law.
C. L. Davis.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida 32611, $1.15. (1970), 22 p, 3 fig.

Descriptors: *Florida, *Economic feasibility, *Industrial wastes, *Waste water treatment, *Pollution abatement, Water pollution control, Water pollution sources, Economic impact, Industrial water, Industries, Water pollution, Air pollution, Pollutants, Solid contamination effects, Solid wastes, Treatment facilities, Waste treatment.

The economic aspects of water pollution must be understood before beneficial legislation can be drafted. Here, a Florida industry with a forward-looking management was chosen as an example of an industrial polluter. The industry's cooperative and pioneering attempts to deal with water and air pollution are analyzed. Various pollution abatement plans were considered and rejected until a three phase program was accepted. Phase one consisted primarily of a collection device for solids. Phase two's clarifier completed primary treatment of the water. Finally, phase three utilized a mechanically aerated lagoon for secondary treatment. This attempt at pollution abatement is the normal pattern in dealing with heavy industry. While specific problems differ with varying locations, a similar or competing industry is remarkably alike in its approach to public relations and economic policy. Public embarrassment exerts a stronger motivating force than a legislator or bureaucrat can ever apply. Solutions to the problem of pollution must consider the economic realities of competition and the technological capabilities available. Uniform federal laws can be passed to effectively clean up industrial pollution at an equivalent increase to the consumer in the price of a particular product. (See also W77-07261) (Rieck-Florida)
W77-07260

LEGAL ASPECTS OF CHANGES BROUGHT ABOUT BY BUCKEYE'S POLLUTION ABATEMENT PROGRAM, PART II,
Florida Univ., Gainesville. Coll. of Law.
C. L. Davis.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida, $.74. October 1, 1970. 11 p.

Descriptors: *Florida, *Discharge(Water), *Industrial wastes, Water pollution sources, Water pollution, Pollutants, RIvers, Zoning, Steam, Generators, Air pollution effects, Inspection, Regulation, Law enforcement, Rivers and Harbors Act, Federal Water Pollution Control Act, Legal aspects, Administrative agencies, State governments.

Changes in Florida industry's water pollution control program may have legal implications that significantly affect the operation of the program. These changes include the use of a lagoon to collect sludge, a greater collection of solids that are burned in the dump, and alterations in the discharge point into the river and the water quality. A right to discharge into the Fenholloway River was originally granted by Florida law. Possible restrictive zoning, odor and pollution of underground water supplies must be considered in connection with the sludge lagoon. The bulk of pollutants taken from the water is used to fuel steam generators. Before discharging smoke and contaminants into the air the provisions of the state's Air and Water Pollution Control Act must be met. The Federal Water Pollution Control Act and the Rivers and Harbors Act restrictions must also be followed. Finally, state regulation classifies water, and creates powers of inspection which curtails unlawful discharges which cause pollution. Failure to comply with these various regulations may result in serious civil and criminal sanctions accompanied by expensive litigation. (See also W77-07260) (Rieck-Florida)
W77-07261

PECOS RIVER COMPACT.
Texas Water Code Ann. secs 42.001 thru .010 (1972).

Descriptors: *Water resources development, *New Mexico, *Texas, *Interstate compact, Interstate rivers, Water law, Regulation, Interstate, Interstate commissions, Governments, State governments, Political aspects, Water policy, Construction, Public health, Floods, Water utilization, Consumptive use, Water quality, Salinity, Administrative agencies, Legal aspects, Prior appropriation, Beneficial use, Water rights.
Identifiers: *Pecos River(Tes-N Mex), *Pecos River Compact, Administrative regulations.

The Pecos River Compact provides equitable division and apportionment of the use of the Pecos River waters. It promotes interstate comity between Texas and New Mexico, removes causes for controversy and protects development within the two states. It also facilitates the construction of works for the salvage of water, more efficient use of water and for the protection of life and property from floods. Under the compact, beneficial use shall be the basis, measure and limit of the right to use water. This beneficial consumptive use of water is apportioned between the states. The states are pledged to alleviate the salinity conditions of the Pecos River. The compact creates an interstate administrative agency and specifies guidelines concerning the duties and powers of the commission's representatives. The principle of prior appropriation shall be applied to maintain flows at the New Mexico-Texas state line. The compact includes provisions to insure that: (1) states importing water have exclusive rights to

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such water, and (2) failure to use apportioned water does not constitute an abandonment of the right to such use. (Rieck-Florida)
W77-07262

ARTESIAN WELLS AND STORAGE RESERVOIRS, AND WORKS CONNECTED THEREWITH.
Kan Stat Ann secs 42-401 thru -506 (1972).

Descriptors: *Kansas, *Artesian wells, *Water sources, *Water supply, Legislation, Regulation, Permits, Governments, Administration, Administrative agencies, Confined water, Aquifers, Pressure, Subsurface waters, State governments, Law enforcement, Legal aspects, Water wells, Wells, Local governments.
Identifiers: Licenses, Administrative regulations, Nuisance(Legal aspects).

Kansas defines an artesian well as a well sunk over 400 feet deep, from which water is raised to the surface by artificial or natural means. Any such well that is not tightly capped will be considered a public nuisance. Permitting wastes from the wells is a misdemeanor. Furthermore, expenses incurred in abating unlawful wastes shall become a lien on the land. Water may be conducted over 1 1/2 to 2 1/2 miles from the well, depending on the manner of conveyance. The manner in which water from artesian wells may be used for stock is strictly regulated to prevent waste. Drilling requirements, bond inspections and casing regulations must be met before an artesian well may be drilled. To carry out the provisions of the act, interested counties must create a board and have a convention to elect commissioners to settle all disputes between the county artesian well supervisor and the owner or occupant of the land upon which the dispute has arisen. The duties of the supervisor and details concerning the license fee and permits are enumerated in the statute. (Rieck-Florida)
W77-07263

ENCROACHMENTS ON NAVIGABLE LAKE.
Idaho Code Ann secs 58-142 thru -153 (Supp 1976).

Descriptors: *Idaho, *Navigable waters, *Encroachment, *Construction, *Beds, Legal aspects, Water law, Legislation, Ownership of beds, State governments, Riparian rights, Remedies, Littoral, Regulation, Permits, Control, Law enforcement, Judicial decisions, Penalties(Legal).
Identifiers: Non-navigational encroachment, Commercial encroachment.

There shall be no encroachments in, on or above the beds or waters of any navigable lake in the state of Idaho unless proper approval has been given. The power to regulate such encroachments is vested in the board of land commissioners. Applications for the construction or enlargment of all navigational encroachments shall be processed by the board with a minimum of procedural requirements. If the encroachment will infringe on the riparian or littoral rights of an adjacent property owner, he must be given notice of the application, whereupon he has the right to object to the encroachment. These specified permit procedures apply to all nonnavigational or commercial navigational encroachments which extend beyond the line of navigability. Any violation of the regulations may result in a fine and may restrain the property owner by means of injunction. Anyone found legally encroaching on the navigable waters may be judicially directed to restore the lake to its previous condition. Current vested water rights will not be affected by the statute. The state has no claim to lands lying above the ordinary high water mark of any navigable lake. (Rieck-Florida)
W77-07264

APPROPRIATION OF WATER--PERMITS, CERTIFICATES AND LICENSES--SURVEY.
Idaho Code Ann secs 42-201 thru -240 (1948), as ammended, (Supp 1976).

Descriptors: *Idaho, *Water quality control, *Water resources development, *Permits, *Water utilization, Administrative agencies, Legislation, Regulation, Natural resources, Environmental effects, Administration, State jurisdiction, Water demand, Water rights, Wells, Drilling, Well regulations, Administrative decisions, Adoption of practices, Local governments, Groundwater, Legal aspects.
Identifiers: Critical ground water area.

This chapter provides the manner in which the waters of the state of Idaho shall be controlled and administered. The title provides application, permit, and license procedures. Prohibitions are put on the diversion of private waters. Persons using diverted water must prove that the water was actually used for the intended beneficial purpose. The chapter also addresses: change in point of diversion or place of use of water under established rights; department duties dealing with survey of appropriations; filing claims of rights established by diversion and use; recording of claims; ground waters established as public waters; drilling and use of wells for domestic purposes; drilling and use of wells for drainage or recovery purposes; methods of appropriation; duties of the director of the department of water resources; definition of 'critical ground water area'; abandonment of water right; powers of the director of the department of water resources; administrative determination of adverse claims; local ground water boards; adjudication of water right; penalties; water administration fund; application for the right to exchange water. (Rieck-Florida)
W77-07265

RIGHT TO ACCRETION BUILT UP FROM ONE TRACT OF LAND AND EXTENDING LATERALLY IN FRONT OF ADJOINING TRACT WITHOUT BEING CONTIGUOUS THERETO.
61 ALR 3d 1173-94 (1975).

Descriptors: *Accretion, *Boundaries(Property), *Riparian rights, *Riparian land, Legal aspects, Water law, Water rights, Alteration of flow, Banks, Navigable waters, Ownership of beds, Relative rights, Riparian waters, Severance, Judicial decisions, Legal review, Adjacent land owners, Avulsion, Bank erosion, Boundary disputes.
Identifiers: *Real property law, *Property interests.

Deposits of alluvion caused by accretion generally benefit the riparian owner. In the usual case, a riparian owner's boundaries are extended outward due to the accretion. The justification for such a principle is either that it falls within the maxim de minimis lex non curat, or that since a riparian owner is liable to lose soil by encroachment of the water, he should also have the benefit of any land gained by the converse situation. A different problem arises when the accretion build up from one tract of land extends laterally in front of an adjoining tract to which it is not contiguous. Under such conditions, courts have almost unanimously ruled that the owner to which the accretion is contiguous cannot claim a property right to any portion which crosses the boundary line of an adjoining landowner. Thus the adjoining landowner acquires title to a portion of the accretion even though it is not contiguous to his land. The justification for this view is that the major right of any riparian owner is access to the water, and that no riparian owner will be allowed to increase his access at the expense of an adjoining riparian owner. The only case contra to this principle was decided in Florida where title to the accretion was granted to the tract of land to which it was attached. The court held that tidal waters (the Gulf of Mexico) required a different rule. (Moorhouse-Florida)
W77-07266

BUNGER V. UNCOMPAHGRE VALLEY WATER USERS ASSOCIATION (CONDITIONAL WATER PERMITS).
557 P.2d 389-95 (Colorado 1976).

Descriptors: *Colorado, *Water resources development, *Permits, Water law, Water rights, Resources development, Water supply development, Administration, Regulation, Conservation, Water utilization, Water allocation(Policy), Water conservation, Judicial decisions, Legal aspects, Potential water supply, Water policy, Local governments, Appropriation, Legal review.
Identifiers: *Conditional water permits, Water Rights Determination and Administration Act, Standing, Water courts, Summary judgments, Conditional water rights.

Applicant for conditional water decrees presented four arguments appealing the defendants' denial of his applications which set out rough guidelines for a massive water collection, diversion and storage plan. Appellant first contended that the defendants' water courts must hold hearings in every contested water right situation regardless of the merits. The Supreme Court of Colorado held that a summary judgment is proper where there is no issue as to any material fact. Appellant's second contention was that objectors-appellees lacked standing to file objections in the water courts. The state Supreme Court held that the Water Rights Determination and Administration Act gave the cities, board of county commissioners and conservation districts standing to challenge applications for conditional water rights. Appellant's third argument that summary judgment was improper was also struck down by the court. Finally, the court disagreed with appellant's fourth contention that the water court misinterpreted the necessary first step prior to obtaining the decree. The court held that appellant could not claim, as his first step, work he completed as an employee for the reclamation bureau. (Rieck-Florida)
W77-07267

SCHULTZ V ATKINS (CLAIM FOR EASEMENT BASED ON CONTRACT FOR WATER RIGHTS BETWEEN PREDECESSORS IN TITLE).
554 P.2d 948-53 (Idaho 1976).

Descriptors: *Easements, *Idaho, *Prescriptive rights, *Contracts, *Water contracts, Legal aspects, Water law, Wells, Water rights, Domestic water, Judicial decisions, Water delivery, Water, Land tenure, Land, Real property, Competing uses.
Identifiers: Property, *Property rights, *Property interests, *Licenses, Prescriptive easements.

Plaintiff landowners brought action against owners of adjacent land seeking a permanent right to have culinary and domestic water delivered from the well on defendant's land. The basis for the action was a contract which had been executed previously between the predecessors in title to both pieces of property. Plaintiffs contended that this contract had resulted in their predecessors' acquisition of an easement which had passed to them with title to their land; defendants denied this and counterclaimed to enjoin plaintiffs from asserting any claim to the well or to the defendants' property. Plaintiffs also contended that their predecessor had by terms of the contract acquired a license for the delivery of water, which the defendants denied. The Seventh Judicial District Court of Idaho held for the plaintiffs, but did not differentiate between an easement or a license, or define the legal basis for its finding. The Supreme Court of Idaho reversed. The holding of the court was that an easement may be created by express agreement, by implication, or by prescription, and that none of these were proven by the plaintiffs. The court further stated that the essential element of a license is the right to use land in the posses-

sion of another, which the contract for delivery of water had not granted. (Sloan-Florida)
W77-07268

RAPPL AND HOENIG COMPANY, INCORPORATED V. NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (APPLICABILITY OF FRESH WATER WETLANDS ACT TO ARTIFICIALLY CREATED WETLANDS).
387 N.Y.S.2d 985-88 (Sup. Ct. 1976).

Descriptors: *New York, *Wetlands, *Freshwater, *Permits, Administrative decisions, Judicial decisions, Regulation, Condemnation, Legal aspects, Surface water, Legislation, Water conservation, Administrative agencies, State government, Water law, Water management(Applied), Water resources, Constitutional law.
Identifiers: Administrative regulations.

The owner of a parcel of land sought judicial review of the Department of Environmental Conservation's determination that a portion of the parcel was fresh water wetland subject to Article 24 of the Environmental Conservation Law, entitled Fresh Water Wetlands Act. Petitioner's argument against respondent's determination was that the statute is applicable only to 'natural wetlands'. The Supreme Court held that the statute is applicable to artificially created wetlands as well as natural wetlands, and that to hold otherwise would require respondent to undertake the inordinate burden of determining the origin of each and every proposed wetland throughout the state. Petitioner further contended that the determination that one-half of his property was wetland constituted a 'taking' of his land, and therefore the court should require the Commissioner to proceed to condemnation. The court concluded that relief by condemnation could only be sought after the Commissioner acted on an application by the landowner for an interim permit. As the petitioner had merely made an inquiry as to whether or not his land would be designated freshwater wetland, and had not made application for an interim permit under the statute, he was not entitled to such relief. (Hilburn-Florida)
W77-07269

PORT ACRES SPORTMAN'S CLUB V MANN (PUBLIC'S RIGHT TO USE NAVIGABLE WATERS OVER PRIVATELY OWNED SUBMERGED LANDS).
541 SW2d 847-51 (Tex Ct Civ App 1976).

Descriptors: *Texas, *Navigable waters, *Ownership of beds, *Non-navigable waters, *Streambeds, Channel morphology, Legal aspects, Public rights, Public access, Patents, Water rights, Water law, Water users, Trespass, Competing uses, Judicial decisions, Submergence.
Identifiers: *Injunctive relief, *Submerged lands.

Plaintiff sports club brought this suit against defendant fishermen to enjoin entry and interference with its alleged exclusive use of waters which now cover its property. Defendents contend that the water covering plaintiff's property is both navigable in fact and navigable under Texas statute. Defendents also seek to enjoin the further maintenance of a fence across the disputed waters. Plaintiff contends that since the waters were not navigable at the time the title to the underlying land was issued from the state, the fact that the waters have subsequently become navigable does not deprive plaintiff of its exclusive right to use of the waters and title to the underlying land. The court held that plaintiff did not lose title to the underlying land, but did lose the exclusive right to use the waters. The title to the submerged land does not change because it was not covered by waters of a navigable stream when patented. The artificial change in the river which resulted in the submergence of plaintiff's property does take away plaintiff's exclusive right to use of the waters, and gives such navigable waters a public nature. (Welch-Florida)
W77-07270

AMDEL PIPELINE INC V STATE OF TEXAS (STATUTORY REQUIREMENT OF PAYMENT FOR SPOIL DREDGED FROM BOTTOM OF APPROACHES TO CORPORATE LOADING DOCKS).
541 SW2d 821-26 (Texas 1976).

Descriptors: *Texas, *Spoil banks, *Dredging, *Compensation, *Permits, Channel improvements, Excavation, Navigable rivers, Navigation, Streambeds, Ownership of beds, Canals, Navigable waters, Water permits, Legal aspects, Legislation, Regulation, State governments, Jurisdiction.

Plaintiff ship terminal facilities owner brought this action against defendant state seeking a declaratory judgement that plaintiff was not statutorily required to pay defendant for spoil dredged from the channel approaches to plaintiff's loading docks. Defendant contends that under state law plaintiff may remove no material from the submerged lands except by state approval and payment of 25 cents per cubic yard for materials removed. Plaintiff contends that the river channel maintenance is the responsibility of the Army Corps of Engineers and that plaintiff received a dredging permit from the Corps, but that the state refused to issue a permit unless it was conditioned upon the payment. The Texas Supreme Court held that defendant had no statutory authority to require plaintiff to obtain a permit for the taking of materials from the bottom of the river under these circumstances. The state did have authority to issue permits for commercial shell dredging on lands patended to the navigation district so long as the dredging did not interfere with navigation. In this situation, plaintiff's operations were both necessary and incidental to navigation and were done under federal authority. (Welch-Florida)
W77-07271

OLSON V BEDKE (FAILURE OF TENANT TO PUT WATER ON LEASED LAND TO BENEFICIAL USE).
555 P2d 156-63 (Idaho 1976).

Descriptors: *Irrigation systems, *Idaho, *Irrigation, *Appropriation, *Beneficial use, Water rights, Legal aspects, Water law, Water, Judicial decisions, Leases, Land, Real property, Agriculture, Alfalfa, Water allocation(Policy), Water distribution(Applied), Adjudication procedure, Farms, Farm management.
Identifiers: *Covenants, *Property interests.

Action was instituted by plaintiff lessors to terminate a ten year lease on farmland, and to recover damages because of alleged failure of defendant lessees to comply with the terms of the lease. The lease had called for defendants to farm the property in a 'good and farmer-like manner', to construct and maintain an irrigation system, and to put to beneficial use all decreed water on the land each year. Plaintiffs alleged that defendants had not conustructed a proper irrigation system and that consequently weeds and erosion were placing the land in danger of irreparable harm. Plaintiffs further alleged that by failing to put the waters on the land to full beneficial use, the waters of the stream on the land were flowing off at such a fashion as to subject them to appropriation, endangering the water rights of plaintiffs. The trial court dismissed the complaint as being premature, since seven years remained on the lease. The Supreme Court reversed and remanded for trial, holding that a factual determination should be made as to whether the defendant was committing waste, and that the plaintiff's water rights were in danger under Idaho law. (Sloan-Florida)
W77-07272

UNITED STATES V ASHLAND OIL AND TRANSPORTATION COMPANY (USE OF THE WORD 'NAVIGABLE WATERS' IN THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 HELD TO MEAN 'WATERS OF THE UNITED STATES').
6 ERC 1991-92 (W D Ky Sept 25, 1973).

Descriptors: *Kentucky, *Water pollution control, *Water pollution sources, *Water pollution effects, Water pollution, Water quality control, Water quality standards, Water quality, Discharge(Water), Navigable waters, Navigable rivers, Federal jurisdiction, Federal government, Federal Water Pollution Control Act.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Plaintiff brought this action against defendant oil company for its failure to immediately notify an appropriate federal agency after ascertaining that it had discharged oil into a nonnavigable stream. Defendant was charged under Section 311(b)(5) of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. Defendant contended that under Section 311 of the Act, the action would lie only for discharges into navigable waters as defined in the classical sense, and therefore it would not grant jurisdication to the plaintiff in this case. The district court found that sufficient definitions were provided in the FWPCA that defined 'navigable waters' as 'waters of the United States'. The court further held that plaintiff, under the Act, is not required to establish the effect on interstate commerce of any particular discharge or of any particular stream. Defendnat' motion to suppress evidence obtained by the exploitation of the defendant's notification was denied along with defendant's motion for acquittal. (Welch-Florida)
W77-07273

UNITED STATES V CUTTER LABORATORIES, INC (CIVIL LIABILITY OF A PERMITTEE FOR WHOM NO INDUSTRIAL EFFLUENT LIMITATIONS OR GUIDELINES EXIST).
413 F Supp 1295-99 (ED Tenn 1976).

Descriptors: *Tennessee, *Permits, *Effluents, *Industrial wastes, Civil law, Administrative decisions, Legal aspects, Judicial decisions, Legislation, Penalties(Legal), Law enforcement, Water pollution sources, Discharge(Water), Water pollution, Administrative agencies, Regulation.
Identifiers: *National Pollution Discharge Elimination System (NPDES) permit, Administrative regulations, Engineering judgment.

Plaintiff sought to collect civil money penalties for alleged violations of a National Pollution Discharge Elimination System (NPDES) permit. Plaintiff had issued a permit to defendant industry with established applicable effluent limitations. Plaintiff, United States, alleged that these limitations had not been met. Defendant contended that the government could not maintain any action since the Administrator of the Environmental Protection Agency (EPA) had established no effluent limitations or guidelines as required by the Federal Water Pollution Control Act (FWPCA). However, plaintiff countered that the action was maintainable since section 1342(a) of the FWPCA gives the Administrator the authority to issue enforceable permits upon such conditions as the Adminstrator may determine necessary to carry out the FWPCA provisions prior to the establishment of effluent limitations. The United States District Court of Tennessee held that even through the Administrator had neither established effluent limitations or guidelines that would be applicable to the defendant, a civil action could be commenced for violation of the permit containing conditions and limitations based upon the best engineering judgment of the EPA. (Rieck-Florida)
W77-07274

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UNITED STATES V DIAMOND (PERMANENT INJUNCTION DURING ADMINISTRATIVE PROCEDURES JUSTIFIED BY DEVELOPERS FILL OF MARSHLAND WITHOUT REFUSE ACT PERMIT),
6 ERC 1968-72 (S.D. Ga April 17, 1974).

Descriptors: *Georgia, *Rivers and Harbors Act, *Landfills, *Marshes, Regulation, Permits, Land development, Land forming, Navigable waters, Navigable rivers, Construction, Disposal, Water quality control, Water quality standards, Water pollution control, Water permits.
Identifiers: *Injunctive relief, *Administrative regulations, *Fill permits.

Plaintiff brought this action for a preliminary and permanent injunction against defendant land developer in connection with an unauthorized fill of marshland. Plaintiff contends that under the Rivers and Harbors Act of 1899 it is unlawful to deposit or discharge refuse of any kind in a navigable stream, that defendant placed fill in a marsh area, that some of it has washed into a navigable stream, and that the fill area is within the navigable waters of the United States as defined by interpretative regulations which have a basis in existing case law. Defendant contended that he had procured a county permit for a rubbish land fill and had sought an After-the-Fact Permit from the Corps of Engineers (Corps). The district court held the fill of the marshland was within the navigable waters of the United States, and that the action without a permit warranted a permanent injunction against further fill operations while defendant proceeded with administrtive procedures concerning his application for an 'after-the-fact' permit. The court further held that pending final determination of the application by the Corps, the court could not order removal of the fill. (Welch-Florida)
W77-07275

COMMITTEE FOR THE CONSIDERATION OF THE JONES FALLS SEWAGE SYSTEM V TRAIN (FEDERAL COMMON LAW CONCERNING WATER POLLUTION APPLICIABLE TO INTERSTATE CONTROVERSEY ONLY),
539 F2d 1006-16 (4th Cir 1976).

Descriptors: *Maryland, *Common law, *Effluents, *Governmental interrelations, *Sewage disposal, Sewage systems, Sewage, Cities, Local governments, State governments, Federal government, Legal aspects, Social aspects, Courts, Judicial decisions, Legal review, Public health, Water pollution, Wastes, Water pollution sources, Sewage effluents, Liquid wastes, Administrative agencies, Permits, *Chesapeake Bay.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Jones Falls(Md), *Patapsco River, Federal common law, Licenses, Administrative regulations, Standing(Legal).

Defendant, the Environmental Protection Agency (EPA), issued a permit to the City of Baltimore for the discharge of raw sewage into Jones Falls. Plaintiffs, area residents, attacked the issuance of the effluent permit. The court denied this, and held that since the Federal Water Pollution Control Act (FWPCA) of 1972 did not call for immediate purity of water, effluent discharge permits were permissible under the Act. Plaintiffs then attempted to envoke federal common law concerning water pollution. The court was not persuaded, holding that federal common law applied only to interstate matters, and further, that only states had standing. The instant case involved local issue and private parties. The court concluded that the FWPCA had preempted the issue of effluent discharge. Since the permit had been under the act, federal common law could not be used to revoke it. A dissenting opinion claimed that federal common law was applicable since Jones Falls constituted part of the navigable waters of the United States. (Moorhouse-Florida)
W77-07276

NUCKOLLS V LOUISIANA STATE HIGHWAY DEPARTMENT (LIABILITY FOR UNAUTHORIZED ALTERATION OF NATURAL DRAIN),
337 So2d 313-16 (La Ct App 1976).

Descriptors: *Drainage effects, *Louisiana, *Culverts, *Overflow, Legal aspects, Water law, Ditches, Highways, Roads, Drainage, Runoff, Surface runoff, Local governments, State governments, Easements, Landscaping, Drainage water, Flooding, Rain, Judicial decisions.
Identifiers: Injunctive relief, Laches, Presumptions(Legal), Servitude of drain.

Plaintiff landowner brought action against adjacent landowner, town, and state department of highways seeking injunctive relief and damages for the flooding of his property caused by defendants' unauthorized alteration of the natural drain of rain waters. In 1954 the state department of highways had built a culvert near plaintiff's property. A nearby town disposed of excess surface water in a ditch from which the waters flowed through the culvert onto plaintiff's property. Water from adjacent landowner's property had flowed onto plaintiff's land as a result of landscaping on the lot in 1955. Defendant town and department of highways claim exception of liberative prescription of two years, and defendant landowner claims a servitude of drain. The court, interpreting a Louisiana statute which requires suits for damage of private property for public purposes be brought within two years from the time damages are sustained, found plaintiff's claims as to the town and state barred. The statute precludes suit after two years from the first occurrence of any damage after the completion of the project. Thus the prescriptive period in the instant case began with the first flood in 1972, and does not run anew from each separage damage. In ruling on adjacent landowner's defense of servitude of drain, the court found that since the defendant had received no complaint from plaintiff during the ten years following the landscaping, a valid servitude was established. (Moorhouse-Florida)
W77-07277

WOOD V WOODCOCK (RIGHTS OF ADJOINING LANDOWNERS TO SEEPAGE WATER FROM JOINT IRRIGATION DITCH),
554 P2d 151-57 (Oregon 1976). 1 dwg.

Descriptors: *Oregon, *Judicial decisions, *Irrigation ditches, *Farm ponds, *Trespass, Water law, Legal aspects, Irrigation, Irrigation canals, Channels, Open channels, Drainage systems, Easements, Legal review, Boundaries(Property), Equity, Seepage, Appropriation, Culverts, Ditches, Prescriptive rights.
Identifiers: Injunctions(Prohibitory), Intentional torts, Injunctive relief, Ditch company.

Plaintiff landowner brought suit to enjoin adjoining landowner from interfering with seepage water stored by plaintiff. Defendant filed a counterclaim for trespass and sought to establish a prescriptive easement over plaintiff's land. Plaintiff and defendent are both members of a ditch company, and they are entitled to use designated amounts of water from the ditch which crosses their properties and terminates in a pond on defendant's land. Natural seepage from the ditch has accumulated in a marsh on plaintiff's property. In 1969 plaintiff applied for and received a permit to appropriate such water; thereafter he built a pond to accumulate the water, and installed equipment to facilitate its use for irrigation. Meanwhile, defendant had improved his pipeline and culvert system to channel the water naturally flowing from plaintiff's land. The Supreme Court of Oregon held that defendant had not established an easement by prescription to divert water over plaintiff's land, since he did not prove continuous and adverse use for more than ten years. The defendant was forbidden from trespassing on plaintiff's property for the purpose of increasing the supply of water. However, as a member of the ditch company, defendant had a duty to help maintain the irrigation ditch, and could enter plaintiff's land to the extent of ditch company's easement in order to insure receipt of his full allotment of water. Similarly, plaintiff was forbidden from trespassing on defendant's lands in order to capture more water, and was assessed $500 for damages. (Moorhouse-Florida)
W77-07278

GILBERT V SMITH (LOSS OF SENIOR APPROPRIATION RIGHTS THROUGH ABANDONMENT, FORFEITURE, OR ADVERSE POSSESSION),
552 P2d 1220-26 (Idaho 1976).

Descriptors: *Idaho, *Judicial decisions, *Prior appropriation, *Priorities, *Adverse possession, Appropriation, Legal aspects, Water law, Water rights, Adjudication procedure, Preferences(Water rights), Beneficial use, Diversion, Irrigation water, Legal review, Streams, Rivers, Sinks, Sumps, Pipelines.
Identifiers: *Forfeiture of water rights, *Abandonment of water rights.

Upstream landowners brought a declaratory judgment action against downstream owners who possessed senior water appropriation rights fixed by a prior judicial decree. Plaintiffs sought a judgment re-allocating appropriation rights. Defendants predecessors in interest had been awarded a priority right to a specific measurement of water from each of three tributaries of the Bear River in 1882. In 1900, plaintiffs' predecessors in interest received a priority right on two of the same tributaries. Defendant downstream users divert their water below the confluence of the three creeks. Between the point of confluence and point of diversion several sump holes and sinks reduced the water available for defendants' use. In 1973 defendant constructed a pipeline circumventing the sinks and substantially increasing his water use. For several years prior to 1973, plaintiffs had increased their diversion. The Idaho Supreme rejected plaintiffs' claims that defendants had abandoned or forfeited the prior right. Abandonment requires an intent to abandon as well as relinquishment of the right. Inability to utilize water effectively, unless absolute, will not give an upstream junior appropriator the right to interfere with a senior right, nor is it clear unequivocal evidence of intention. Statutory forfeiture requires plaintiff to prove the existence of a 5 year period during which an owner fails to apply his water right to the beneficial use for which it was appropriated. The prior decree allocating junior and senior water rights is reaffirmed. (Moorhouse-Florida)
W77-07279

CITY AND COUNTY OF HONOLULU V BENNETT (DETERMINATION OF PRIVATE OWNERSHIP RIGHTS IN OFFSHORE ISLANDS AND BEACH PARCELS),
552 P2d 1380-92 (Hawaii 1976). 1 map.

Descriptors: *Hawaii, *Recreation facilities, *Parks, *Islands, *Condemnation, Judicial decisions, Legal review, Legal aspects, Water law, Real property, Adverse possession, Local governments, State governments, Beaches, Eminent domain, Public access, Public lands.
Identifiers: *Presumptions(Legal), Jury instructions, Notice, Land titles, Deeds, Property rights, Private ownership.

City and county of Honolulu condemned for park purposes an uninhabited island and two beach front parcels. The City contended that the state owned the island by virtue of an 1850 Privy Council resolution. Defendant Bennett claimed ownership of the island and of Parcel 2 through a deed to his undisputed predecessor in interest. Defendant McAulton claimed an undivided one-half interest in Parcel 9 in conflict with Bennett's claim of sole

ownership of that parcel. The trial court directed verdict for Bennett as to ownership of the island and the jury found Bennett the sole owner of Parcel 9. On appeal, ownership of the island was affirmed. The Supreme Court of Hawaii found the Privy Council resolution inapplicable to ownership of islands, and without the force of law. While the deed is ambiguous as to whether the island itself or only the fishing rights adjacent thereto were conveyed, it is presumed that when a small offshore island is expressly named in an ambiguous clause of a sizeable grant, the intent of the grant was to include the island. As to the verdict placing ownership of Parcel 9 in defendant Bennett, the case was remanded due to improper instructions to the jury. (Moorhouse-Florida)
W77-07280

WASTEWATER AND SLUDGE CONTROL IN THE CANADIAN METAL FINISHING INDUSTRY, SEGMENT INCLUDING CHEMICAL, ELECTROLYTIC TREATMENT; ELECTROCHEMICAL MACHINING AND POLISHING; CYANIDE HARDENING,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W77-07333

STATUS REPORT ON ABATEMENT OF WATER POLLUTION FROM THE CANADIAN PETROLEUM REFINING INDUSTRY - 1975,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W77-07334

HYDROLOGY RESEARCH DIVISION, ANNUAL PROGRESS REPORTS AND SHORT RESEARCH NOTES 1975-76.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
Report Series No. 45, 1976, 90 p., 11 fig., 5 tab.

Descriptors: *Hydrology, *Research and Development, *Programs, *Projects, Regional development, *Canada.
Identifiers: Progress reports(1975-1976).

A series of brief papers and reports on various research programs in the Hydrology Research Division is presented. There are seven research areas: (1) the Maritime Research Program to investigate salt water intrusion into coastal aquifers and flow through fractured media; (2) the Subsurface Contamination Research Program to investigate the infiltration of fluid contaminants into the subsurface and their movement through the ground; (3) the Northern Hydrogeology Program to gather information on the ground water-permafrost system of northern Canada and to improve our understanding of its response to environmental disturbances; (4) the GOWN program to develop an operational computerized system for the storage, processing and retrieval of ground water data; (5) the Urban Hydrogeology Program to investigate the interrelationships between hydrogeology and human activities in an urbanizing region; (6) the Hydrogeology of Major Excavations and Impoundments to study the effects on hydrogeologic regimes of such activities as open-pit mining and mine dewatering and (7) the Interface Hydrology Program to develop, investigate and improve hydrologic simulation and forecast models. (WATDOC)
W77-07336

REPORT OF A STUDY OF CONTROL AGENCY REVENUE FEES,
Environmental Protection Agency, Washington, D. C. Office of Planning and, Management.
For primary bibliographic entry see Field 5G.
W77-07435

LEGAL DECISIONS AND OPINIONS IN POLLUTION CASES,
Messenger, Lynch, Hills and Miller, Beltsville, Md.
For primary bibliographic entry see Field 5G.
W77-07436

WATER RESOURCES PLANNING AND MANAGEMENT GOALS,
Corps of Engineers, Washington, D.C. Central Reports Management Branch.
For primary bibliographic entry see Field 6B.
W77-07523

SNOW AND ICE HYDROLOGY IN THE UNITED STATES--CURRENT STATUS AND FUTURE DIRECTIONS,
National Committee for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-07565

6F. Nonstructural Alternatives

THE EVOLUTION OF APPROACHES TO FLOOD DAMAGE REDUCTION,
Oregon State Univ., Corvallis. Dept. of Geography.
K. W. Muckleston.
Journal of Soil and Water Conservation, Vol. 31, No. 2, p. 53-59, March/April 1976. 3 photo, 11 ref.

Descriptors: *Flood plain insurance, *Legislation, *Flood control, *Flood flow, *Flood plains, Flood protection, Floods, Water control, Flood damage, Flood discharge, Water management(Applied), Federal government, Flood frequency, Flood plain zoning, Flood recurrence interval, Flood stages, State governments.

America's approach to flood hazards is changing. In the past, reliance was put most heavily on large expenditures to modify and provide for post-flood aid. Today, the trend is more towards checking the expansion into 100-year floodplains, with a greater emphasis on compulsory flood insurance for those in susceptible areas. Legislative tools have been effectively used to effect this change. The Flood Diaster Protection Act of 1973 added sanctions that for all practical purposes make participation in the flood insurance program mandatory. The Water Resources Development Act of 1974 directed federal agencies to consider nonstructural alternatives when surveying, planning, or designing any project involving flood protection. The Disaster Relief Amendments of 1974 require regulation of both land use and construction as a condition for post-flood disaster loans and grants. The author suggests that certain other actions could be taken, among them requiring that planning include those areas beyond the 100-year line to reduce catastrophic losses from future floods larger than the 100-year event. (Frank-Florida)
W77-07248

EVOLUTION AND OBJECTIVES OF RIVER BASIN COMMISSIONS IN THE UNITED STATES,
Department of Justice, Washington, D.C. Land and Natural Resources Div.
For primary bibliographic entry see Field 6E.
W77-07249

SOME SUGGESTIONS FOR THE MANAGEMENT OF INTERNATIONAL RIVER BASINS,
New Mexico Univ., Albuquerque. School of Law.
For primary bibliographic entry see Field 6E.
W77-07250

PUBLIC PARTICIPATION IN WATER RESOURCE DEVELOPMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydr. lab.
For primary bibliographic entry see Field 6B.
W77-07526

6G. Ecologic Impact Of Water Development

THE ECOLOGICAL CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART I: ECOLOGICAL STUDIES,
Maine State Dept. of Marine Resources, Augusta.
For primary bibliographic entry see Field 5C.
W77-07178

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART II. CHEMICAL STUDIES,
Bowdoin Coll., Brunswick, Maine. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-07179

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART III: HISTOPATHOLOGICAL STUDIES,
National Water Quality Lab., West Kingston, R. I.
For primary bibliographic entry see Field 5C.
W77-07180

OFFSHORE OIL AND FISHERY RESOURCES,
New York State Dept. of Environmental Conservation, Delmar. Div. of Marine and Coastal Resources.
For primary bibliographic entry see Field 5C.
W77-07195

SCIENTIFIC AND SCENIC RIVERS ACT: COMMENTARY AND MODEL STATUTE,
Natural Resources Defense Council, Washington, D.C.
R. I. Compton.
Earth Law Journal, Vol 1, No 3, p 241-55, August 1975.

Descriptors: *River systems, *Rivers, *Wildlife conservation, *International law, Wild rivers, Recreation, Aesthetics, Legislation, Environment, Ecology, Governmental interrelations, Protection, Preservation, Federal government, Federal jurisdiction.
Identifiers: *Model legislation, *Scientific and Scenic Rivers Act, International agreement.

The world's remaining unspoiled river areas are being diminished by pressures of expanding population and development. This model statute exemplifies a means whereby countries can protect for future generations the beauty and ecological values of river areas. It recommends identifying those river areas possessing unique characteristics worthy of preservation, and bringing them under the control of the national, as opposed to a local, government. The statute further provides: (1) that studies of potential additions to the river systems be conducted; (2) that river areas be protected by the statute while they are being studied for inclusion in the river system; (3) that lands to be protected and not already held by the state be acquired through purchase or donation; (4) that other agencies having jurisdiction over the river areas be reviewed by an authority responsible for executing the statute's purpose. The Act recognizes that the degree of protection given will depend upon the special attributes of an area. Finally, the Act provides guidelines for international cooperation and written agreements where

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river areas include more than one nation. (Jones-Florida)
W77-07231

RULES FOR THE PROTECTION OF THE MARINE ENVIRONMENT RELATING TO TANK VESSELS CARRYING OIL IN BULK,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-07251

NUTRIENT TRANSFORMATIONS IN LOUISIANA SALT MARSH SOILS,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
For primary bibliographic entry see Field 5C.
W77-07319

EFFECT OF THE ASWAN HIGH DAM ON THE NILE FLOOD AND ON THE ESTUARINE AND COASTAL CIRCULATION PATTERN ALONG THE MEDITERRANEAN EGYPTIAN COAST,
Alexandria Univ. (Egypt). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-07363

MORBIDITY AND MORTALITY OF MARINE MAMMALS,
Alaska Univ., College. Inst. of Artic Biology; and Alaska Univ., College. Inst. of Marine Science.
F. H. Fay.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 43-47, November 1976. 03-5-022-56.

Descriptors: *Alaska, *Morbidity, *Mortality, *Oil pollution, *Pathology, *Baseline studies, *Resources development, *Ecological distribution, *Environmental effects, Water resources, Data collections, Mammals, Diseases.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, Kotzebue Sound, Dermatomycosis, Streptococcosis.

The coast of Kotzebue Sound from Bering Strait to Point Hope was surveyed for dead or Moribund marine mammals. A total of 166 dead marine mammals was sighted, 92 of which were old weathered remains from previous years. The findings thus far suggest that two pathologic conditions, namely dermatomycosis and streptococcosis, occur frequently enough to merit further investigation of their rate of occurrence, present impact, and potential aggravation by the stresses of oil development activities and environmental pollution. Low level infections by agents of both conditions appear to be common to all or most of the pinnipeds inhabiting the Bering and Chukchi Seas, and acute infections occur frequently enough to have been detected even in the present small samples. It is easily conceivable that a variety of stresses potentially imposed by oil development could have a synergistic effect on both of these conditions. (See also W77-06793) (Sinha-OEIS)
W77-07405

BIOLOGY OF THE HARBOR SEAL, PHOCA VITULINA RICHARDI, IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
K. Pitcher, and D. Calkins.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 48-54, November 1976. 03-5-022-69.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Mammals, Biology, Food habits, Population, Habitats.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Gulf of Alaska, Phoca vitulina richardi, *Harbor seal, Trophic relationships, Seasonal distribution.

Preliminary data from Tagidak Island indicate a late summer buildup of seals approaching 15,000 animals on September 2. The estimates of animals hauling on Tugidak from mid-May through July ranged from 3-6,000 and then progressively increased into September. Pupping began about May 25. The greatest number of ups was observed on June 19. By mid-July few pups remained on the island. Major disturbance factors observed were aircraft, both fixed wing and helicopter. During this quarter all field data were collected from Tugidak Island south of Kodiak Island. (See also W77-06793) (Sinha-OEIS)
W77-07406

TROPHIC RELATIONSHIPS AMONG ICE INHABITING PHOCID SEALS,
Alaska Dept. of Fish and Game, Fairbanks.
L. F. Lowry, and J. J. Burns.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 127-143, November 1976. 1 fig, 4 tab, 15 ref. 03-5-022-53.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Mammals.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, Pinnipedia Phoca (Pusa) hispida, Erignathus barbatus, Phoca vitulina largha, Stomach content, Trophic relationships, *Phocid seals.

The investigation of trophic relationships among ice inhabiting phocids consisted of the compilation of existing literature and unpublished data on food habits of ringed seals, bearded seals, spotted seals and ribbon seals. In addition, available informtion on distribution, abundance and natural history of potentially important prey species was gathered. The contents of seal stomachs collected during the quarter were sorted, identified and quantified. This information will be analyzed for geographical and temporal variability to prey utilization patterns as well as for species, sex and age related dietary differences. With the understanding obtained of the trophic interrelationships of ice inhabiting phocids in the Bering-Chukchi and Beaufort marine systems, the probably kinds and magnitude of effects of OCS development on this species of seals will be evaluated. (See also W77-06793) (Sinha-OEIS)
W77-07407

POPULATION ASSESSMENT, ECOLOGY AND TROPHIC RELATIONSHIPS OF STELLER SEA LIONS IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
D. G. Calkins, and K. W. Pitcher.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 149-160, November 1976. 2 tab. 03-5-022-69.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collection, *Ecological distribution, *Distribution patterns, *Environmental effects, *Water resources, Surveys, Population, Mammals.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Gulf of Alaska, Pinnipedia, *Sea lions, Trophic relationships, Geographic distribution.

A method of photo censusing was used to determine numbers and biomass of Steller sea lions in the Gulf of Alaska. Counts have been made of a total of 97 sea lion rookeries and hauling areas in March and 100 in june in which sex and age composition were established. Other objectives of the investigation were to determine patterns of animal movement, population identity, and changes in seasonal distribution. Tentative ages for 60 sea lions have been established by counting cementum annuli which is deposited on the roots of the teeth. (See also W77-06793) (Sinha-OEIS)
W77-07408

THE RELATIONSHIPS OF MARINE MAMMAL DISTRIBUTIONS, DENSITIES AND ACTIVITIES TO SEA ICE CONDITIONS,
Alaska Dept. of Fish and Game, Fairbanks.
J. J. Burns, F. H. Fay, and L. H. Shapiro.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 161-163, November 1976.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Mammals, Sea ice, Distribution patterns, Marine animals.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Bering Sea, *Chukchi Sea.

The concurrent investigation of sea ice conditions and Marine mammal distribution, densities and activities includes the following task objectives: Summarization and evaluation of existing literature and available unpublished data concerning relationships of marine mammals to sea ice conditions in the study areas; development of a classification of sea ice conditions which is meaninful in terms of marine mammal habitat and can be determined directly from satellite imagery; evaluation of the physical and environmental factors prevailing in the Bering and Chukchi seas which influence the annuual occurrence, dynamics and extent of these habitats; and correlation of the temporal and spatial distribution of marine mammals in the study areas to sea ice conditions. Data regarding observations of mammal occurrences, obtained through 30 June have been organized, put into approved formats and keypunched. (See also W77-06793) (Sinha-OEIS)
W77-07409

THE DISTRIBUTION, ABUNDANCE, DIVERSITY AND PRODUCTIVITY OF THE WESTERN BEAUFORT SEA BENTHOS,
Oregon State Univ., Corvallis. School of Oceanography.
A. G. Carey, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 6-38, November 1976. 2 fig, 10 tab. 03-5-022-68.

Descriptors: Water resources, *Resources development, *Baseline studies, *Biomass, *Productivity, *Environmental effects, *Alaska, Data collections, Oceanography, Benthos.
Identifiers: *Outer Continental Shelf, *Beaufort Sea, *Environmental assessment, *Environmental impact, resource availability, Geographic distribution.

Specific objectives of this study include the continuation of studies and analyses to: describe the distribution, species composition, numerical density, biomas of the benthos in the western part of the Beaufort Sea; describe the spatial and seasonal variability of faunal distributions and abundances; describe the benthic communities present and delineate their geographical and environmental extent; describe the effect of seasons on population size and reproductivity activity of dominant species; and determine the degree of correlation of species distributions and of various bio-indices with features of the benthic environment and

oceanography of the region. One hundred and sixty-eight grab samples from five seasonal Arctic field trips are being processed at the Oregon State University benthic laboratory where one of the main goals has been final species identification. Progress has remained steady in this area of final analysis. Systematic study of polychaetes, molluscs, amphipods and bottom copepods has continued throughout the quarter. (See also W77-06825) (Sinha-OEIS)
W77-07410

A DESCRIPTION AND NUMERICAL ANALYSIS OF THE FACTORS AFFECTING THE PROCESSES OF PRODUCTION IN THE GULF OF ALASKA,
Washington Univ., Seattle.
G. C. Anderson, R. K. Lam, and B. Booth.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 165-172, November 1976. 1 tab, 3 map. 03-5-022-67.

Descriptors: *Alaska, Data collections, Numerical analysis, Water resources, *Baseline studies, *Resources development, *Environmental effects, Productivity, Plankton, Phytoplankton, Temporal distribution.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, Environmental conditions, *Environmental assessment, Environmental impact.

A search was conducted to present a compilation of available baseline biological and associated physical and chemical data from the Gulf of Alaska (planktonic realm). All data were converted into OCSEAP format and entered on magnetic tape. To use the compiled data for a description of the temporal and geographic variation in phytoplankton standing stock (and species), production, and related physical and chemical factors a program was written. Results are graphically displayed. Some species display a clearly limited distribution whereas others are frequent and widely distributed. A standard run, simulating the evolution of the chlorophyll distribution in the upper 150 m of water over a period of one year, was completed for Station P. The chlorophyll distribution depends on five constant parameters and six independent variables. (See also W77-06825) (Sinha-OEIS)
W77-07411

ZOOPLANKTON AND MICRONEKTON STUDIES IN THE BERING - CHUKCHI/BEAUFORT SEAS,
Alaska Univ., College. Inst. of Marine Science.
R. T. Cooney.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 345-348, November 1976. 03-5-022-56.

Descriptors: *Alaska, Water resources, *Zooplankton, *Baseline studies, *Resources development, *Environmental effects, Distribution patterns, Data collections.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Norton Sound, Kotzebue Sound, Micronekton, Bering Sea, Beaufort Sea, Chukchi Sea.

On-site observations documented large numbers of hydomedusae and gaddoid fishes in the nearshore waters of both Norton and Kotzebue Sounds. Also many specimens of the scyphozoans were counted and discarded from samples. the amphipod Parathemisto libellula was extremely abundant in many of the samples taken well off shore, while a marine Cladocern appeared to dominate the net zooplankton close to the beach. The nearshore zooplankton community around the periphery of Norton and Kotzebue Sounds differs in species composition and abundance from that of the waters further out over the shelf. These areas in addition to being shallower are probably 'fresher' in terms of salt content than the more open shelf regions which would be selected for a more niretic community. The presence of large jellyfish in abundance may be indicative of a restricted circulation in these areas also. (See also W77-06825) (Sinha-OEIS)
W77-07412

PHYTOPLANKTON STUDIES IN THE BERING SEA,
Alaska UUniv., College. Inst. of Marine Science.
V. Alexander.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 349-353, November 1976. 03-5-022-56.

Descriptors: *Alaska, Water resources, *Sea ice, *Baseline studies, *Resources development, *Environmental effects, Data collections, Aquatic plants, Phytoplankton.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Bering Sea, Ice pack.

The dynamics of phytoplankton populations at the edge of the retreating ice pack in the Bering Sea was studied in order to assess the significance of the ice edge in the productivity of the Bering Sea. Studies away from the ice edge were carried out to provide data for comparison. Data organization, sample processing and analysis has been undertaken. All primary productivity samples have been counted and calculated, chlorophyll samples analyzed and calculated and alkalinity titrations performd. (See also W77-06825) (Sinha-OEIS)
W77-07413

BEAUFORT SEA PLANKTON STUDIES,
Washington Univ., Seattle. Dept. of Oceanography.
T. S. English, and R. A. Horner.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 457-482, November 1976. 1 fig, 7 tab, numerous ref. 03-5-022-67-TA2 No. 4.

Descriptors: *Plankton, *Surveys, *Baseline studies, *Resources development, *Environmental effects, Water resources, *Alaska, *Data collections, Primary productivity, Bibliographies, Distribution patterns, Seasonal, Ecology.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Beaufort Sea, Biological data.

The primary objectives of this project were to determine the seasonal density distribution and environmental requirements of principal species of phytoplankton, zooplankton and ichthyoplankton, and to determine seasonal indices of phytoplankton production. The secondary objective was to summarize existing literature, unpublished data, and archived samples. A cruise aboard USCGC GLACIER from August 7 to Sept. 4, 1976 resulted in zooplankton and ichthyoplankton samples. Acoustic surveys were conducted and subsamples were taken for salinity, standing stock primary productivity and chlorophyll a determinations. The Arctic phytoplankton references have been put on computer cards and the first listings run. This is to be considered a preliminary list because corrections and additions have not been completed. (See also W77-06825) (Sinha-OEIS)
W77-07414

THE ECONOMICS OF NATURAL ENVIRONMENTS, STUDIES IN THE VALUATION OF COMMODITY AND AMENITY RESOURCES.
Resources for the Future, Inc., Washington, D. C.
J. V. Krutilla, and A. C. Fisher.
Johns Hopkins University Press, Baltimore, Md. 1975. 304 p. 11 fig., 41 tab., 249 ref.

Descriptors: *Natural resources, *Economics, *Resource allocation, *Theoretical analysis, *Value, Water policy, *Research priorities, Water allocation(Policy), Water resources development, *Evaluation, Institutional constraints, Political constraints, Administrative agencies, Optimization, Land use, Public lands, Public rights, Reclamation states, Property values, Real property, Discount rates, Risks, National parks, National wildlife refuges, Mining, Pipelines, Oil industry, Reservoirs, Research facilities, Research and development.
Identifiers: Hells Canyon dam and reservoir(Idaho and Ore), White Cloud Peaks(Idaho), Challis National Forest(Idaho), Mineral King Valley(Cal), Sequoia National Park(Cal), Prairie Wetlands Area(U.S. and Canada), Alaskan Oil Pipeline.

A book addresses valuation, allocation and management of the resourcesof natural environments, and in particular aims at describing the range of amenity resources that have not previously been included in economic analyses even though they have been long recognized in public policies providing for such services as national parks, wildlife reufges and wilderness areas. The two-part volume covers institutional and theoretical considerations and provides five case studies in which analyses are applied. Chapters on theory include: (1) managing natural environments; (2) externalities, property rights, and valuation of resources on the public lands; (3) irreversibility and the optimal use of natural environments; (4) further analysis of irreversibility: Discounting, intergenerational transfers and uncertainty. Case studies include: (1) the Hells Canyon dam and reservoir on the Snake River(Idaho and Oregon); (2) mining activities in the White Cloud Peaks area of the Challis National Forest near Sun Valley, Idaho; (3) efforts to incorporate Mineral King Valley in the Sierra Nevad a Mountains (Calif.) into the surrounding Sequoia National Park; (4) the allocation of prairie wetlands in the north-central U.S. and neighboring provinces of Canada for breeding habitats of migratory waterfowl; and (5) environmental consequences and alternatives for the trans-Alaska oil pipeline. A summary chapter includes recommendations for establishing a network of regional centers of natural resources research focusing on various aspects of public land management, with each center to be assigned a specific area of research competence. (Harris-Wisconsin).
W77-07437

THE ENVIRONMENTALLY CONCERNED CITIZEN: SOME CORRELATES,
Connecticut Univ., Storrs.
L. R. Tucker.
Pennsylvania State Univ., Center for the Study of Environmental Policy Working Paper 23 (undated). 8 tab., 46 ref.

Descriptors: *Surveys, *Social participation, *Social values, Decision making, Psychological aspects, Motivation, Sampling, Statistical methods, Data collections, Environment, Environmental effects, Pennsylvania.
Identifiers: *Public opinion sampling, *Citizen participation, *Environmental protection, *Sierra Club, *Audubon Society.

Examination is made of the relationship between measures of internal-external control, social responsibility, social class, age and income, and environmental responsibility. To assess these relationships, a survey of 179 female homemakers in a central Pennsylvania shopping center was made of opinions and related actions in connection with environmentally-related behavior. Thirty-four homemakers were recruited through membership in the local Sierra Club and Audubon Society and 145 general-population subjects were solicited

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through local media. Responses were obtained from 166 women: 27 club members and 139 general-population members. Hypotheses tested by the survey were: (1) that members of the Sierra Club and/or Audubon Society exhibit more positive environmentally responsible attitudes and behaviors than the members of the general population; and (2) that members of these groups show higher social responsibility scale scores and social class standing and income levels and lower internal-external control scale scores and age than the members of the general population. Data collection was a two-stage process. In the first stage, questionnaires were administered which contained personality and attitude scales and demographic and self-report behavior items. In the second phase, the women were given choices of supermarket gifts: soft drinks in cans or returnable bottles, low-phosphate detergent vs. other detergents. Correlates were tested through statistical analysis techniques.(Harris-Wisconsin).
W77-07438

MODELING MULTIPLE-USE IN NATURAL AREAS: PART I -- THE BASIC FORMULATION,
Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo.
For primary bibliographic entry see Field 6A.
W77-07530

DECISION-MAKING FOR ENVIRONMENTAL RESOURCES MANAGEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. D. Bradley.
Journal of Environmental Management, Vol. 1, No. 3, p 289-302, July 1973. 30 ref.

Descriptors: *Environment, *Management, *Model studies, *Decision making, Economics, Water resources, Water policy, Political aspects, Social aspects, Effects, Ecology.
Identifiers: Mixed scanning, Incremental model, Information strategy, Strategic choice, Ecological integration.

In a world of accelerating scientific and technological advance, of rapid social and economic appraisal and reappraisal of resources, increasingly complex choices have to be promptly made. The cost of faulty decisions weighs heavily, however, as society becomes increasingly concerned with broad environmental side effects, especially where these effects may be irreversible. Focus upon the forces and resistances acting upon the decision-makers when questions of resource management are judged is needed to understand more completely the factors that contribute to decisions which ultimately reflect changes in the landscape, and which affect future public use and enjoyment of the environment. Discussed are four general decision-making approaches for environmental resource management: (1) the rational model, which uses a direct approach and eliminates the need for ideology in decision making; (2) the incremental model, which is more political in nature--it considers a few changing policies which differ only incrementally from existing policies and attempts to redefine the ends-means adjustments by way of feedback from various publics; (3) mixed scanning,which seeks to avoid the most serious problems of both the overly-rationalistic model and the excessively pragmatic model; and (4) the ecological model, an integrative decision-making model using long- and short-run time spans and micro- and macro-spans of analysis. The strengths and weaknesses of these approaches are described. Discussed also are the formation of goals, strategic choice, information strategy, and ecological integration. (Bell-Cornell)
W77-07542

POWER PLANT SITE EVALUATION: THE CASE OF THE SHARON PLANT IN ISRAEL,
Technion - Israel Inst. of Tech., Haifa. Center for Urban and Regional Studies.
M. Hill, and R. Alterman.
Journal of Environmental Management, Vol. 2, No. 2, p 179-196, April 1974. 1 fig, 5 tab, 13 ref.

Descriptors: *Powerplants, *Sites, *Evaluation, *Methodology, Pollution abatement, Industries, Environmental effects, Planning, Decision making, Cost-benefit analysis, Coasts, Cooling water, Sea water, Constraints, System analysis.
Identifiers: *Israel, Mediterranean coastal strip, Goals achievement matrix, Criteria evaluation matrix.

Site selection for polluting industries presents planners and decision makers with a difficult problem. Even more complex is the problem of locating powerplants because they affect the environment in several different ways, not all of which can be expressed by a common measure. It is therefore necessary to compare sites not only aspect by aspect, but also in terms of making some aggregative evaluation. This paper reviews several prevalent methods of evaluation, such as cost-benefit analysis, the goals-achievement matrix, and the indices method. Presented is the method finally selected by the research team. The method, a modified version of the goals-achievement matrix, is called the criteria evaluation matrix and is described herein. It was felt to be most suitable due to the limited problem of selecting one of two given sites and in view of the limiting terms of reference. This research method is based on separate but coordinated work on the part of each subteam of experts, with each subteam formulating its own conclusions based on its subject area. The topics selected for study are: land use planning, landscape and ecology, economic considerations, distribution of pollutants and their effect on health, and legal-administrative problems in implementation. The comprehensive conclusions were formulated after the conclusion of each subteam was discussed by the full team, in light of additional considerations that were regarded as cutting across all the subject areas. These considerations were: reversibility and substitutability, existing versus planned uses, and possible effects of new technologies for pollution control. (Bell-Cornell)
W77-07546

LITERATURE ON ENVIRONMENTAL PROTECTION, MANAGEMENT AND HYGIENE IN SWEDEN 1952-1971: BIBLIOGRAPHY AND ANALYSIS, (IN SWEDISH),
Y. Dahlstrem-Ekbohm.
Vaextekol Stud 6, p 1-119, 1975.

Descriptors: *Bibliographies, *Ecology, *Environmental effects, *Environmental control, Water pollution, Air pollution, Sewage, Public health, Toxicity, Waste water treatment.
Identifiers: *Sweden.

Subject headings are noise; ecology, biotope and landscape management, protection and management, of wild life; outdoor recreation, planning; counteracting of air pollution; environmental poisons; environmental protection and management; general, administrative and legal aspects; environmental hygiene, sewge treatment, waste; and management of water resources. The development of environmental protection and management in Sweden is summarized. A passive protection of nature from a scientific and cultural point of view gave way to an increasing number of active measures to protect and preserve nature, including the beauty of the landscape. Greater attention began to be given to the need for leisure and outdoor recreational facilities and greater emphasis was placed on recreation along with protecting and managing the landscape. With the development of ecology, there grew an awareness of the limited nature of the earth's natural resources, the dangers of waste and its uncontrolled dispersal, the dangers of pesticides, and the part played by man in the ecosystem, leading to an increased sense of societal responsibility toward the environment.--Copyright 1977, Biological Abstracts, Inc.
W77-07586

7. RESOURCES DATA

7A. Network Design

MAXIMUM 5-MINUTE AND HOURLY RAINFALLS ON METROMEX NETWORK, 1971-1975,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W77-07374

THE ECONOMIC BASIS OF RESOURCE INFORMATION SYSTEMS: THE CASE OF STREAMFLOW DATA NETWORK DESIGN,
Geological Survey, Reston, Va. Geologic Div.
E. D. Attanasi, and M. R. Karlinger.
Water Resources Research, Vol. 13, No. 2, p 273-280, April 1977. 2 fig, 2 tab, 19 ref, 1 append.

Descriptors: *Streamflow, *Networks, *Design, *Optimization, Economics, *Data collections, Resource allocation(Policy), Hydrologic data, Input-output analysis, Natural resources, Constraints, Methodology, Surface waters, Costs, Decision making, Probability, Equations, Mathematical models, Systems analysis.
Identifiers: *Information systems, Cost minimization, Production function, Loss function, Parameter uncertainty, Utility function.

A general method for the economic design of natural resource information systems is presented for a certain class of natural phenomena. The system design is determined by the interaction of the technical input-output relationship, e.g., the production function, the set of resource constraints, and an economic loss function defined in terms of parameter uncertainty. An application of the proposed method to streamflow network design is presented. The least-cost system design configuration is based on the economically relevant system inputs and is determined by the relationship between input costs (including opportunity cost of time) and the value of information defined in a decision theoretic sense. Results of this analysis indicate that the method is fairly robust with respect to the assumptions. Observations are made which suggest extensions to flood measurement networks, long-term precipitation networks, and seismic observation network design. (Bell-Cornell)
W77-07534

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 1, TEXT OF REPORT,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W77-07566

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 2, APPENDICES,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W77-07567

7B. Data Acquisition

AUTOMATIC MONITORING OF SOIL MOISTURE CONDITIONS IN A HILLSLOPE SPUR AND HOLLOW,
Bristol Univ., (England). Dept. of Geography.

For primary bibliographic entry see Field 2G.
W77-07146

A LIGHT-WEIGHT AND CHEAP DEPTH SAMPLER,
Teesside Polytechnic, Middlesborough (England).
For primary bibliographic entry see Field 5A.
W77-07155

A NEW METHOD FOR PHYSICAL LIMNOLOGY--TRITIUM-HELIUM-3 AGES--RESULTS FOR LAKE ERIE, HURON, AND ONTARIO,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2H.
W77-07168

AN OXYGEN-ISOTOPE CLIMATIC RECORD FROM THE DEVON ISLAND ICE CAP, ARCTIC CANADA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Polar Continental Shelf Project.
For primary bibliographic entry see Field 2C.
W77-07175

LABORATORY APPARATUS FOR PROVIDING DIEL TEMPERATURE REGIMES FOR AQUATIC ANIMALS,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-07188

SURBER SAMPLING IN DEEP WATER FOR BOTTOM ORGANISMS,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
R. H. Gray, and D. A. Neitzel.
The Progressive Fish-Culturist, vol. 38, no. 3, p. 142-143, 1976. 1 fig., 16 ref.

Descriptors: *Bottom sampling, Rivers, Research equipment, *Sampling, On-site data collections, River beds, River flow, Scuba diving, Benthos, Aquatic life, *Methodology.
Identifiers: *Surber sampler.

A thick-walled canvas bag with a drawstring is added to the standard Surber sampler for use in deep, fast-flowing rivers. One SCUBA diver stabilizes the sampler and one collects the sample by placing gravel and rocks in the canvas bag. The net and bag catch any dislodged organisms. (Katz)
W77-07199

A HAND-OPERATED IN SITU WATER SAMPLER,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W77-07200

EVALUATION OF TWO METHODS FOR CALCULATING FRESHWATER ZOOPLANKTON PRODUCTION, (IN RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
I. N. Andronikova.
Gidrobiol Zh 12(1), p 71-75, 1976.

Descriptors: *Zooplankton, *Productivity, Methodology, *Copepods, *Crustaceans, Reproduction, Respiration, Growth rates.
Identifiers: Eudiaptomus, Mesocyclops.

Comparison of graphic (weight gain) and physiological respiration) methods of production calculation showed that with K2 (coefficient of food assimilation) = 0.4 used in the 2nd method of calculation the production values, especially for Copepoda, are 4-5 times as high as those obtained by the 1st method. The greatest convergence of the values is observed when K2 = 0.2 for Eudiaptomus, K2 = 0.15 for Mesocyclops and K2 = 0.35 for Cladocera. When using the physiological method for the Copepoda population, adult individuals should not be included in the calculation, since their somatic growth has already stopped. Production owing to generative growth, or reproduction, should be determined separately and added to the production calculated by respiration for that part of the population which gives gain in weight.--Copyright 1976, Biological Abstracts, Inc.
W77-07228

ACOUSTIC MEASUREMENT OF SEDIMENT TRANSPORT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W77-07338

HYDROGEOLOGICAL APPLICATIONS OF EARTH RESOURCES TECHNOLOGY SATELLITE LANDSAT 1 IMAGERY,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
J. E. Charron.
Scientific Series No. 62, (English and French), 1976, 9 p., 9 fig., 5 ref.

Descriptors: *Remote sensing, Hydrology, *Geography, *Land resources, *Satellites, Technology, Groundwater recharge, Artesian wells, Freshwater, Mapping, *Canada.
Identifiers: *ERTS, *LANDSAT 1, Imagery, Manitoba, Ottawa, Ontario, Montreal, Quebec, Winnipeg.

A correlation of LANDSAT I imagery with various hydrogeological and surficial geology features in the Winnipeg area, Manitoba, and the Ottawa (Ontario)-Montreal (Quebec) area of Canada is presented. The study includes the identification of groundwater recharge and discharge areas and artesian zones; areas of freshwater discharge into surface-water bodies; and the identification and mapping of various types of surficial deposits. (WATDOC)
W77-07339

USE OF AERIAL REMOTE SENSORS TO MONITOR DREDGING PROJECTS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-07344

REAERATION-COEFFICIENT MEASUREMENTS OF 10 SMALL STREAMS IN WISCONSIN USING RADIOACTIVE TRACERS--WITH A SECTION ON THE ENERGY-DISSIPATION MODEL.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-07496

VALUE OF LANDSAT IN URBAN WATER RESOURCES PLANNING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-07527

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2H.
W77-07549

7C. Evaluation, Processing and Publication

MISSOURI RIVER POWER CURVE REGRESSION EQUATIONS,
Missouri Univ., St. Louis. Dept. of Geology.
For primary bibliographic entry see Field 2E.
W77-07152

DIGITAL RAINGAGE RECORDER,
Siena Coll., Loudonville, N.Y. Dept. of Physics.
For primary bibliographic entry see Field 2B.
W77-07172

PHYSICAL ENVIRONMENT ATLAS OF COASTAL ALABAMA,
Alabama Univ. System, Dauphine Island. Marine Science Programs; and Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss.
For primary bibliographic entry see Field 2L.
W77-07322

HYDROGRAPHIC PROPERTIES, MESA NEW YORK BIGHT ATLAS MONOGRAPH 1,
New York Sea Grant Inst., Albany,
For primary bibliographic entry see Field 2L.
W77-07328

OBSERVATIONS ON BACTERIOLOGICAL CONDITIONS IN THE UPPER GREAT LAKES 1968-1974,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W77-07340

MATHEMATICAL MODELING OF SEDIMENTATION TRANSIENTS IN SAND-BED CHANNELS,
Colorado State Univ., Fort Collins, Engineering Research Center.
For primary bibliographic entry see Field 2J.
W77-07354

MAXIMUM 5-MINUTE AND HOURLY RAINFALLS ON METROMEX NETWORK, 1971-1975,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W77-07374

PRELIMINARY MAPS SHOWING GROUNDWATER RESOURCES IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Tucson, Ariz. Water Resources Div.
S. G. Brown.
Available from Branch of Distribution, USGS--Box 25286, Federal Center Denver, Colo 80225, price $5.25. Hydrologic Investigations Atlas HA-542, 1976. 3 sheets, 87 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Mapping, *Colorado River basin, Arizona, Nevada, New Mexico, Utah, Geologic mapping, Subsurface mapping, Aquifer characteristics, Hydraulic conductivity, Hydrogeology, Groundwater movement, Aquifer systems, Pumping, Water yield, Water supply, Groundwater recharge, *Maps.
Identifiers: *Lower Colorado River Region.

This atlas was prepared to meet the need for information on the areal distribution, quantity, and availability of ground water in the lower Colorado River region, an area of about 140,000 square miles in parts of Arizona, Nevada, New Mexico, and Utah. The lower Colorado River region is divided into three water provinces--the Basin and

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Range lowlands province, the Plateau uplands province, and the Central highlands province. The annual precipitation in the region ranges from 3 inches near Yuma, Ariz., to as much as 35 inches on the highest peaks, such as those of the Chiricahua Mountains in Arizona. The precipitation in the lowlands ranges from about 10 to 12 inches per year. In the Basin and Range lowlands the hydraulic conductivity of the aquifers can be as much as 130 feet per day. In the Plateau uplands province most of the groundwater occurs in three multiple-aquifer systems. For the most part, the multiple-aquifer systems do not transmit water readily, and the hydraulic conductivity generally is less than 1.3 feet per day. The Central highlands province is a mountainous area that separates the Plateau uplands from the Basin and Range lowlands in most of the lower Colorado region. The principal discharge area for ground water in the highlands occurs along the base of the Mogollon Rim. (Woodard-USGS)
W77-07478

GROUND-WATER LEVELS IN MASSACHUSETTS, 1936-74,
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07485

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1973-77,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07486

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, Calif. Water Resources Div.
Geological Survey Water-Data Report CA-75-1, December 1976. 548 p, 6 fig, 5 tab, 34 ref.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Flow rates, Gaging stations, Lakes, Reservoirs, Chemical analysis, Sediments, Water temperature, Sampling, Sites, Water levels, Water analysis.
Identifiers: *Southern California.

Volume 1 of water resources data for the 1975 water year for California consist of records of stage, discharge, and water quality of stream; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 248 gaging stations; stage-only record for 1 gaging station; stage and contents for 21 lakes and reservoirs; water quality for 57 stations and 4 wells; water levels for 30 observation wells. Also included are 14 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W77-07491

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif. Water Resources Div.
Geological Survey Water-Data Report CA-75-2, December 1976. 515 p, 3 fig, 5 tab, 34 ref.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *California, Gaging stations, Streamflow, Flow rates, Sediments, Lakes, Reservoirs, Sampling, Sites, Chemical analysis, Water temperature, Water levels.
Identifiers: *Pacific slope basins(Calif).

Volume 2 of water resources data for the 1975 water year for California consist of records of stage, discharge, and water quality of streams and wells; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 150 gaging stations; stage and contents for 20 lakes and reservoirs; water quality for 106 stations and 15 wells, water levels for 27 observation wells. Also included are 17 crest-stage partial-record stations and 2 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W77-07492

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70--PART 15. ALASKA.
Geological Survey, Reston, Va. Water Resources Div.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202 Price $4.00.
Water-Supply Paper 2136, 1976. 428 p, 1 fig.

Descriptors: *Hydrologic data, *Surface waters, *Streamflow, *Lakes, *Alaska, Basic data collections, Runoff, Discharge(Water), Gaging stations, Flow measurement, Flow rates, Average flow, Resevoirs.
Identifiers: Maximum discharges, Minimum discharges, Reservoir content.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in Alaska. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W77-07493

SYMAP COMPUTER PROJECTIONS OF SUMMER ZOOPLANKTON POPULATIONS IN VAN LAKE, MONTANA,
W. A. Zemko, and P. A. Buscemi.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 850-855, 1975. 8 fig., 5 ref.

Descriptors: *Mapping, *Computer programs, *Zooplankton, Distribution, Water temperature, *Montana, Phytoplankton, Maps, Lakes.
Identifiers: SYMAP computer program, *Van Lake(Mont).

Symap, a computer program for producing maps which graphically depict spatially-arranged data, was used to examine distribution boundaries of summer zooplankton populations in Van Lake, Montana. Maps for total Copepoda, Cladocera, and Ceratium hirundinella were constructed using quantitative data collected at 1 m intervals from surface to bottom in a littoral and limnetic area. Maps of temperature were also constructed for comparison. Data values were divided, into ten equal ranges by the computer and the location of each range was plotted on a vertical profile outline of the lake along a 350 m long transect. Symap projections indicated that zooplankton distribution in this lake is linked to temperature. The boundaries indicated by Symap profiles for temperature are clearly reproduced when profiles for qualitative zooplankton and phytoplankton are constructed. Symap profiles can be constructed to conform to any outline and data can be modified before insertion to the package, or the program can be changed to accommodate raw data. A series of projections can be produced by simply substituting data values, allowing comparison of seemingly unrelated parameters. Combinations of standard computer characters are used to display a scale of tone from black to white. The limited number of sampling points required to produce a workable projection of a lake environment emphasizes Symap's efficiency. (Auen-Wisconsin)
W77-07511

CALCULATION OF CALCIUM CARBONATE-CARBON DIOXIDE EQUILIBRIUM IN WATER AND MIXTURES OF WATER,
For primary bibliographic entry see Field 5A.
W77-07513

TEST OF LANDSAT-BASED URBAN HYDROLOGIC MODELING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-07528

SATELLITE OBSERVATIONS OF WATER QUALITY,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-07554

8. ENGINEERING WORKS

8A. Structures

DESIGN OF GRAVITY DAMS, DESIGN MNUAL FOR CONCRETE GRAVITY DAMS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. A Water Resources Technical Publication, Denver, Colorado, 1976. 584 p.

Descriptors: *Concrete dams, *Dam design, *Spillways, *Dam foundations, *Analytical techniques, Hydraulic structures, Design data, Design criteria, Hydraulics, Outlet works, Foundation investigations, Concretes, Concrete control, Analysis, Gravity dams, Structural analysis, Diversion, Ecology, Environmental effects, Hydraulic design, Inflow, Flood forecasting, Specifications, Streamflow, Floods, Hydrology.

Instructions, examples, procedures, and standards were presented for use in the design of concrete gravity dams. The information is intended to serve as a guide to sound engineering practices and to provide the technically trained, qualified design engineer with specialized and technical information that can be readily used in the design of concrete gravity dams. Discussions in this manual were limited to dams on rock foundations and to dams more than 50 ft high. Dams less than 50 ft high were covered in 'Design of Small Dams.' Subjects discussed in detail include design considerations, design data and criteria, layout and analysis, river diversion, foundation treatment, temperature control of concrete, joints in structures, spillways,

outlet works and power outlets, galleries and adits, miscellaneous appurtenances, structural behavior measurements, concrete construction, and ecological and environmental considerations. The manual should be of service to all concerned with the planning and designing of water storage projects, but it cannot relieve the agency or person using it of the responsibility for a safe and adequate design. The limitations stated in the design procedures should be heeded. (See also W74-01058 thru W74-01070) (Humphreys-ISWS)
W77-07151

RECLAMATION RESEARCH IN THE SEVENTIES, SECOND PROGRESS REPORT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
Also available from Sups. Doc, U.S. Government Printing Office, Washington, D.C. 20402, for $2.50. Water Resources Technical Publication, Research Report No. 28, (1977), 102 p.

Descriptors: *Weather modification, Water resources, Energy, Environment, Water quality, *Electric power, Instrumentation, *Geothermal studies, Pumped-storage, *Water conservation, Management, Land classification, Ecology, Structural behavior, Soil mechanics, Rock mechanics, Concrete technology, Materials testing, Rapid excavation, *Research and development.
Identifiers: *Energy research.

This report summarizes the Bureau's congressionally funded water resources research programs, including the major research activities of the seven regional offices of the Bureau and those of the Engineering and Research (E&R) Center in Denver. The material, with the exception of Project Skywater and Energy Research and Development, is organized and presented under five subject categories established by the Committee for Water Resources Research (COWRR), i.e., Water Supply Augmentation and Conservation, Water Quantity Management and Control, Water Quality Management and Protection, Water Resources Planning, and Engineering Works. Some of the projects discussed are long-term studies of physical problems facing all water resources development organizations; and many are new studies of social, economic, ecological, and environmental concepts. This report reveals a significant increase in research on environmental impacts of projected or existing projects, new emphasis on energy, and greater attention to social and sociological factors related to resources development. Certain continuing routine studies not listed here may be found in previous reports covering the years 1965, 1966, 1967, 1968, 1969 and 1974. (Bur Reclam)
W77-07600

8B. Hydraulics

DESIGN OF GRAVITY DAMS, DESIGN MNUAL FOR CONCRETE GRAVITY DAMS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W77-07151

FREE FLOW IMMEDIATELY BELOW SLUICE GATES,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
N. Rajaratnam.
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol. 103, No. HY4, Proceedings Paper 12867, p 345-351, April 1977. 7 fig, 1 tab 9 ref, 2 append.

Descriptors: *Boundary layers, *Flow, *Sluice gate, Gate control, Gates, Open channel flow, Sluices, Hydraulics, Laboratory tests, Channels, Profiles, Pressure.
Identifiers: *Contraction, Water surface profiles, Coefficient of contraction, Pressure field, Free flow.

Based on the results of an experimental study, it was found that the water surface profiles immediately below sluice gates in rectangular channels are similar. The coefficient of contraction was found to be larger than the theoretically predicted value, and it is not possible to attribute this difference to boundary layer effects alone. The pressure field in the converging flow was measured, and the dimensionless excess pressure on the bed was correlated with the dimensionless longitudinal distance from the gate. (Lee-ISWS)
W77-07161

LOCATION OF FREE SURFACE IN POROUS MEDIA,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W77-07162

HYDRAULIC JUMPS AND WAVES AT ABRUPT DROPS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
N. Rajaratnam, and N. V. Ortiz.
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol. 103, No. HY4, Proceedings Paper 12869, p 381-394, April 1977. 14 fig, 2 tab, 11 ref, 2 append.

Descriptors: *Drops(Structures), *Flow, *Hydraulic jump, Open channel flow, Open channels, Shear stress, Turbulent flow, Waves(Water), Tail water, Hydraulics.
Identifiers: Abrupt drops, Tailwater depth, Bed shear, Captive eddy.

Experimental results on the structure of the mean flow in B-jumps and waves formed at abrupt drops in open channels for a wide range of the supercritical Froude number and relative drop height were presented. In the B-jump, the supercritical stream undergoes diffusion; firstly as a curved free jet sandwiched between the captive eddy on the bottom and the surface roller on the top, and secondly as a reattached plane wall jet with the surface roller on its top. The bed shear stress in the downstream channel was measured and well correlated along with the variation of the maximum velocity. In the wave, it was found: (1) that the supercritical stream is deflected by the tailwater back-pressure, and (2) that the deflected stream behaves like a curved surface jet until it plunges into the tailwater. The decay of the maximum velocity in the wave was found to be generally faster than that in the classical jump and the B-jump. (Lee-ISWS)
W77-07163

DESIGN CRITERIA FOR HYDROLOGIC EXTREMES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
V. T. Chow, and N. Takase.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY4, Proceedings Paper 12886, p 425-436, April 1977. 4 fig, 4 tab, 11 ref, 2 append.

Descriptors: *Design criteria, *Floods, *Model studies, *Illinois, Hydrology, Water resources, Probability, Statistical models, Statistical methods, Rivers, Equations, Monte Carlo method.
Identifiers: Recurrence interval, Water resources system, Independent random variables.

Hydrologic extremes, such as floods and low flows, were treated as independent random variables. Accordingly, probabilistic models were derived for two approaches of adopting hydrologic extremes as design criteria in water resources project planning. One approach was to use the hydrologic event of a given occurrence interval, and the other was to use the extreme flood observed in the record. The models were verified agreeably by the flood data of 10 Illinois rivers. Both models gave essentially the same results when the period of design was less than 1/10 of the recurrence interval and the length of the record. Also, by the Monte Carlo method, synthetic hydrologic extremes were generated by a time-series model for use in water resources systems analysis. (Roberts-ISWS)
W77-07165

THE CABLE TOOL DRILLING MACHINE, PART III,
For primary bibliographic entry see Field 8C.
W77-07286

THE CABLE TOOL DRILLING MACHINE, PART IV,
For primary bibliographic entry see Field 8C.
W77-07287

DEEP WELLS FOR DEWATERING OFFER REAL ADVANTAGES, PART I.
The Johnson Drillers Journal, Vol. 49, No. 1, p 1-4, 11, January-February, 1977. 2 fig.

Descriptors: *Dewatering, *Deep wells, Wellpoints, Excavation, Drawdown, Specific yield, Transmissivity, Pumping, Soils.
Identifiers: Boyle's Law.

Because deep wells can lower water tables up to 4 times more than commonly used single-stage wellpoint systems, they are frequently more effective in dewatering soil for excavation. Though of limited use in trenching operations and other projects requiring mobility, deep wells are very economical in many cases and are capable of relieving artesian pressure below digging level. Wells for dewatering, unlike production wells, are designed to provide maximum drawdown. The combined effect of a group of dewatering wells can be estimated by graphic or computer superimposition of the effects of single wells; since transmissivity of water table aquifers decreases with the reduction of saturated thickness during pumping, the actual amount of pumpage will usually be lower. It is common practice to install submersible or line-shaft turbine pumps with air-tight seals between the pump column pipe and the well casing in order to maintain the pumping level in the well while increasing drawdown. Vacuum and additional drawdown produced by such sealing can be estimated using a variant of Boyle's Law. (Eberle-NWWA)
W77-07294

CATHODIC PROJECTION OF BOREHOLE CASING,
For primary bibliographic entry see Field 8G.
W77-07297

NEW RIG CONCEPT USES CONTINUOUS DRILL STRING.
For primary bibliographic entry see Field 8G.
W77-07298

NEW LOST CIRCULATION REMEDY IS EASY TO USE.
For primary bibliographic entry see Field 8G.
W77-07299

PHYSICAL MODELING OF COMBINED FORCED AND NATURAL CONVECTION IN WET GEOTHERMAL FORMATIONS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 4B.
W77-07303

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MATHEMATICAL MODELING OF SEDIMENTATION TRANSIENTS IN SAND-BED CHANNELS,
Colorado State Univ., Fort Collins, Engineering Research Center.
For primary bibliographic entry see Field 2J.
W77-07354

THE RESPONSE OF AN ESTUARY TO THE CLOSURE OF A MOBILE BARRIER; RICHMOND BARRIER ON THE UPPER THAMES ESTUARY,
Institute of Oceanographic Sciences, Birkenhead (England).
For primary bibliographic entry see Field 2L.
W77-07366

PREDICTING CHANGES IN TIDAL REGIME: THE OPEN BOUNDARY PROBLEM,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
C. Garrett, and D. Greenberg.
Journal of Physical Oceanography, Vol 7, No 2, p 171-181, March 1977. 4 fig, 2 tab, 23 ref, 1 append.

Descriptors: *Tides, *Tidal powerplants, *Model studies, *Mathematical models, Water levels, Tidal waters, Tidal energy, Bays, Gulfs, Continental shelf, Estuaries, Flow, Mass transfer, Barriers, Oceanography.
Identifiers: *Bay of Fundy, *Gulf of Maine.

Attempts to predict the impact on a tidal regime of large engineering structures generally are based on the use of a numerical model which is calibrated to reproduce the natural tidal regime and then rerun with the structures in place. Usually it is assumed that the 'input' tide at the open boundary is unchanged by the structures, though this is clearly wrong in principle. It was shown how errors in this procedure can be corrected, or at least estimated, for using output from the numerical model and estimates of the impedance of the exterior ocean. The ocean impedance can be expressed as an infinite series in terms of the normal modes of the ocean, with some terms allowing for near-resonant enhancement of particular modes, and the infinite tail corresponding to a local source-like behavior which can be estimated independently. Application of the technique to the problem of predicting the impact of Fundy tidal power suggests that any predicted change may be uncertain to about plus or minus 25% of the change in mass flux across the open boundary. This uncertainty could amount to plus or minus 4% of the tidal range for a large tidal power development. It is clear that numerical models used in this type of problem should generally extend to the edge of the continental shelf. The role of side boundaries from the coast to the edge of the shelf is uncertain, although in the Fundy problem there is little mass flux across them so that they appear not to be important. (Sims-ISWS)
W77-07370

MANNING N AND THE OVERLAND FLOW EQUATION,
Agricultural Research Service, Stillwater, Okla.
For primary bibliographic entry see Field 2E.
W77-07371

REDUCING POWER CONSUMPTION IN IRRIGATION SYSTEMS WITH THE AID OF A MATHEMATICAL MODEL FOR PIPE DIMENSIONING,
Academia de Studii Economice, Bucharest (Rumania). Dept. of Economic Cybernetics.
For primary bibliographic entry see Field 3F.
W77-07547

RECLAMATION RESEARCH IN THE SEVENTIES, SECOND PROGRESS REPORT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W77-07600

8C. Hydraulic Machinery

THE CABLE TOOL DRILLING MACHINE, PART III,
Ground Water Age, Vol. 11, No. 4, p 19-22, December, 1976. 5 figs.

Descriptors: *Drilling equipment, *Drilling, Well casings.
Identifiers: *Cable tool drilling equipment, *Bailing.

Preparation for drilling using the cable tool machine consists of several steps. Preliminary steps include obtaining a sufficient water supply for the drilling, setting the rig, attaching and spooling the wire rope drums, extending the derrick, and stringing the tools. After this, the drilling process commences; selection of proper stroke length and operating speed are essential at this point to ensure proper drilling progres. As mud and water accumulate in the borehole a certain amount of the fluid will need to be bailed out depending on the character of the formation being penetrated. Close monitoring of the bailing process can alert the driller to problems with the hole that should be corrected before drilling further. Pipe is driven into the hole by means of drive clamps and usually a drive head attached to the sting of drilling tools. Bailing and clean-out operations are often necessary as the driving process slows down. Great care must be taken that the first 40 to 60 feet of casing go in absolutely straight. (See also W77-07287) (Eberle-NWWA)
W77-07286

THE CABLE TOOL DRILLING MACHINE, PART IV,
Ground Water Age, Vol. 11, No. 6, p 23-25, February, 1977. 3 figs, 1 tab.

Descriptors: *Drilling equipment, *Drilling, *Well casings.
Identifiers: *Cable tool drilling equipment, Hollow rod drilling, Jetting systems.

Because each type of material that a driller works presents its own set of problems, it is important for the driller to know how to handle casing under varying conditions. In soft clays and in sand and gravel formations, casing is frequently driven ahead of the hole. This is not the case with hard clays, hard pan formations (which may require blasting to open up the hole when obstacles are encountered), or drilling in bedrock. Drilling in quicksand is especially difficult, and sometimes can only be accomplished by filling the bottom of the well with Portland cement or by keeping the drill hole full of water. Cable tool rigs are sometimes used with hollow rod or jetting system attachments. Hollow rod bits are equipped with a check valve and operate by allowing the drill pipe to fill with fluid and cuttings with each successive stroke. Jetting is somewhat the reverse process; fluid is pumped down through the drill pipe, the cuttings flowing up through the space between the drill pipe and casing. (See also W77-07286) (Eberle-NWWA)
W77-07287

THE CHIEF DRILLER'S REPORT ON JCCIP,
Christian Organization for Relief and Rehabilitation, New York.
B. Eaton.
Agricultural Development Agencies in Bangladesh, Dhanmandi, Dacca, June, 1976. 29 p. TKs. 3.00.

Descriptors: *Drilling, *Drilling equipment, *Well screens, *Plastic pipes, *Irrigation wells, *Pumps, Well casings, Drilling fluids, Bearings.
Identifiers: *Well development, *Propeller pumps, Bangladesh, Gravel packing, Jetting, Bailing, Over pumping, Pump drive systems, Bamboo.

Research performed by the Joint CORR-CRS (Catholic Relief Services) Irrigation Project (JCCIP) in Bangdladesh between 1973 and 1976 has demonstrated moderate success with labor-intensive drilling and well development methods. Manual adaptations of cable-tool techniques such as 'manual percussion,' jetting, and hollow rod methods were possible because of unconsolidated alluvial formations underlying most of the country. Though initial capital investment for equipment is much lower than for modern rigs, cost per foot of drilling is actually higher for the manual methods. Both naturally developed and gravel-packed wells were completed during the project, including one well with a longitudinally slotted bamboo screen. Propeller pumps were employed to draw water from levels too low for operation of centrifugal pumps in Bangladesh, however, lack of rigidity in PVC casing and inability to put down a completely straight well by manual methods led to frequent pump and well failures. Slow speed diesel engines used experimentally to drive pumps were judged inadequate. Future projections suggest that very small wells capable of irrigating 1 to 5 acres via hand pumps may be the trend for upcoming projects, and that Bangladeshi nationals will soon be able to supervise alone all phases of such well projects. (Eberle-NWWA)
W77-07288

INSTALLATION TIPS ON LARGE SUBMERSIBLES,
General Electric Co., Schenectady, N.Y.
J. J. Collins.
Water Well Journal, Vol. 31, No. 3, p 63-64, March, 1977.

Descriptors: *Pumps, *Pipes, *Joints(Connections), *Installation, Electric insulation, Electric cables.
Identifiers: *Submersible pumps, Torque.

Proper installation of large submersible pumps can prevent problems such as loose column pipe joints. A joint tightening torque of 10 lb. ft. per h.p. for 4-pole motors is recommended to prevent unscrewing of joints due to motor torque; a rope and cathead or an auxillary winch applied to a 4 ft. chain tong may be necessary to supply the needed force when installing 60 to 200 h.p. units. Spot welding or even clamps may sometimes be necessary to ensure that joints will not back off. The amount of unscrewing before damage occurs varies greatly. Spiraling cable may result in electrical failure, which may in turn lead to misdiagnosis of the real underlying problem. Pulling procedure should therefore include checking the cable at and below each band for cuts, cable insulation distortion, and cable tension. Splices and waterproof lead plugs also should be examined for signs of arcing and tension, and the true nature of the problem ascertained before replacing the unit. (Eberle-NWWA)
W77-07289

GEOTHERMAL POWER, THE 'SLEEPER' IN THE ENERGY RACE,
Magma-Thermal Power Project, Santa Rosa Calif.
For primary bibliographic entry see Field 3E.
W77-07296

ELECTRIC POWER GENERATION FROM GEOTHERMAL HOT WATER DEPOSITS,
California Univ., Livermore. Lawrence Livermore Lab.
A. L. Austin, and A. W. Lundberg.
Mechanical Engineering, Vol. 97, No. 12, p 18-25 December, 1976. 9 fig, 2 tab, 14 ref.

Descriptors: *Geothermal studies, *Energy conversion, *Thermal powerplants, *Electric power production, Turbines, Generators, Heat exchangers.
Identifiers: Flashed steam conversion, Binary cycle conversion, Total flow systems.

Water-dominated geothermal systems are an energy resource from which a great quantity of clean, low-cost electric energy can be extracted. Though dry steam deposits are the easiest to exploit, they are only about one-twentieth as common as hot water deposits. The range of chemical conditions, however, necessitates special systems for the latter. Three conversion concepts -- the flashed steam system, the binary cycle system, and the total flow system -- were compared for efficiency and practicality in this study. In the flashed steam method, the vapor fraction of the wellhead product is increased via an isenthalpic expansion to a lower pressue, and the derived steam used to power turbines. The binary cycle system makes use of a heat exchanger to vaporize a secondary working fluid to drive turbines. The total flow concept utilizes a mixed phase expander to modify the incoming flow of geothermal fluid. Although still in experimental stages, total flow promises to be the most efficient method of the three. Problems will need to be worked out, howeer, before total flow systems can be developed commercially. (Eberle-NWWA)
W77-07300

DOWNHOLE MEASUREMENTS THROUGH MODIFIED DRILL PIPE,
Shell Development Co., Houston, Tex. Bellaire Research Center.
For primary bibliographic entry see Field 8G.
W77-07304

PARAMETER STUDY OF VARIABLES AFFECTING THE PERFORMANCE OF A HYDRAULIC PIPELINE DREDGE MODEL,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-07346

GEOTHERMAL RESOURCES, A NEW LOOK,
For primary bibliographic entry see Field 4B.
W77-07477

PUMPED STORAGE OPTIMIZATION IN GENERATION SYSTEMS,
Natal Univ., Durban(South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07525

RECLAMATION RESEARCH IN THE SEVENTIES, SECOND PROGRESS REPORT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W77-07600

8D. Soil Mechanics

PROCEEDINGS OF THE SEVENTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 587, Price codes: A11 in paper copy, A01 in microfiche. Report No CDS-181 and Sea Grant Report TAMU-SG-76-105, September 1975. 247 p. Herbich, J.B., editor. NOAA 04-5-158-19.

Descriptors: *Conferences, *Publications, *Dredging, *Inland waterways, Excavation, Channel improvement, Remote sensing, Equipment, Oceans, Estuaries, Estuarine environment, Suspended solids, Pumping, Pipelines, Hydraulics, Sediment control, Trenches, Harbors, Transportation, Channels, Soil physical properties, Aquatic life, Deposition(Sediments).
Identifiers: Dredges, Cutterhead dredges.

This seminar was held in New Orleans, Louisiana, November 8, 1974. Topics presented were: Salvops-Hopper Dredge 'A. MACKENZIE', Use of Aerial Remote Sensors to Monitor Dredging Projects, Dredged Material Disposal Effects and Alternatives, Parameter Study of Variables Affecting the Performance of a Hydraulic Pipeline Dredge Model, The Port of New Orleans and Its Dredging Program, Problems Associated with Construction of Submarine Pipelines, Compressibility and Strength of Compacted Dredgings, Permeability and Drainage Characteristics of Dredgings, Concepts for the Reclamation of Dredged Material, and The Responses of Some Estuarine Organisms to Suspended Solids. (See W77-07343 thru W77-07353) (Humphreys-ISWS)
W77-07342

SALVOPS-HOPPER DREDGE 'A. MACKENZIE',
Army Engineer District, Galveston, Tex.
D. S. McCoy.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 1-23, September 1975. 14 fig.

Descriptors: *Inland waterways, *Navigation, *Hazards, *Texas, Safety, Channel improvement, Channels, Ships, Dredging.
Identifiers: *Galveston entrance channel, Ship salvage.

On April 24, 1974, while dredging the north half of the Galveston entrance channel, the U.S. Hopper Dredge 'A. MACKENZIE' was involved in a three-vessel collision. She sank in 42 feet of water. The 50 year old MACKENZIE turned crosswise in the channel as she sank, blocking the north half of the entrance channel serving the ports of Galveston, Texas City, and Houston. The dredge was declared a total loss after a thorough investigation of the ship's condition. The ship was cut in place and removed for sale as scrap. The MACKENZIE salvage operation was completed in 117 working days. The job was accomplished without any shipping mishaps despite the close quarters between ship traffic to and from the 3 ports. An estimated 4,700 ships used the channel during this period, with only brief delays, if any, caused by the salvage operation. There were no injuries incurred by the work crew, which numbered up to a peak of 125 persons during the lifting operations. Environmentally, the entire operation was accomplished with only relatively minor fish loss, and this loss occurred essentially only at the time of the first use of explosives. Elaborate preparations were made to control any oil spillage which might have occurred, but there was virtually no oil loss from the MACKENZIE, and there was no known environmental damage. (See also W77-07342) (Humphreys-ISWS)
W77-07343

USE OF AERIAL REMOTE SENSORS TO MONITOR DREDGING PROJECTS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
J. L. Machemehl.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 24-28, September 1975. 6 ref.

Descriptors: *Remote sensing, *Dredging, *Monitoring, Aerial photography, Films, Photography, Coasts, Erosion, Estuaries, Currents(Water), Sediment distribution, Estuarine environment, Waves(Water), Water pollution.

Application of aerial remote sensing to the dredging industry was reviewed. The primary aerial remote sensors considered were black and white, black and white infrared, color, color infrared aerial photographs, and multispectral aerial photographs. Remote sensing can be utilized to obtain data for designing, planning, and controlling a dredging project. (See also W77-07342) (Humphreys-ISWS)
W77-07344

DREDGED MATERIAL DISPOSAL EFFECTS AND ALTERNATIVES,
Army Engineers Waterways Experiment Station, Vicksburg, Miss.
R. M. Meccia.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 29-42, September 1975. 8 fig, 1 tab.

Descriptors: *Dredging, *Research and development, *Programs, *Resources development, Excavation, Land use, Land management, Aquatic life, Wetlands, Marshes, Habitat improvement, Spoil banks, Landfills, Aquatic environment, Navigation, Channel improvement.
Identifiers: Dredged material disposal.

Dredging to create and maintain navigable channels for the nation's waterborne commerce inherently requires removal of large quantities of sediment, which must be disposed of economically but with the least possible adverse environmental impact. But just what are the impacts or effects, and what are the alternatives. A research program of national scope is underway at the Corps' Waterways Experiment Station to seek answers to basic and critical questions. The objective of the Dredged Material Research Program (DMRP) is to develop technically satisfactory, environmentally compatible, and economically feasible alternatives for dredging and disposal, including considering the dredged material itself as a manageable resource. Dredged material had once been regarded as a nuisance waste product to be dumped in open waters or on marshes without any awareness of the environmental consequences. The program goals and tasks are consolidated into the four areas of aquatic disposal, habitat development, disposal operations, and productive uses. The field and laboratory investigations underway in each of these broad areas were briefly discussed. (See also W77-07342) (Humphreys - ISWS)
W77-07345

PARAMETER STUDY OF VARIABLES AFFECTING THE PERFORMANCE OF A HYDRAULIC PIPELINE DREDGE MODEL,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
D. R. Basco.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 43-78, September 1975. 24 fig, 6 ref.

Descriptors: *Dredging, *Model studies, *Pumps, *Hydraulics, Pumping, Slurries, Discharge lines, Design criteria, Pipelines, Theoretical analysis, Mathematical models, Equations, Evaluation, Analytical techniques, Head loss, Sediment discharge, Sediment transport, Horsepower, Cavitation.
Identifiers: Dredge model.

Reviewed were the elements of an equation-based model of hydraulic dredging systems which correctly demonstrate the effects of line length, digging depth, and grain size on solids output of

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the dredge. Limited field data 'agreed' with the model results. Based on the pump performance curves available and the use of the computer model described, it was concluded that: (1) the 'one-dredge-pump-is-as-good-as-another' (hydraulically) hypothesis must be rejected. Substantial differences in production (50% + or -) were demonstrated for both the horsepower (line-length) and cavitation (digging depth) solids output limiting criteria; (2) the model dredge program can systematically and economically study the effects of variables such as horsepower available, suction-pipe size, and particle size. This work is continuing in order to examine additional variables such as booster pumps (suction and discharge), pump location, terminal elevation, discharge pipe size, etc. (See also W77-07342) (Humphreys - ISWS)
W77-07346

MAINTENANCE DREDGING IN THE NEW ORLEANS DISTRICT, US ARMY CORPS OF ENGINEERS,
Army Engineer District, New Orleans, La.
H. R. Vick.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 79-110, September 1975. 22 fig.

Descriptors: *Dredging, *Maintenance, *Navigation, *Mississippi River, *Louisiana, Inland waterways, Channel improvements, Rivers, Channels, Equipment, Jetties, Shoals, Navigable waters, Inlets(Waterways).

The New Orleans District of the Corps of Engineers covers an area of 47,000 sq mi. The area covered includes most of Louisiana and small portions of Mississippi, Arkansas, and Texas. There are approximately 2800 miles of navigable waterways, including 405 miles of deep draft waterways. Each year 110 miles of deep draft (authorized depths, 30-42 ft) channels and 60 miles of shallow draft (5-20 ft) channels are dredged. The principal navigation projects in the district were described in this report, and the dredging activities for the years 1968-1972 were summarized. (See also W77-07342) (Humphreys - ISWS)
W77-07347

THE PORT OF NEW ORLEANS AND ITS DREDGING PROGRAM,
Williams-McWilliams Co., Inc., New Orleans, La.
C. B. Hakenjos.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 112-123, September 1975. 5 fig.

Descriptors: *Harbors, *Louisiana, *Dredging, Water resources development, *Mississippi River, Programs, Projects, Transportation, Navigation, Resources development, Facilities, Inland waterways.
Identifiers: *New Orleans(La).

The port of New Orleans has a 30-year, $400,000,000 development plan called Centroport USA. This plan includes a partial move from the congested bank of the Mississippi River to a tidewater area along the Mississippi River-Gulf Outlet. The location of initial barge carrier terminals will be determined by the adequacy of the connection between the tidewater area and the river because the present connection through the Industrial Canal Lock has reached total capacity. A new ship lock and connecting channel is now (1975) being designed, and completion is scheduled for 1981. Dredging for the port is done in the two deep-water passes of the Mississippi River, the wharves along the Mississippi River, the Industrial Canal, and the Mississippi River-Gulf Outlet. Meeting the future port goals is highly dependent upon the accomplishment of major new dredging projects and an increasing major maintenance dredging program. (See also W77-07342) (Humphreys - ISWS)
W77-07348

PROBLEMS ASSOCIATED WITH CONSTRUCTION OF SUBMARINE PIPELINES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
W. A. Dunlap.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 124-139, September 1975. 7 fig.

Descriptors: *Construction, *Underwater, *Pipelines, *Trenches, Hydraulic structures, Movement, Submergence, Slope stability, Bottom sediments, Scour, Soil mechanics, Soil stability, Stability.
Identifiers: Liquefaction, Bottom slides.

Submarine pipeline problems were discussed, and a few solutions were presented. Flexible pipe joints and pipelines with relatively low specific gravities, approaching that of water, appear to at least partially set the stage for some of the problems. Causes of pipeline movement include liquefaction of the soil surrounding the pipe, wave induced motions of bottom sediments, scour of material surrounding pipe, and trench sidewall slides. Several points recommended for a contractor to consider when faced with construction of a submarine pipeline were: (1) Look closely at the soil profile presented with bid documents. Borings for design purposes should show the soil types involved. If silts and fine sands are encountered, be wary of liquefaction problems. (2) Closely examine side slopes for trenches to make sure these slopes are stable during the construction period. Side slopes of 1.30 to 1.50 seem desirable. (3) Backfill the trench completely and quickly. Do not, under any circumstances, leave the pipe partially backfilled during periods when storm activity is expected. (4) Remove any mounds of material or fill bottom depressions resulting from construction operations. (5) Perform adequate and frequent bottom surveys to show that the pipe was constructed to proper line and grade and to show that backfill was also properly placed to grade. (6) Consider borings into the backfill material at various stages during construction, particularly just before shutting down for winter. (See also W77-07342) (Humphreys - ISWS)
W77-07349

COMPRESSIBILITY AND STRENGTH OF COMPACTED DREDGINGS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
M. W. Giger, and R. J. Krizek.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 140-153, September 1975. 9 fig, 1 tab, 8 ref. EPA 15070-GCK, R-800948.

Descriptors: *Dredging, *Soil physical properties, *Laboratory tests, *Soil tests, Liquid limits, Soil density, Soil strength, Soil properties, Shear strength, Compaction, Compressibility, Data collections, Plasticity index, Particle size, Uniformity coefficient.
Identifiers: Dredged materials.

Laboratory tests were performed on three samples of polluted dredgings from Riverside Site in Toledo, Ohio, to evaluate their compaction, compressibility, and strength characteristics. Based on these tests, the following conclusions were advanced: (1) Upon compaction at approximately the optimum water content, the dredgings exhibited maximum dry densities of 78 to 86 pounds per cubic foot (pcf) for Standard Proctor compactive effort, 82 to 94 pcf for Modified Proctor compactive effort, and 90 to 100 pcf for Harvard Miniature compactive effort. (2) A comparison between the maximum dry densities of compacted dredgings and the dry densities of hydraulically placed dredgings indicated that the capacity of a given disposal site may be increased substantially by compacting the materials. (3) The compressibility of dredgings is strongly related to dry density, and their load-deformation characteristics are comparable to those of loose sand and significantly larger than those of dense sand, Vicksburg clay, ad Grundite. (4) Compacted dredgings exhibited shear strengths which were substantially higher than the strengths of natural, hydraulically placed materials. (5) The compressibility and strength characteristics of dredgings can be improved considerably by use of compaction procedures. (See also W77-07342) (Humphreys-ISWS)
W77-07350

PERMEABILITY AND DRAINAGE CHARACTERISTICS OF DREDGINGS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
R. J. Krizek, J. S. Jin, and A. M. Salem.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 154-179, Setember 1975. 9 fig, 8 tab, 12 ref. EPA 15070-GGK, R-800948.

Descriptors: *Dredging, *Soil physical properties, *Laboratory tests, *Soil tests, Soil properties, Permeability, Dewatering, Laboratory equipment, Analytical techniques, On-site tests, Drainage, Data collections, Void ratio, Consolidation, Gradation, Soils, Testing procedures.
Identifiers: Dredged materials.

The dewatering of disposal areas composed of polluted maintenance dredgings is directly related to the permeability and drainage characteristics of these materials, but relatively little quantitative data regarding these properties are available. This study synthesized the results determined from several different types of laboratory tests on a variety of different dredgings, and the coefficient of permeability was found to decrease from about 0.0001 to 10 to the minus 9th power cm/sec as the void ratio decreases from approximately 10 to 0.6; data from two field infiltration tests indicated permeability values on the order of 0.0001 to 0.00001 cm/sec for materials that yielded laboratory values of about 10 to the minus 7th power to 10 to the minus 8th power cm/sec. The electro-osmotic coefficient of permeability was found to be on the order of 0.00003 sq cm/volt-sec, which is about one-half the value used for a large variety of soils. A partial vacuum served to increase substantially the dewatering rate as compared to drainage by gravity alone. The overall permeability and drainage characteristics of polluted maintenance dredgings were comparable to those for many fine-grained, organic soils. (See also W77-07342) (Humphreys-ISWS)
W77-07351

CONCEPTS FOR THE RECLAMATION OF DREDGED MATERIAL,
Hittman Associates, Inc., Columbia, Md.
C. W. Mallory, and R. M. Meccia.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 180-214, September 1975. 13 fig, 9 tab.

Descriptors: *Dredging, *Land reclamation, *Settling basins, *Retention, Gradation, Soils, Basins, Slurries, Separation techniques, Analytical techniques, Sands, Gravels, Silts, Clays, Flow rates, Pumping, Dewatering.
Identifiers: Dredged materials.

Over the past two decades, increasing use has been made of containment facilities to store the materials generated in dredging operations. Land disposal of dredged material is expected to increase, and it has been estimated that 7,000 acres of new land will be required each year for the containment of material generated from maintenance dredding operations. Because of intensive land use in areas adjacent to many dredging operations, suitable land disposal sites will be difficult to obtain in the future. Land disposal of dredged material has used conventional containment facilities to separate the solids and provide long-term, if not indefinite, storage of the separated material. In order to reduce the commitment of land for this purpose, investigations were made of alternatives to the use of conventional containment facilities. Concepts for reducing the size and for prolonging the useful life of containment facilities were defined for evaluation purposes. The defined concepts included the separation and reclamation of useful materials, the separation and handling of materials for offsite disposal, and methods for improving the effectiveness of separation and handling processes. (See also W77-07342)(Humphreys-ISWS)
W77-07352

THE RESPONSES OF SOME ESTUARINE ORGANISMS TO SUSPENDED SOLIDS,
Lawler, Matusky and Skelly Engineers, Tappan, N.Y.
J. M. O'Connor, and J. A. Sherk.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 215-234, September 1975. 2 fig, 5 tab, 12 ref.

Descriptors: *Dredging, *Environmental effects, *Estuaries, *Aquatic life, Suspended solids, Laboratory tests, Testing procedures, Fish, Zooplankton, Algae, Phytoplankton, Lethal limit, Fish physiology, Bioindicators.

Outlined in general terms were some of the results of laboratory studies undertaken to assess the impact of suspended solids on estuarine organisms common to the bays and rivers of the Atlatic Coast of North America. Conclusions derived from the studies were summarized as follows: (1) Suspended solids have significant effects on primary productivity, zooplankton feeding rates, fish survival, and the physiological state of fishes. Although the experiments conducted used heavy concentrations of solids, the scope of responses observed was deemed meaningful as a general phenomenon and ma be more pronounced among less hardy species in natural environments. (2) The lethal and sublethal effects of resuspended natural muds were less than those of mineral solids. (3) The effects of suspended sediments on phytoplankton and zooplankton appeared to be related to particle concentration rather than to particle size. The results obtained from tests with phytoplankton were basically those one would expect from reduction in light intensity. (4) Dredging and spoiling operations are capable of producing suspended solids concentrations capable of affecting the natural function of organisms and ecosystems as a whole. It is unlikely that harmful concentrations of suspended solids would persist for a period of time sufficient to induce meaningful lethal or sublethal effects on most communities. (See also W77-07342) (Humphreys-ISWS)
W77-07353

8E. Rock Mechanics and Geology

RECTILINEAR LEADS AND INTERNAL MOTIONS IN THE ICE PACK OF THE WESTERN ARCTIC OCEAN,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 2C.
W77-07373

8F. Concrete

DESIGN OF GRAVITY DAMS, DESIGN MNUAL FOR CONCRETE GRAVITY DAMS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W77-07151

8G. Materials

THE CHIEF DRILLER'S REPORT ON JCCIP,
Christian Organization for Relief and Rehabilitation, New York.
For primary bibliographic entry see Field 8C.
W77-07288

INSTALLATION TIPS ON LARGE SUBMERSIBLES,
General Electric Co., Schenectady, N.Y.
For primary bibliographic entry see Field 8C.
W77-07289

CATHODIC PROJECTION OF BOREHOLE CASING,
M. Unz.
Materials Performance, Vol. 14, No. 10, p 40-47, October, 1975.

Descriptors: *Cathodic protection, *Well casings, *Corrosion, *Corrosion control, Steel pipes, Cement grouting, Resistivity, Electric currents, Electrochemistry, Deep wells.
Identifiers: Galvanic effects, Composite casing, Cathodic current density, Reflected Image Method, Axial voltage gradient.

Outer well casing is subject to intensive corrosion attack from several sources, and because it is difficult to get a uniform coating of hydraulic cement on external casing surfaces, cathodic protection is necessary. By analyzing data from potential profiles, amount of current necessary to achieve maximum protection can be determined. Outer cathode voltage profiles can be readily derived from internal probing tests, and these voltage profiles (known as current density) indicate the actual degrees of protection attained at various depths of a casing string. Numerous examples of computation of voltage potential and application of test systems to both shallow and deep wells are given. (Eberle-NWWA)
W77-07297

NEW RIG CONCEPT USES CONTINUOUS DRILL STRING.
World Oil, Vol. 184, No. 4, p 94-97, March, 1977. 3 fig.

Descriptors: *Rotary drilling, *Drilling equipment.
Identifiers: *Uni-Flex Rig Company(Alberta Canada), Continuous drill string, Downhole motors.

A new idea in drilling rigs, developed by Uni-Flex Rig Company Ltd. of Brooks, Alberta, Canada, has several advantages that allow it to drill up to a 6 1/4 inch hole to 3000 feet at reduced cost. The rig utilizes a continuous string of coiled aluminum pipe which eliminates the drill pipe joining operation and can reduce the drilling crew by two men per shift. A Dyna-Drill positive displacement downhole motor is used with conventional bits at relatively high RPM. A stinger crane replaces the derrick and blocks for hoisting the three drill collars used with the string. An injector runs the pipe in and out of the hole at rates up to 150 ft./min. Penetration rates are comparable to those of conventional rotary rigs, and deviation problems are average. The new rig's limitations at present are low hoisting capacity, necessity of outside services for completing the surface hole, and limited bit selection. To date, the rig has drilled several gas wells in southeastern Alberta and has been used to drill out faulty plugs during a well reabandonment program. (Eberle-NWWA)
W77-07298

NEW LOST CIRCULATION REMEDY IS EASY TO USE.
World Oil, Vol. 184, No. 4, p 76-77, March, 1977. 1 tab.

Descriptors: *Rotary drilling, *Slurries, Drilling fluids.
Identifiers: *Magne-Set, Lost circulation, Well plugs.

A new material has been developed to combat lost circulation problems. A blend of magnesium and other inorganic materials, Magne-Set (developed by Oil Base, Inc., of Houston) is blended into a pill and when pumped into a zone of lost circulation, cures into a solid cement-like plug. Special blending equipment, fluids, and pumps are unnecessary, and setting additives allow the adjustment of setting time from two to seven hours to accommodate specific well needs. After the lost circulation zone is located, drill pipe is positioned above the zone and the Magne-Set slurry is pumped down at a maximum rate. The slurry is either left spotted in the hole or squeezed into the formation. Mud is then conditioned in a similar fashion as for green cement or chloride contamination, and drilling can be resumed after washing and reaming the bottom of the hole. (Eberle-NWWA)
W77-07299

GEOTHERMAL ENERGY: NEEDED, EFFECTIVE HEAT TRANSFER EQUIPMENT,
International Society for Geothermal Engineering, Whittier, Calif.
E. F. Wehlage.
Mechanical Engineering, Vol. 98, No. 8, p 27-33, August, 1976. 10 fig, 20 ref.

Descriptors: *Geothermal studies, *Thermal power plants, *Electric power production, *Energy conversion, *Scaling, Fouling, Corrosion control, Turbines, Generators, Heat exchangers.
Identifiers: Magmamax Geothermal System, Keller Rotating Oscillating Vane Machine, Hutchinson-Holt Process.

Although geothermal heat transfer has been highly successful in a few cases, general results are somewhat discouraging for several reasons. Fouling due to high proportions of dissolved solids in thermal water is an almost universal threat, and in cases where deposition is controlled, corrosion seems to be accelerated. Studies of scaling versus fluid temperature and dissolved gas concentrations may improve the capability to deal with such problems, but a serious data shortage exists at present in this area. The binary cycle concept of geothermal energy conversion is predicated upon effective heat exchange equipment -- by separating raw wellhead fluids from working fluids used to power turbines, deposition problems might be minimized. The 'Magmamax' Geothermal System, the Keller Rotating Oscillating Vane Machine, and the Hutchinson-Holt Process are among the more promising modifications of basic binary cycle concepts under development. Geothermally energized refrigeration processes to bypass the generation of electric power for compression also appears feasible and desirable for various applications. (Eberle-NWWA)
W77-07301

GEOTHERMAL SYSTEMS AND POWER DEVELOPMENT,
Department of Scientific and Industrial Research, Auckland (New Zealand).
For primary bibliographic entry see Field 4B.

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W77-07302

DOWNHOLE MEASUREMENTS THROUGH MODIFIED DRILL PIPE,
Shell Development Co., Houston, Tex. Bellaire Research Center.
E. B. Denison.
Drilling-DCW, Vol. 38, No. 5, p 53-56, March, 1977. 8 fig, 3 ref.

Descriptors: *Drill monitors, *Electrical well logging, *Electronic equipment, *Telemetry, Logging(Recording), Boreholes, Steel pipes, Rotary drilling.
Identifiers: *Drill pipes, Drill collars, Electrical connections.

The ability to continuously monitor downhole parameters while drilling has great utility for safety, logging, borehole surveying, and drilling optimization. The system discussed uses electrical data transmission, which can accommodate a data rate three orders of magnitude greater than any mud pulse scheme and at least one order of magnitude greater than electromagnetic or acoustic systems. Dozens of downhole parameters can be monitored simultaneously. Experimentation with the system in October, 1975, yielded satisfying results in a 600 meter, 114 hour drilling test. Problems with electrical connections were slight, and very little time was lost in recleaning the connections. Among the parameters measured at this time were borehole inclination and magnetic heading, annulus pressure, pipe pressure, temperature, and accelerations along three orthogonal axes. Unlike other techniques, the system does not require a downhole power source. (Eberle-NWWA)
W77-07304

COMPRESSIBILITY AND STRENGTH OF COMPACTED DREDGINGS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-07350

PERMEABILITY AND DRAINAGE CHARACTERISTICS OF DREDGINGS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-07351

8H. Rapid Excavation

THE INFLUENCE OF UNDERWATER EXPLOSION ON FISH, (IN JAPANESE),
S. Sakaguchi, O. Fukuhara, S. Umeyawa, M. Fujiya, and T. Ogawa.
Bulletin of the Nansei Regional Fisheries Research Laboratory, Vol 9, p 33-56, 1976. 14 fig, 2 tab, 2 ref.

Descriptors: *Explosions, *Fishkill, *Fish physiology, Excavation, Bridge construction, Marine fish, Freshwater fish, Carp, Mode of action, Laboratory tests, On-site investigations.
Identifiers: Rockfish, Sebastiscus marmoratus, Instantaneous cap blasting, Borehole blasting, Energy flux density, Underwater explosions.

Common carp, Cyprinus carpio, and rock fish, Sebasticus marmoratus, were examined for damage to internal and external organs following underwater explosions with differing orientations to the fish. Damage was most serious when the explosion was ventral to the fish and leas serious when caudally located. Rupture of the sinus verosus and damage to the liver and kidney were the most common effects. Peak pressure is the usual indicator of explosion strength but this study found damage to fish to be more closely related to the energy flux density. (Katz)
W77-07316

8I. Fisheries Engineering

THE INFLUENCE OF UNDERWATER EXPLOSION ON FISH, (IN JAPANESE),
For primary bibliographic entry see Field 8H.
W77-07316

COLLECTION OF JUVENILE SALMONIDS FROM TURBINE INTAKE GATEWELLS OF MAJOR DAMS IN THE COLUMBIA RIVER SYSTEM,
Bureau of Commercial Fisheries, Seattle, Wash.
For primary bibliographic entry see Field 5C.
W77-07419

THE EFFECTS OF HIGH VACUUM ON FISH,
Arkansas Game and Fish Commission, Lonoke.
For primary bibliographic entry see Field 5C.
W77-07421

EFFECTS OF DAMS ON PACIFIC SALMON AND STEELHEAD TROUT,
National Marine Fisheries Service, Seattle, Wash.
For primary bibliographic entry see Field 5C.
W77-07426

SECOND STATUS REPORT ON ANADROMOUS FISH RUNS OF THE COLUMBIA RIVER,
Oregon Fish Commission, Portland.
For primary bibliographic entry see Field 5C.
W77-07427

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

BIBLIOGRAPHY AND INDEX OF NORTH DAKOTA WATER RESOURCES 1878-1970,
North Dakota Univ., Grand Forks.
For primary bibliographic entry see Field 10C.
W77-07140

10C. Secondary Publication And Distribution

BIBLIOGRAPHY AND INDEX OF NORTH DAKOTA WATER RESOURCES 1878-1970,
North Dakota Univ., Grand Forks.
M. W. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 346, Price codes: A25 in paper copy, A01 in microfiche. North Dakota Water Resources Research Center, Fargo, Research Project Technical Completion Report, No. WI-221-038-76, August, 1976, 570 p. OWRT A-029-NDAK(2). 14-31-0001-5034.

Descriptors: Bibliographies, *Publications, *Water resources, *North Dakota, Documentation, History, Agriculture, Artesian wells, Floods, Flood control, Groundwater, Irrigation, Lakes, Maps, Missouri River, Water supply.

This bibliography is a collection of references relating to water resources in North Dakota from 1878 through 1970. Subject index and author index are included.
W77-07140

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For primary bibliographic entry see Field 5C.
W77-07402

ANNOTATED BIBLIOGRAPHY ON HYDROBIOLOGY AND HYDROCHEMISTRY OF THE KARA KUM CANAL 1955-74, (IN RUSSIAN),
For primary bibliographic entry see Field 2I.
W77-07540

SUBJECT KEYWORD LIST, (ESTUARINE AND COASTAL MARINE SCIENCE),
For primary bibliographic entry see Field 2L.
W77-07564

SNOW AND ICE HYDROLOGY IN THE UNITED STATES--CURRENT STATUS AND FUTURE DIRECTIONS,
National Committee for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-07565

LITERATURE ON ENVIRONMENTAL PROTECTION, MANAGEMENT AND HYGIENE IN SWEDEN 1952-1971: BIBLIOGRAPHY AND ANALYSIS, (IN SWEDISH),
For primary bibliographic entry see Field 6G.
W77-07586

10F. Preparation Of Reviews

PROCEEDINGS, TECHNOLOGY TRANSFER SEMINAR ON HIGH QUALITY EFFLUENTS,
Environmental Protection Service, Ottawa (Ontario). Water Training and Technology Transfer Div.
For primary bibliographic entry see Field 5D.
W77-07330

SNOW AND ICE HYDROLOGY IN THE UNITED STATES--CURRENT STATUS AND FUTURE DIRECTIONS,
National Committee for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 02C.
W77-07565

SUBJECT INDEX

AAR RIVER (SWITZERLAND)
Regional Study of the Upper Basin of the AAR from its Sources to Bern: Profile of Floods of a Given Return Period at any Point on the River (Etude Regionale du Bassin Superieur de L'Aar de ses Sources Jusqu'a Berne: Profile des Crues de Periode Donnee le Long du Cours d'eau).
W77-07358 2E

ABANDONMENT OF WATER RIGHTS
Gilbert V Smith (Loss of Senior Appropriation Rights Through Abandonment, Forfeiture, or Adverse Possession),
W77-07279 6E

ABSORPTION
Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Uptake and Accumulation of the Nickel Ion by Mytilus edulis,
W77-07198 5C

Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

Uptake of Dissolved Ammonium and Nitrate Ion by the Fry of Common Carp, Crucian Carp and Loach from Surrounding Water, (In Japanese),
W77-07314 5C

PCB Contents in the Muscle of Marine Animals Collected in the Sea near Hakodate (In Japanese),
W77-07315 5C

Effect of Nutrient Enrichment on the Heterotrophic Uptake of Organic Solutes by Microorganisms,
W77-07466 5C

Uptake and Retention of Kuwait Crude Oil and Its Effects on Oxygen Uptake by the Soft-Shell Clam, Mya Arenaria,
W77-07506 5C

Water Quality and Aquitard Permeability,
W77-07551 5G

ACARTIA CLAUSI
Study on Respiratory Metabolism Modifications in Acartia clausi (Crustacea: Copepoda) Populations after Passage through the Cooling Circuit of a Power Plant,
W77-07305 5C

ACCRETION
Right to Accretion Built up from One Tract of Land and Extending Laterally in Front of Adjoining Tract Without Being Contiguous Thereto.
W77-07266 6E

ACETIC ANHYDRIDE
How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

ACIDIC WATER
Egg and Larval Survival of White Suckers (Catostomus Commersoni) at Low pH,
W77-07184 5C

ACOUSTICS
Acoustic Measurement of Sediment Transport,
W77-07338 2J

ACUTE TOXICITY
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

ADMINISTRATIVE REGULATIONS
Proposed Toxic Pollutant Effluent Standard for Polychlorinated Biphenyls,
W77-07253 6E

United States V Diamond (Permanent Injunction During Administrative Procedures Justified by Developers Fill of Marshland Without Refuse Act Permit),
W77-07275 6E

ADVERSE POSSESSION
Gilbert V Smith (Loss of Senior Appropriation Rights Through Abandonment, Forfeiture, or Adverse Possession),
W77-07279 6E

AEROBIC BACTERIA
Oil-Oxidizing Bacteria of the River Yenisei, (In Russian),
W77-07532 5C

Bacteriological and Colimetric Examination of the Water Supplied to the Slaughterhouses Situated Near Salvador, Bahia, Brazil, (In Portugese),
W77-07587 5A

AFRICA
The Effect of Soil Moisture on Circulation and Rainfall in a Tropical Model,
W77-07166 2B

Estimating Above and Below Normal Rainfall Periods Over South Africa, 1972-2000,
W77-07170 2B

Utilization of the Results from Representative and Experimental Basins with a View to the Management of Water Resources,
W77-07355 4A

Preliminary Estimates of Production by a Calanoid Copepod in Subtropical Lake Sibaya,
W77-07500 5C

Similarities and Differences in the Chemical Composition of Waters from West, Central, and East Africa,
W77-07510 5A

AGRICULTURAL CHEMICALS
Apparent Potentiation of the Cotton Defoliant DEF by Methyl Parathion in Mosquitofish,
W77-07204 5C

Occurrence and Determination of a Herbicide Benthiocarb in Rivers and Agricultural Drainages,
W77-07361 5A

AGRICULTURAL DRAINAGES
Occurrence and Determination of a Herbicide Benthiocarb in Rivers and Agricultural Drainages,
W77-07361 5A

AGRICULTURAL RUNOFF
Application of Nitrogen-Isotope Studies to Hydrology and Hydrogeology--Analysis of the Peculiar Case of the Melarchez Basin (Seine-et-Marne, France) (Application de L'Etude Isotopique de L'Azote en Hydrologie et en Hydrogeologie--Analyse des Resultats Obtenus Sur un Exemple Precis: Le Bassin de Melarchez (Seine-et-Marne, France)),
W77-07154 5B

Control of Agricultural Water Pollution: A Continuing Regulatory Dilema,
W77-07233 5G

The Oligochaete Communities of a Lowland Stream and Their Value as Indicators of Organic Pollution,
W77-07307 5C

AIR POLLUTION
Legal Decisions and Opinions in Pollution Cases,
W77-07436 5G

AIR TEMPERATURE
Evaporation of Wastewater from Mountain Cabins,
W77-07284 5E

ALABAMA
Physical Environment Atlas of Coastal Alabama,
W77-07322 2L

ALASKA
Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

Wind and Current Patterns in an Arctic Coast Lagoon,
W77-07323 2L

Life History Notes for a Population of Slimy Sculpin (Cottus Cognatus) in an Alaskan Arctic Stream,
W77-07393 5C

Morbidity and Mortality of Marine Mammals,
W77-07405 6G

Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

Trophic Relationships Among Ice Inhabiting Phocid Seals,
W77-07407 6G

Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

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ALASKA

A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska,
W77-07411 6G

Zooplankton and Micronekton Studies in the Bering - Chukchi/Beaufort Seas,
W77-07412 6G

Phytoplankton Studies in the Bering Sea,
W77-07413 6G

Beaufort Sea Plankton Studies,
W77-07414 6G

Surface Water Supply of the United States, 1966-70--Part 15. Alaska.
W77-07493 7C

ALBERTA

A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

ALGAE

Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

Diphenamid Removal from Water and Metabolism by Aquatic Plants,
W77-07193 5C

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

Primary Production and Biomass of Algae Populations in an Oligotrophic Lake in the French Massif Central, (In French),
W77-07398 5C

Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

Synergistic Effects of Phosphate and Manganese on Growth of Lake Superior Algae,
W77-07448 5C

Changes in Phytoplankton Species Composition Since 1894 in Two Lakes in East-Holstein, Germany,
W77-07501 5C

Algal Response to Nutrient Inputs in Some Iowa Lakes,
W77-07515 5C

Phytomicrobenthos of the Kurtli Reservoir, (In Russian),
W77-07596 5C

Study of Bacteria Associated with the Rearing of Larvae of Marine Bivalves, (In French),
W77-07599 5C

ALGAL CONTROL

Wind Control of Algae Growth in Eutrophic Lakes,
W77-07497 5G

ALGAL CULTURE

Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

ALLIGATOR WEED

Application of Vascular Aquatic Plants for Pollution Removal, Energy and Food Production in a Biological System,
W77-07474 5D

ALLUVIAL CHANNELS

Mathematical Modeling of Sedimentation Transients in Sand-Bed Channels,
W77-07354 2J

ALPINE LAKES

The Vertical Distribution of Plankton Rotifers in a Small Alpine Lake with a Sharp Oxygen Depletion (Lunzer Obersee),
W77-07456 5C

AMMONIA

Experimental Study of the Nitrogen Excretion of Bass (Dicentrarchus labrax) during Growth. I. Effects of Temperature and Weight on the Excretion of Ammonia and Urea,
W77-07313 5C

Uptake of Dissolved Ammonium and Nitrate Ion by the Fry of Common Carp, Crucian Carp and Loach from Surrounding Water, (In Japanese),
W77-07314 5C

The Analysis of Ammonia in Polluted Sea Water,
W77-07362 5A

AMMONIUM ANALYSIS

The Analysis of Ammonia in Polluted Sea Water,
W77-07362 5A

AMMONIUM COMPOUNDS

The Analysis of Ammonia in Polluted Sea Water,
W77-07362 5A

AMMONIUM CONTENT

The Analysis of Ammonia in Polluted Sea Water,
W77-07362 5A

AMMONIUM NITROGEN

The Changes in Inorganic Nitrogen Concentration of Drinking Water from Wells Over a Two Year Period in Ani-Machi, Ibaraki Prefecture, (In Japanese),
W77-07570 5B

AMPHIPODS

Survival and Reproduction of Gammarus spp. (Amphipoda) Following Short-Term Exposure to Elevated Temperatures,
W77-07125 5C

AMYLOLYSIS ACTIVITY

Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

ANADROMOUS FISH

Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

ANALOG MODELS

Analog-Model Analysis of Regional Three-Dimensional Flow in the Ground-Water Reservoir of Long Island, New York,
W77-07479 2F

ANALYTICAL TECHNIQUES

Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

Design of Gravity Dams, Design Mnual for Concrete Gravity Dams,
W77-07151 8A

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

Water Quality and Chemical Models,
W77-07246 5C

The Analysis of Ammonia in Polluted Sea Water,
W77-07362 5A

Tripton Sedimentation in Eutrophic Lakes--Sample Correction for the Resuspended Matter,
W77-07463 5C

An Investigation of Colloidal Organic Particles Isolated from Different Populations of Bivalves,
W77-07498 5A

ANIMAL PATHOLOGY

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

ANNUAL FLOWS

Streamflow Regionalization in British Columbia, No. 2, Regression of Mean Annual Flows on Physiographic Parameters,
W77-07434 2E

ANTARCTIC

The Lentic and Lotic Freshwater Types of Marion Island (Sub-Antarctic): A Limnological Study,
W77-07514 5C

APPROPRIATION

Olson V Bedke (Failure of Tenant to Put Water on Leased Land to Beneficial Use).
W77-07272 6E

APPROXIMATION METHOD

Solutions to Green-Ampt Infiltration Equation,
W77-07553 4A

AQUARIA

Influence of an Ozonisation Plant on the Bacterial Content in Water of a Demonstration Aquarium,
W77-07311 5C

AQUATIC BACTERIA

Bacteriological Studies in the Cienaga Grande (Great Marsh) of Santa Maria, Columbia, (In Spanish),
W77-07512 5C

AQUATIC FUNGI
Studies on Fungal Propagules in the Weser Estuary (German Bight): I. Quantitative Data 1974, (In German),
W77-07583 5C

Data 1973/1974 Regarding Hydrography and Water Quality in the Weser Estuary, Germany, (In German),
W77-07584 5C

AQUATIC LIFE
The Responses of Some Estuarine Organisms to Suspended Solids,
W77-07353 8D

AQUATIC MICROORGANISMS
Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

AQUATIC PLANTS
Diphenamid Removal from Water and Metabolism by Aquatic Plants,
W77-07193 5C

Application of Vascular Aquatic Plants for Pollution Removal, Energy and Food Production in a Biological System,
W77-07474 5D

The Release of Dissolved Organic Carbon from Submersed Aquatic Macrophytes: Diel, Seasonal and Community Relationships,
W77-07516 5C

AQUATIC WEED CONTROL
Lake Restoration Through Mechanical Harvesting of Aquatic Vegetation,
W77-07451 5G

AQUEOUS SOLUTIONS
Electrolytic Treatment of Chromate and Cyanide Wastes with Packed Bipolar Cell, (In Japanese),
W77-07211 5D

AQUICULTURE
Comparison of Artificial and Natural Sea Water as Culture Media for Juvenile Lobsters,
W77-07118 5C

Use of Quicklime to Increase Oyster Seed Production,
W77-07122 5C

Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

AQUIFER CHARACTERISTICS
Analog-Model Analysis of Regional Three-Dimensional Flow in the Ground-Water Reservoir of Long Island, New York,
W77-07479 2F

Major Aquifers in Deuel and Hamlin Counties, South Dakota,
W77-07483 4B

AQUIFER TESTING
Type Curves for Analysis of Pump Tests in Leaky Strip Aquifers,
W77-07145 2F

AQUIFERS
Interconnection of Surface and Underground Water Resources in Southeast Durham,
W77-07149 4B

Specific Yield Determinations from a Consolidated Sandstone Aquifer,
W77-07153 2F

Calculation of the Leaky Aquifer Function,
W77-07156 2F

Management Model for Ground Water Development,
W77-07529 4B

AQUITARDS
Finite-Element Analysis of Groundwater Flow in Multiaquifer Systems, I. The Behavior of Hydrological Properties in an Aquitard While Being Pumped,
W77-07148 2F

Water Quality and Aquitard Permeability,
W77-07551 5G

ARCTIC
Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

Life History Notes for a Population of Slimy Sculpin (Cottus Cognatus) in an Alaskan Arctic Stream,
W77-07393 5C

ARCTIC OCEAN
Wind and Current Patterns in an Arctic Coast Lagoon,
W77-07323 2L

Rectilinear Leads and Internal Motions in the Ice Pack of the Western Arctic Ocean,
W77-07373 2C

AREAL DISTRIBUTION
Areal Distribution and Stratigraphy of Diatoms in the Sediments of Lake Sallie, Minnesota,
W77-07481 5C

AREIAL PHOTOGRAPHY
Test of Landsat-Based Urban Hydrologic Modeling,
W77-07528 6A

ARGENTINA
Reconnaissance of Sediment Transport and Channel Morphology in the Lower Rio Bermejo Basin, Argentina--With a Section on Reconnaissance of the Lower Rio Pilcomayo Basin, Argentina and Paraguay,
W77-07490 2J

ARGOPECTEN IRRADIANS
Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

ARIZONA
Effects of the Catastrophic Flood of December 1966, North Rim Area, Eastern Grand Canyon, Arizona,
W77-07480 2E

AROCLORS
Proposed Toxic Pollutant Effluent Standard for Polychlorinated Biphenyls,
W77-07253 6E

AROMATIC CONTENT
Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms-II. Lethal Concentrations of Oil-Spill Emulsifier Components for Marine Phytoplankton, (In Japanese),
W77-07182 5C

ARTESIAN WELLS
Artesian Wells and Storage Reservoirs, and Works Connected Therewith.
W77-07263 6E

ARTHROBACTER-SP
Oil-Oxidizing Bacteria of the River Yenisei, (In Russian),
W77-07532 5C

ARTIFICIAL RECHARGE
Consumptive Use of Ground Water,
W77-07257 6E

ARTIFICIAL SUBSTRATES
Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

Use of Quicklime to Increase Oyster Seed Production,
W77-07122 5C

ASSESSMENT
Modeling Multiple-Use in Natural Areas: Part I -- The Basic Formulation,
W77-07530 6A

ASTERIAS
Effects of Combination of Temperature and Hydrostatic Pressure on Asterias rubens,
W77-07308 5C

ASWAN HIGH DAM
Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

ATLANTIC MENHADEN
Gas Bubble Disease Mortality of Atlantic Menhaden at Pilgrim Nuclear Power Station, April, 1975,
W77-07429 5C

ATLANTIC SALMON
Environmental Dependence of Manganese and Zinc in the Scales of Atlantic Salmon, Salmo Salar (L) and Brown Trout, Salmo Trutta (L),
W77-07203 5C

Effects of Pressure on Survival of Six Species of Fish,
W77-07424 5C

ATMOSPHERIC GAS
Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

ATMOSPHERIC GASES
Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

ATOMIC ABSORPTION ANALYSIS
Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

ATOMIC ABSORPTION SPECTROMETRY
Heavy Metals (Fe, Mn, Cd, Cr, Cu, Pb and Zn) in the Pelagic Zone of Lake Constance (Obersee and Untersee) and the Greifensee, (In German),
W77-07580 5A

ATP
Improved Method for the Determination of ATP in Lakewater, (In German),
W77-07578 5A

AUDUBON SOCIETY
The Environmentally Concerned Citizen: Some Correlates,
W77-07438 6G

AUSTRALIA
Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

AUTOMATIC CONTROL
Inline Sensor Tightens Control on Sludge Consistency to Within 1.4-1.5% Solids,
W77-07214 5D

AUTOMATION
Automatic Monitoring of Soil Moisture Conditions in a Hillslope Spur and Hollow,
W77-07146 2G

AVERAGE FLOW
Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources,
W77-07192 5C

Streamflow Regionalization in British Columbia, No. 2, Regression of Mean Annual Flows on Physiographic Parameters,
W77-07434 2E

AVOIDANCE RESPONSE
Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

AVULSION
Subsidence: Settling Down Within the Laws of Accretion, Reliction, Erosion, and Submergence,
W77-07238 6E

BABINE LAKE (BRITISH COLUMBIA)
Upwelling in a Model of an Intermontane Lake,
W77-07469 5B

BACTERIA
Influence of an Ozonisation Plant on the Bacterial Content in Water of a Demonstration Aquarium,
W77-07311 5C

Observations on Bacteriological Conditions in the Upper Great Lakes 1968-1974,
W77-07340 5A

A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

Studies on Fungal Propagules in the Weser Estuary (German Bight): I. Quantitative Data 1974, (In German),
W77-07583 5C

Data 1973/1974 Regarding Hydrography and Water Quality in the Weser Estuary, Germany, (In German),
W77-07584 5C

Bacteriologic Analysis in the Arosa, Vigo and Pontevedra Estuaries, (In Spanish),
W77-07589 5A

Self-Purification in the Coastal Waters of the Black Sea, (In Russian),
W77-07592 5C

Studies on Virus Inactivation by Chlorine During Water Disinfection, (In German),
W77-07595 5F

Study of Bacteria Associated with the Rearing of Larvae of Marine Bivalves, (In French),
W77-07599 5C

BACTERIOLOGY
Bacteriology of Chesapeake Bay Surface Waters,
W77-07382 5C

Bacteriological Studies in the Cienaga Grande (Great Marsh) of Santa Maria, Columbia, (In Spanish),
W77-07512 5C

Bacteriological and Colimetric Examination of the Water Supplied to the Slaughterhouses Situated Near Salvador, Bahia, Brazil, (In Portugese),
W77-07587 5A

Bacteriologic Analysis in the Arosa, Vigo and Pontevedra Estuaries, (In Spanish),
W77-07589 5A

Bacteriological Quality of Poultry-Farms' Water in Minas Gerais State, Brazil: 1973, (In Portugese),
W77-07594 5F

BACTERIOPHAGE
Enterovirus and Bacteriophage Inactivation in Subsurface Waters and Translocation in Soil,
W77-07283 5B

BAILING
The Cable Tool Drilling Machine, Part III,
W77-07286 8C

BAJA CALIFORNIA
Red Tide in the Upwelling Region of Baja California,
W77-07169 5C

Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

BALTIC LAKES
Studies on the Typology of Baltic Lakes with Different States of Eutrophication, (In German),
W77-07576 5B

BALTIC SEA
Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

BARRIERS
The Response of an Estuary to the Closure of a Mobile Barrier; Richmond Barrier on the Upper Thames Estuary,
W77-07366 2L

BASELINE STUDIES
Physical Environment Atlas of Coastal Alabama,
W77-07322 2L

Morbidity and Mortality of Marine Mammals,
W77-07405 6G

Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

Trophic Relationships Among Ice Inhabiting Phocid Seals,
W77-07407 6G

Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska,
W77-07411 6G

Zooplankton and Micronekton Studies in the Bering - Chukchi/Beaufort Seas,
W77-07412 6G

Phytoplankton Studies in the Bering Sea,
W77-07413 6G

Beaufort Sea Plankton Studies,
W77-07414 6G

Changes in Phytoplankton Species Composition Since 1894 in Two Lakes in East-Holstein, Germany,
W77-07501 5C

BASS
Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

Experimental Study of the Nitrogen Excretion of Bass (Dicentrarchus labrax) during Growth. I. Effects of Temperature and Weight on the Excretion of Ammonia and Urea,
W77-07313 5C

BASSETTE CREEK FLOOD CONTROL COMMISSION (MINN)
Public Participation in Water Resource Development,
W77-07526 6B

BAY OF FUNDY
Predicting Changes in Tidal Regime: The Open Boundary Problem,
W77-07370 8B

BAY OF QUINTE (LAKE ONTARIO)
Effect of Nutrient Enrichment on the Heterotrophic Uptake of Organic Solutes by Microorganisms,
W77-07466 5C

BAY SCALLOP
Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

BAYESIAN DECISION APPROACH
Economic Value of Low Flow Data,
W77-07537 5D

BAYESIAN DECISION THEORY
Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

BEACH EROSION
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-07549 2H

BEACHES
Property-Coastal Shores-Private Property Rights Upheld over Claimed Public Right to Recreational use of Beach-Implied Dedication, Easement by Prescription, Public Trust Through Custom and Grant, and Doctrine of Submergence not Applicable. Department of Natural Resources V. Mayor and Council of Ocean City, 274 Md. 1, 332 A.2d 630 (1975).
W77-07239 6E

BEAUFORT SEA
The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

Beaufort Sea Plankton Studies,
W77-07414 6G

BEDS
Encroachments on Navigable Lake.
W77-07264 6E

BEHAVIOR
Attainment of the Final Thermal Preferendum in Brown Bullheads Acclimated to Different Temperatures,
W77-07381 5C

BELGIUM
Simulation of a Series of Daily Areal Mean Rainfalls for a Basin Using Rainfall Observations at a Reference Station Located Outside the Basin,
W77-07356 2B

BELGIUM (BRUSSELS AREA)
Ecological Studies of the Brussels Urban Ecosystem: Contribution 8. First Survey of the Hydrobiology of the Woluwe Valley in Brussels, (In French),
W77-07292 5C

BENEFICIAL USE
Olson V Bedke (Failure of Tenant to Put Water on Leased Land to Beneficial Use).
W77-07272 6E

BENEFIT MAXIMIZATION
Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

BENTHIC FAUNA
Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

Experimental Sediment Addition Studies on the Harris River, N.W.T., Canada: The Effect on Macroinvertebrate Drift,
W77-07455 5C

Aspects of Zoobenthos Ecology of the Mackenzie Delta, N.W.T.,
W77-07499 5C

BENTHICARB
Study on the Herbicidal Properties of Benthiocarb; Factors Affecting Herbicidal Activity and Its Behavior in Soil, (In Japanese),
W77-07387 5B

BENTHIOCARB
Occurrence and Determination of a Herbicide Benthiocarb in Rivers and Agricultural Drainages,
W77-07361 5A

BENTHIOCARB DETERMINATION
Occurrence and Determination of a Herbicide Benthiocarb in Rivers and Agricultural Drainages,
W77-07361 5A

BENTHOS
The Distribution and Ecology of Common Marine and Estuarine Gastropods in the Delaware Bay Area,
W77-07185 5C

Composition and Dynamics of the Bottom Animals in the Littoral Zone of Dojran Lake, Macedonia,
W77-07457 5C

Phytomicrobenthos of the Kurtli Reservoir, (In Russian),
W77-07596 5C

BENZENE
Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

Hygienic Standardization of Disodium Salts of Meta-and Para-Diisopropylbenzene in Water Bodies, (In Russian),
W77-07590 5C

BERING SEA
The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

Phytoplankton Studies in the Bering Sea,
W77-07413 6G

BIBLIOGRAPHIES
A Bibliography of Soviet Literature on Freshwater Hydrobiology and Related Problems for 1975: Part 21, (In Russian),
W77-07402 5C

Annotated Bibliography on Hydrobiology and Hydrochemistry of the Kara Kum Canal 1955-74, (In Russian),
W77-07540 2I

Snow and Ice Hydrology in the United States--Current Status and Future Directions,
W77-07565 2C

Literature on Environmental Protection, Management and Hygiene in Sweden 1952-1971: Bibliography and Analysis, (In Swedish),
W77-07586 6G

BIOACCUMULATION
The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Variations in the Lead, Zinc and Calcium Content of Dendrobaena rubida (Oligochaeta) in a Base Metal Mining Area,
W77-07135 5C

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

BIOASSAY
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms-II. Lethal Concentrations of Oil-Spill Emulsifier Components for Marine Phytoplankton, (In Japanese),
W77-07182 5C

Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

BIOASSAYS
Experiments on the Resistance of Fish to Rapid Increase in Hydrostatic Pressure,
W77-07416 5C

BIOCHEMICAL OXYGEN DEMAND
Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

LIBRARY U. OF I. URBANA-CHAMPAIGN

BIOCHEMICAL OXYGEN DEMAND

Sediment Respiration in Six Italian Lakes in Different Trophic Conditions,
W77-07461 5C

BIOCHEMISTRY
The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

Diphenamid Removal from Water and Metabolism by Aquatic Plants,
W77-07193 5C

BIOCONCENTRATION
Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

Dynamics of Storage of Organochlorine Pollutants in Herring Gulls,
W77-07127 5C

Variations in the Lead, Zinc and Calcium Content of Dendrobaena rubida (Oligochaeta) in a Base Metal Mining Area,
W77-07135 5C

BIODEGRADATION
Role of Mussels Mytilus edulis in Removal Petroleum Products from Seawater (Under Experimental Conditions),
W77-07116 5C

The Rate of Microbial Degradation of Oil in a Beach Gravel Column,
W77-07138 5B

BIOINDICATORS
An Industrial View of Biological Monitoring,
W77-07126 5A

Quest for an Index of Community Structure Sensitive to Water Pollution,
W77-07136 5A

The Differential Use of Chironomidae and Ceratopogonidae (Diptera) in the Monitoring of Various Aquatic Wastes,
W77-07282 5A

The Oligochaete Communities of a Lowland Stream and Their Value as Indicators of Organic Pollution,
W77-07307 5C

Qualitative and Quantitative Studies on the Meiofauna of a Tropical Fresh Water Stream Subject to Tidal Influence, (In Italian),
W77-07390 5C

BIOLOGICAL COMMUNITIES
Some Effects of Channelization on the Fishes and Invertebrates of Rush Creek, Modoc County, California,
W77-07109 5C

Seasonal Changes of Invertebrate Populations in the Polluted River Medlock,
W77-07121 5C

Survival of Mayfly Larvae Under Mine Acid Conditions,
W77-07128 5C

Subtidal and Intertidal Marine Fouling on Artificial Substrata in Northern Puget Sound, Washington,
W77-07201 5C

The Oligochaete Communities of a Lowland Stream and Their Value as Indicators of Organic Pollution,
W77-07307 5C

The Structure of Phytoplankton Associations in Lake Tahoe (California-Nevada),
W77-07473 5C

Changes in Phytoplankton Species Composition Since 1894 in Two Lakes in East-Holstein, Germany,
W77-07501 5C

BIOLOGICAL MONITORING
An Industrial View of Biological Monitoring,
W77-07126 5A

BIOMASS
Some Effects of Channelization on the Fishes and Invertebrates of Rush Creek, Modoc County, California,
W77-07109 5C

Planktonic Infusoria in Two Lakes of the Gorki Oblast, (In Russian),
W77-07234 5C

The Effect of Collector Discharge Water from Rice Fields on the Zooplankton of Some Kuban Estuaries, (In Russian),
W77-07331 5C

Primary Production and Biomass of Algae Populations in an Oligotrophic Lake in the French Massif Central, (In French),
W77-07398 5C

The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

Preliminary Investigations on Bivalves Bivalvia of the Dam Reservoir at Goczalkowice,
W77-07440 5C

Sub-Thermocline Biomass Concentration Detected by Transmissometer in Lake Superior,
W77-07447 5C

Population Changes in the Aquatic Fauna Inhabiting the Bladderwort, Utricularia Flexuosa Vahl., in a Tropical Swamp, Tasek Bera, Malaysia,
W77-07465 5C

The Role of Phosphate in Eutrophication. Stimulation of Plankton Growth and Residence Times of Inorganic Phosphate in Lake Kinneret Water,
W77-07517 5C

Satellite Observations of Water Quality,
W77-07554 5A

BIRDS
Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

BITTER PANICUM
Dune Stabilization with Panicum amarum Along the North Carolina Coast,
W77-07327 2L

BIVALVES
Preliminary Investigations on Bivalves Bivalvia of the Dam Reservoir at Goczalkowice,
W77-07440 5C

BIVALVES (MARINE)
Study of Bacteria Associated with the Rearing of Larvae of Marine Bivalves, (In French),
W77-07599 5C

BLACK SEA
Self-Purification in the Coastal Waters of the Black Sea, (In Russian),
W77-07592 5C

BLEACHING WASTES
An Ozone Reactor for Color Removal from Pulp Bleachery Wastes,
W77-07216 5D

Great Lakes Paper Launches First Closed-Cycle Kraft Pulp Mill.
W77-07218 5D

BLUEGILL SUNFISH
The Effects of High Vacuum on Fish,
W77-07421 5C

BOATING REGULATIONS
Amend the Federal Boat Safety Act of 1971 (Hearings on S. 3214 to Declare Certain Waters of New Hampshire to Be Non-navigable for Certain Purposes).
W77-07255 6E

BOGS
Observations on a Peat Bog's Ability to Withstand Increasing Public Pressure,
W77-07139 5C

BOTTOM SAMPLING
Surber Sampling in Deep Water for Bottom Organisms,
W77-07199 7B

BOTTOM SEDIMENTS
Distribution Thickness and Certain Physical and Chemical Properties of Bottom Sediments in the Kiev Reservoir, (In Russian),
W77-07321 2J

Composition and Dynamics of the Bottom Animals in the Littoral Zone of Dojran Lake, Macedonia,
W77-07457 5C

Effect of Organic Acids on Experimental Manganese Isolation from Bottom Sediments, (In Russian),
W77-07597 5B

BOUNDARIES (PROPERTY)
Subsidence: Settling Down Within the Laws of Accretion, Reliction, Erosion, and Submergence,
W77-07238 6E

Right to Accretion Built up from One Tract of Land and Extending Laterally in Front of Adjoining Tract Without Being Contiguous Thereto.
W77-07266 6E

BOUNDARIES (SURFACES)
Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

BOUNDARY LAYERS
Free Flow Immediately Below Sluice Gates,
W77-07161 8B

BOWERBANKIA GRACILIS
Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

BRAZIL (MINAS GERAIS)
Bacteriological Quality of Poultry-Farms' Water in Minas Gerais State, Brazil: 1973, (In Portugese),
W77-07594 5F

BRAZIL (NORTHEAST REGION)
Dynamics of Climatic Hazards in Northeast Brazil,
W77-07167 2B

BREAM PARASITES
Comparative Characteristics of the Parasite Fauna of Bream in Lakes Dusios, Obelijos, Salvantu and Galstas, Which Have Different Thermal Regimes, (In Russian),
W77-07312 2H

BRITISH COLUMBIA
Streamflow Regionalization in British Columbia, No. 2, Regression of Mean Annual Flows on Physiographic Parameters,
W77-07434 2E

Limitations of Single Water Samples in Representing Mean Water Quality 1. Thompson River at Shaw Spring, British Columbia,
W77-07563 5A

BROWN TROUT
Environmental Dependence of Manganese and Zinc in the Scales of Atlantic Salmon, Salmo Salar (L) and Brown Trout, Salmo Trutta (L),
W77-07203 5C

Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

BRUSH FIRES
Deposition of Mineral Nitrogen by Rain in the Lamto Savanna, (In French),
W77-07574 5B

BULGARIA
The Ciliates of Two Bulgarian Tributaries of the Danube which are Polluted: The Rivers Vit and Ossam, (In French),
W77-07573 5B

BULLHEADS
Attainment of the Final Thermal Preferendum in Brown Bullheads Acclimated to Different Temperatures,
W77-07381 5C

BURDEN OF PROOF (LEGAL)
Legal Decisions and Opinions in Pollution Cases,
W77-07436 5G

BURNING
Fire Effects on Water Supply, Floods, and Sedimentation,
W77-07318 4C

Deposition of Mineral Nitrogen by Rain in the Lamto Savanna, (In French),
W77-07574 5B

CABLE TOOL DRILLING EQUIPMENT
The Cable Tool Drilling Machine, Part III,
W77-07286 8C

The Cable Tool Drilling Machine, Part IV,
W77-07287 8C

CADMIUM
The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

CADMIUM CHLORIDE
Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

CAGE CULTURE (CATFISH)
Cage Culture of Channel Catfish in a Heated Effluent from a Power Plant, Thomas Hill Reservoir,
W77-07101 5C

CALCIUM
In Vitro Effect of Organic Nitrogen and Potassium Additions on Nitrogen Mineralization and on Exchanges Between the Mud and Water of a Pond, (In French),
W77-07575 5B

CALCIUM CARBONATE
Calcium Carbonate in the Revomal of Iron and Lead from Dilute Waste Water,
W77-07208 5D

Nitrogen, Phosphorus, Particulate and Colloidal Carbon Content of Sedimenting Seston of a Hard-Water Lake,
W77-07441 5C

Calculation of Calcium Carbonate-Carbon Dioxide Equilibrium in Water and Mixtures of Water,
W77-07513 5A

CALCIUM COMPOUNDS
Use of Quicklime to Increase Oyster Seed Production,
W77-07122 5C

CALCIUM OXIDE
Use of Quicklime to Increase Oyster Seed Production,
W77-07122 5C

CALIFORNIA
Some Effects of Channelization on the Fishes and Invertebrates of Rush Creek, Modoc County, California,
W77-07109 5C

The Feasibility of a Water Importation Project for South Florida,
W77-07259 6E

Aspects of the Life History of Tresus Nuttallii in Elkhorn Slough,
W77-07388 2L

Chemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07487 2K

Convective Heat Flow from Hot Springs in the Long Valley Caldera, Mono County, California,
W77-07488 2K

Geochemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07489 2K

Water Resources Data for California, Water Year 1975--Volume 1. Colorado River Basin, Southern Great Basin from Mexican Border to Mono Lake Basin, and Pacific Slope Basins from Tijuana River to Santa Maria River.
W77-07491 7C

Water Resources Data for California, Water Year 1975--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W77-07492 7C

CANADA
Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

Fifty Million Dollars Is a Lot of Fish,
W77-07219 5D

Proceedings of the Annual Conference, April 20-23, 1975, Toronto, Ontario,
W77-07329 5D

Public Participation Techniques and Methodologies: A resume,
W77-07332 6B

Wastewater and Sludge Control in the Canadian Metal Finishing Industry, Segment Including Chemical, Electrolytic Treatment; Electrochemical Machining and Polishing; Cyanide Hardening,
W77-07333 5D

Status Report on Abatement of Water Pollution from the Canadian Petroleum Refining Industry - 1975,
W77-07334 5G

Hydrology Research Division, Annual Progress Reports and Short Research Notes 1975-76.
W77-07336 6E

Land Application of Digested Sludge Under Adverse Conditions.
W77-07337 5D

Hydrogeological Applications of Earth Resources Technology Satellite Landsat 1 Imagery,
W77-07339 7B

Review of Treatment Technology in the Fruit and Vegetable Processing Industry in Canada.
W77-07341 5D

LIBRARY U. OF I. URBANA-CHAMPAIGN

CANADA

Streamflow Regionalization in British Columbia, No. 2, Regression of Mean Annual Flows on Physiographic Parameters,
W77-07434 2E

A Model of the Phosphorus Cycle and Phytoplankton Growth in Skaha Lake, British Columbia, Canada,
W77-07445 5C

Predicting the Impacts of Phosphorus Management Policies on the Eutrophication of Skaha Lake, British Columbia, Canada,
W77-07446 5C

Lake Restoration Through Mechanical Harvesting of Aquatic Vegetation,
W77-07451 5G

Comparison of Primary Productivity (14C) per Unit Biomass Between Phytoplankton and Periphyton in the Ottawa River Near Ottawa, Canada,
W77-07454 5C

Experimental Sediment Addition Studies on the Harris River, N.W.T., Canada: The Effect on Macroinvertebrate Drift,
W77-07455 5C

Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

Upwelling in a Model of an Intermontane Lake,
W77-07469 5B

Aspects of Zoobenthos Ecology of the Mackenzie Delta, N.W.T.,
W77-07499 5C

Uptake and Retention of Kuwait Crude Oil and Its Effects on Oxygen Uptake by the Soft-Shell Clam, Mya Arenaria,
W77-07506 5C

Evaluating Alternative Levels of Water and Sanitation Service for Communities in the Northwest Territories,
W77-07557 6A

Vacuum Sewer Systems and Their Possible Canadian Applications,
W77-07558 5D

A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

Limitations of Single Water Samples in Representing Mean Water Quality 1. Thompson River at Shaw Spring, British Columbia,
W77-07563 5A

CANADARAGO LAKE (NY)

Role of Oligochaetes in the Circulation of Water and Solutes Across the Mud-Water Interface,
W77-07508 5C

CAPACITY EXPANSION

Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

CAPILLARY ACTION

Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

CARBAMATE PESTICIDES

Study on the Herbicidal Properties of Benthiocarb; Factors Affecting Herbicidal Activity and Its Behavior in Soil, (In Japanese),
W77-07387 5B

CARBON

The Utilization of Dissolved Free Amino Acids by Estuarine Microorganisms,
W77-07117 5C

Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

Phosphorus and Carbon Distributions in a Polluted Coastal Environment,
W77-07368 5B

Annual Contribution of Carbon, Nitrogen and Phosphorus by Migrant Canada Geese to a Hardwater Lake,
W77-07505 5C

CARBON CYCLE

An Organic Carbon Budget for an Oligotrophic Lake In New Hampshire, U.S.A.,
W77-07470 5C

The Release of Dissolved Organic Carbon from Submersed Aquatic Macrophytes: Diel, Seasonal and Community Relationships,
W77-07516 5C

CARBON DIOXIDE

Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

Dynamics of O2 and CO2 Exchange, Photosynthesis, and Respiration in Rivers from Time-Delayed Correlations with Ideal Sunlight,
W77-07364 5C

Calculation of Calcium Carbonate-Carbon Dioxide Equilibrium in Water and Mixtures of Water,
W77-07513 5A

CAREX-ROSTRATA

Macrophytes and Phosphorus in Lake Andsjon, Central Sweden, (In Swedish),
W77-07582 5C

CARP

Uptake of Dissolved Ammonium and Nitrate Ion by the Fry of Common Carp, Crucian Carp and Loach from Surrounding Water, (In Japanese),
W77-07314 5C

CATALYTIC OXIDATION

Dyehouse Water Treatment with Catalytic Oxidation.
W77-07221 5D

CATHODIC PROTECTION

Cathodic Projection of Borehole Casing,
W77-07297 8G

CATION EXCHANGE

Study of the State of Water on the Surface of H+, NA+, MG2+ Saturated Kaolinite by the NMR Method, (In Russian),
W77-07241 2G

CESTODES

Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

CETRARIA

Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

CHANNEL CATFISH

Cage Culture of Channel Catfish in a Heated Effluent from a Power Plant, Thomas Hill Reservoir,
W77-07101 5C

CHANNEL MORPHOLOGY

Reconnaissance of Sediment Transport and Channel Morphology in the Lower Rio Bermejo Basin, Argentina--With a Section on Reconnaissance of the Lower Rio Pilcomayo Basin, Argentina and Paraguay,
W77-07490 2J

Techniques for Estimating Flow Characteristics of Wyoming Streams,
W77-07495 4A

CHANNELING

Some Effects of Channelization on the Fishes and Invertebrates of Rush Creek, Modoc County, California,
W77-07109 5C

CHELATION

The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

CHEMCONTROL

Outbreak of Chironomid Midge in a Polluted River and the Chemical Control of the Larvae, (In Japanese),
W77-07585 5G

CHEMICAL ANALYSIS

Residues of 3-trifluoromethyl-4-nitrophenol (TFM) Undetected in Lake Trout and Chinook Salmon from the Upper Great Lakes,
W77-07187 5A

The Analysis of Ammonia in Polluted Sea Water,
W77-07362 5A

Chemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07487 2K

Geochemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07489 2K

CHEMICAL OXYGEN DEMAND

Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

CHEMICAL PROPERTIES

A Survey of the Physical and Chemical Limnology of Lake Titicaca,
W77-07460 5C

CHEMICAL TREATMENT

Calcium Carbonate in the Revomal of Iron and Lead from Dilute Waste Water,
W77-07208 5D

Techniques for Purifying Oily Waste Water,
W77-07213 5D

CHEMICAL WASTES
The Evaluation of Toxic Effects of Chemicals in Fresh Water by Using Frog Embryos and Larvae,
W77-07132 5C

The Development of Regional Industrial Waste Processing Centres,
W77-07205 5D

Phenol-Selective, Highly Resistant Ro-Membranes Made from PVA for the Purification of Toxic Industrial Wastes,
W77-07206 5D

CHEMICALS
Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

CHESAPEAKE BAY
The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Committee for the Consideration of the Jones Falls Sewage System V Train (Federal Common Law Concerning Water Pollution Applicable to Interstate Controversey Only),
W77-07276 6E

Bacteriology of Chesapeake Bay Surface Waters,
W77-07382 5C

CHINOOK SALMON
Residues of 3-trifluoromethyl-4-nitrophenol (TFM) Undetected in Lake Trout and Chinook Salmon from the Upper Great Lakes,
W77-07187 5A

The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

A Nitrogen Gas (N2) Model for the Lower Columbia River, Final Report,
W77-07422 5B

Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

CHLAMYDOMONAS SP.
Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

CHLORINATED HYDROCARBON PESTICIDES
Dynamics of Storage of Organochlorine Pollutants in Herring Gulls,
W77-07127 5C

PCB Contents in the Muscle of Marine Animals Collected in the Sea near Hakodate (In Japanese),
W77-07315 5C

The Effect of Collector Discharge Water from Rice Fields on the Zooplankton of Some Kuban Estuaries, (In Russian),
W77-07331 5C

CHLORINATED WASTEWATER
Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

CHLORINATION
Effects of Passage Through Power Plant Cooling Systems on Estuarine Copepods,
W77-07134 5C

Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

Ozonation in a Better Perspective,
W77-07293 5D

Studies on Virus Inactivation by Chlorine During Water Disinfection, (In German),
W77-07595 5F

CHLORINE
Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

A Study on Standing Crops in Phragmites Communis Communities and Their Environmental Factors, (In Korean),
W77-07335 5C

CHLOROPHYLL
Pigment Cycle in a North German Lake,
W77-07459 5C

Satellite Observations of Water Quality,
W77-07554 5A

CHLOROPHYTA
Effect of DDT on Photosynthesis of Selenstrum Capricornutum,
W77-07444 5C

The Utilization of the Green Alga Dictyosphaerium Pulchellum as Food for Certain Crustaceans of Fresh Water Plankton,
W77-07468 5C

CHROMATOGRAPHY
Occurrence of Toxic Bivalves in Association with the Bloom of Gonyaulax sp. in Owase Bay,
W77-07119 5C

CHROMIUM
Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

CHUKCHI SEA
The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

CIRCULATION
Far Field Circulation Velocities in Shallow Lakes,
W77-07164 2H

Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

CITIZEN PARTICIPATION
The Environmentally Concerned Citizen: Some Correlates,
W77-07438 6G

CLAMS
The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

Aspects of the Life History of Tresus Nuttallii in Elkhorn Slough,
W77-07388 2L

Development of Eggs and Embryos of the Surf Clam, Spisula Solidissima, in Synthetic Seawater,
W77-07396 5C

Effect of Silt and Salinity on the Mortality of Meretrix Lusoria (Roeding), (In Korean),
W77-07428 5C

Uptake and Retention of Kuwait Crude Oil and Its Effects on Oxygen Uptake by the Soft-Shell Clam, Mya Arenaria,
W77-07506 5C

CLASSIFICATION
The Distribution and Ecology of Common Marine and Estuarine Gastropods in the Delaware Bay Area,
W77-07185 5C

Use of Quantitative Correlations Between Microorganisms for River Pollution Evaluation, (In Russian),
W77-07482 5B

CLAYS
Water Quality and Aquitard Permeability,
W77-07551 5G

CLIMATIC DATA
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

CLIMATOLOGY
Dynamics of Climatic Hazards in Northeast Brazil,
W77-07167 2B

Estimating Above and Below Normal Rainfall Periods Over South Africa, 1972-2000,
W77-07170 2B

CLOSED-CYCLE KRAFT MILL
Great Lakes Paper Launches First Closed-Cycle Kraft Pulp Mill.
W77-07218 5D

CLOUD SEEDING
Physical Problems of Weather Modification,
W77-07357 3B

LIBRARY U. OF I. URBANA-CHAMPAIGN

Final Report on The Pyramid Lake Pilot Project, 1970r1975, Volume 1, Text of Report,
W77-07566 3B

Final Report on the Pyramid Lake Pilot Project, 1970-1975, Volume 2, Appendices,
W77-07567 3B

COAGULATION
Use of Cation Polyelectrolytes for Water Purification from Viruses, (In Russian),
W77-07108 5F

COAL HUMIC ACIDS
Interactions of Cupric Ion with Humic Acid,
W77-07104 5B

COAL MINE WASTES
The Federal Water Pollution Control Act Amendments of 1972 as Applied to the Surface Mine in West Virginia - Pollutant Discharge Permit Requirements,
W77-07240 5G

COAL MINES
A Light-Weight and Cheap Depth Sampler,
W77-07155 5A

COAST GUARD REGULATIONS
Rules for the Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Bulk,
W77-07251 5G

Rules and Regulations for Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Domestic Trade,
W77-07254 5G

COASTAL WATERS
Pollution Susceptibility: An Environmental Parameter for Coastal Zone Management,
W77-07230 5G

Federal Riverbasin Planning in the Coastal Zone: The Long Island Sound Study,
W77-07232 2L

Rules for the Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Bulk,
W77-07251 5G

COASTAL ZONE MANAGEMENT
Pollution Susceptibility: An Environmental Parameter for Coastal Zone Management,
W77-07230 5G

Federal Riverbasin Planning in the Coastal Zone: The Long Island Sound Study,
W77-07232 2L

COASTS
Phosphorus and Carbon Distributions in a Polluted Coastal Environment,
W77-07368 5B

COATZOALCOS RIVER ESTUARY (MEX)
Aquatic Organism Contamination by Mercury Residues in the Coatzacoalcos River Estuary, Mexico,
W77-07394 5C

COBALT RADIOISOTOPES
Preliminary Experiment of Cobalt 60 Pollution of a Marine Food Chain: Results of a Single Ingestion,
W77-07317 5C

COD
Swim Bladder Gas Pressure of Cod in Relation to Hydrostatic Pressure,
W77-07417 5C

COHO SALMON
Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

COLIFORMS
A Study of Environment Sanitation on the Wells in Jungneung-Dong Area, Seoul, (In Korean),
W77-07475 5B

Bacteriological and Colimetric Examination of the Water Supplied to the Slaughterhouses Situated Near Salvador, Bahia, Brazil, (In Portugese),
W77-07587 5A

COLIMETRIC EXAMINATIONS
Bacteriological and Colimetric Examination of the Water Supplied to the Slaughterhouses Situated Near Salvador, Bahia, Brazil, (In Portugese),
W77-07587 5A

COLLOIDS
An Investigation of Colloidal Organic Particles Isolated from Different Populations of Bivalves,
W77-07498 5A

COLOR
An Ozone Reactor for Color Removal from Pulp Bleachery Wastes,
W77-07216 5D

COLORADO
Bunger v. Uncompahgre Valley Water Users Association (Conditional Water Permits).
W77-07267 6E

Evaporation of Wastewater from Mountain Cabins,
W77-07284 5E

Water-Level Records for the Northern High Plains of Colorado, 1973-77,
W77-07486 4B

COLORADO RIVER BASIN
Preliminary Maps Showing Ground-Water Resources in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W77-07478 7C

COLORIMETRY
Assay of Detergent Residues in Fresh Water, Sea Water and Waste Waters: Method of Extraction and Concentration of Surfactants by Adsorption on Liquid-Liquid Interface, (In French),
W77-07591 5A

COLUMBIA (CIENAGA GRANDE)
Bacteriological Studies in the Cienaga Grande (Great Marsh) of Santa Maria, Columbia, (In Spanish),
W77-07512 5C

COLUMBIA RIVER
Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

A Nitrogen Gas (N2) Model for the Lower Columbia River, Final Report,
W77-07422 5B

Dissolved Gas Survey, Pacific Northwest Region.
W77-07423 5C

Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

Spillway Redesign Abates Gas Supersaturation in Columbia River,
W77-07432 5G

COLUMBIA RIVER BASIN
Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

COMMERCIAL CLAM BEDS
The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

COMMERCIAL FISH
Present and Historical Spawning Grounds and Nurseries of American Shad, Alosa sapidissima, in the Delaware River,
W77-07131 5C

COMMERCIAL FISHING
Offshore Oil and Fishery Resources,
W77-07195 5C

COMMERCIAL SHELLFISH
Comparison of Artificial and Natural Sea Water as Culture Media for Juvenile Lobsters,
W77-07118 5C

Occurrence of Toxic Bivalves in Association with the Bloom of Gonyaulax sp. in Owase Bay,
W77-07119 5C

Use of Quicklime to Increase Oyster Seed Production,
W77-07122 5C

Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

Offshore Oil and Fishery Resources,
W77-07195 5C

COMMON LAW
Committee for the Consideration of the Jones Falls Sewage System V Train (Federal Common Law Concerning Water Pollution Applicable to Interstate Controversey Only),
W77-07276 6E

COMPARATIVE LAW
Some Suggestions for the Management of International River Basins,
W77-07250 6E

COMPENSATION
Amdel Pipeline Inc V State of Texas (Statutory Requirement of Payment for Spoil Dredged from Bottom of Approaches to Corporate Loading Docks).
W77-07271 6E

COMPREHENSIVE PLANNING
Imperatives of Water Resources Planning in the Developing Economy of India,
W77-07555 6A

COMPUTER MODELS
Mathematical Modeling of Sedimentation Transients in Sand-Bed Channels,
W77-07354 2J

Test of Landsat-Based Urban Hydrologic Modeling,
W77-07528 6A

COMPUTER PROGRAMS
Missouri River Power Curve Regression Equations,
W77-07152 2E

Symap Computer Projections of Summer Zooplankton Populations in Van Lake, Montana,
W77-07511 7C

Calculation of Calcium Carbonate-Carbon Dioxide Equilibrium in Water and Mixtures of Water,
W77-07513 5A

CONCRETE DAMS
Design of Gravity Dams, Design Mnual for Concrete Gravity Dams,
W77-07151 8A

CONDEMNATION
City and County of Honolulu V Bennett (Determination of Private Ownership Rights in Offshore Islands and Beach Parcels),
W77-07280 6E

CONDITION FACTOR
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

CONDITIONAL WATER PERMITS
Bunger v. Uncompahgre Valley Water Users Association (Conditional Water Permits).
W77-07267 6E

CONFERENCE
Proceedings, Technology Transfer Seminar on High Quality Effluents,
W77-07330 5D

CONFERENCES
Proceedings of the Annual Conference, April 20-23, 1975, Toronto, Ontario,
W77-07329 5D

Proceedings of the Seventh Dredging Seminar.
W77-07342 8D

CONGO (AFRICA)
Utilization of the Results from Representative and Experimental Basins with a View to the Management of Water Resources,
W77-07355 4A

CONGRESSIONAL HEARINGS
Amend the Federal Boat Safety Act of 1971 (Hearings on S. 3214 to Declare Certain Waters of New Hampshire to Be Non-navigable for Certain Purposes).
W77-07255 6E

CONNECTICUT
A Contribution to the Life History of the Cunner, Tautogolabrus Adspersus, in Fishers Island Sound, Connecticut,
W77-07377 5C

CONSTRUCTION
Looking Ahead (Federal Water Pollution Control Act of 1972).
W77-07235 6E

Encroachments on Navigable Lake.
W77-07264 6E

Problems Associated with Construction of Submarine Pipelines,
W77-07349 8D

CONTINENTAL SHELF
Hydrographic Properties, MESA New York Bight Atlas Monograph 1,
W77-07328 2L

CONTRACTION
Free Flow Immediately Below Sluice Gates,
W77-07161 8B

CONTRACTS
Schultz v Atkins (Claim for Easement Based on Contract for Water Rights Between Predecessors in Title).
W77-07268 6E

CONTROL PLANS
A Nitrogen Gas (N2) Model for the Lower Columbia River, Final Report,
W77-07422 5B

CONVECTION
Convective-Dispersion in Perennial Streams,
W77-07160 5B

Physical Modeling of Combined Forced and Natural Convection in Wet Geothermal Formations,
W77-07303 4B

COOLING
Thermal Pollution and Its Control,
W77-07245 5G

COOLING PONDS
Thermal Pollution and Its Control,
W77-07245 5G

COOLING TOWER
Thermal Pollution and Its Control,
W77-07245 5G

COOLING WATER
Study on Respiratory Metabolism Modifications in Acartia clausi (Crustacea: Copepoda) Populations after Passage through the Cooling Circuit of a Power Plant,
W77-07305 5C

COOLING WATERS
Subtidal and Intertidal Marine Fouling on Artificial Substrata in Northern Puget Sound, Washington,
W77-07201 5C

COPEPODS
Effects of Passage Through Power Plant Cooling Systems on Estuarine Copepods,
W77-07134 5C

Evaluation of Two Methods for Calculating Freshwater Zooplankton Production, (In Russian),
W77-07228 7B

Study on Respiratory Metabolism Modifications in Acartia clausi (Crustacea: Copepoda) Populations after Passage through the Cooling Circuit of a Power Plant,
W77-07305 5C

The Effect of Collector Discharge Water from Rice Fields on the Zooplankton of Some Kuban Estuaries, (In Russian),
W77-07331 5C

Studies on the Effect of Temperature on the Egg Laying of Three Species of Calanoid Copepods in the Laboratory (Acartia Tonsa, Temora Longicornis, and Pseudocalanus Elongatus),
W77-07391 5C

Preliminary Estimates of Production by a Calanoid Copepod in Subtropical Lake Sibaya,
W77-07500 5C

COPPER
The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

CORES
Post-Glacial History of Mirror Lake and Its Watershed In New Hampshire, U.S.A.: An Initial Report,
W77-07472 5C

CORRELATION ANALYSIS
Use of Quantitative Correlations Between Microorganisms for River Pollution Evaluation, (In Russian),
W77-07482 5B

Apparent Regional Skew,
W77-07484 2E

CORROSION
Cathodic Projection of Borehole Casing,
W77-07297 8G

CORROSION CONTROL
Cathodic Projection of Borehole Casing,
W77-07297 8G

COST-BENEFIT ANALYSIS
Modeling Multiple-Use in Natural Areas: Part I -- The Basic Formulation,
W77-07530 6A

Accounting for Non-Economic Goals in Benefit-Cost Analysis,
W77-07543 6B

COURT DECISIONS
Legal Decisions and Opinions in Pollution Cases,
W77-07436 5G

COVENANTS
Olson V Bedke (Failure of Tenant to Put Water on Leased Land to Beneficial Use).
W77-07272 6E

LIBRARY U. OF I. URBANA-CHAMPAIGN

COXSACKIEVIRUS B-1
Enterovirus and Bacteriophage Inactivation in Subsurface Waters and Translocation in Soil,
W77-07283 5B

CRABS
Preliminary Experiment of Cobalt 60 Pollution of a Marine Food Chain: Results of a Single Ingestion,
W77-07317 5C

Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

Interaction of Temperature and Salinity on Oxygen Consumption of the Estuarine Crab Panopeus Herbstii,
W77-07375 5C

The Effect of Salinity and Cyclic Temperature on Larval Development of the Mud-Crab Rhithropanopeus Harrisii (Brachyura: Xanthidae) Reared in the Laboratory,
W77-07384 5C

CRAYFISH
Fate of the Organophosphate Insecticide Parathion in the Freshwater Invertebrates,
W77-07285 5C

CRICOTOPUS BICINCTUS
Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

CRICOTOPUS MACKENZIENSIS
Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

CRUDE OIL
Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

CRUSTACEANS
Evaluation of Two Methods for Calculating Freshwater Zooplankton Production, (In Russian),
W77-07228 7B

Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

The Effect of Collector Discharge Water from Rice Fields on the Zooplankton of Some Kuban Estuaries, (In Russian),
W77-07331 5C

Comparative Ecophysiology of Gammarids (Crustacea: Amphipoda) From Marine, Brackish and Fresh-Water Habitats, Exposed to the Influence of Salinity-Temperature Combinations. I. Effect on Survival,
W77-07397 5C

The Effect of Temperature on Size and Structure-II. The Body Musculature of Cyclops Agilis (Koch, Sars),
W77-07433 5C

The Larval Spirurid Nematodes of Fresh-Water Crustaceans: I. The Identification and the Examination of Their Pathogenicity,
W77-07458 5C

The Utilization of the Green Alga Dictyosphaerium Pulchellum as Food for Certain Crustaceans of Fresh Water Plankton,
W77-07468 5C

CRYSTAL GROWTH
Parameterization of Depositional Ice Growth,
W77-07171 2B

CULVERTS
Nuckolls V Louisiana State Highway Department (Liability for Unauthorized Alteration of Natural Drain),
W77-07277 6E

CUNNERS
A Contribution to the Life History of the Cunner, Tautogolabrus Adspersus, in Fishers Island Sound, Connecticut,
W77-07377 5C

CUPRIC ION
Interactions of Cupric Ion with Humic Acid,
W77-07104 5B

CURRENTS
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-07549 2H

CURRENTS (WATER)
Wind and Current Patterns in an Arctic Coast Lagoon,
W77-07323 2L

CURVES
Type Curves for Analysis of Pump Tests in Leaky Strip Aquifers,
W77-07145 2F

CUTTHROAT TROUT
Responses to Odors by Fingerling Cutthroat Trout from Yellowstone Lake,
W77-07111 5C

The Influence of Temperature on Scope for Activity in Cutthroat Trout, Salmo Clarki,
W77-07380 5C

CYANIDE WASTES
Electrolytic Treatment of Chromate and Cyanide Wastes with Packed Bipolar Cell, (In Japanese),
W77-07211 5D

CYANOPHYTA
Ecological Studies of the Brussels Urban Ecosystem: Contribution 8. First Survey of the Hydrobiology of the Woluwe Valley in Brussels, (In French),
W77-07292 5C

Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

Phytomicrobenthos of the Kurtli Reservoir, (In Russian),
W77-07596 5C

CYCLING NUTRIENTS
Seasonal Variation in Sediment-Water Exchange of Nutrient Ions in Lake Esrom,
W77-07467 5C

CYCLOPS AGILIS
The Effect of Temperature on Size and Structure-II. The Body Musculature of Cyclops Agilis (Koch, Sars),
W77-07433 5C

DAM DESIGN
Design of Gravity Dams, Design Mnual for Concrete Gravity Dams,
W77-07151 8A

DAM FOUNDATIONS
Design of Gravity Dams, Design Mnual for Concrete Gravity Dams,
W77-07151 8A

DAMAGES
Observations on a Peat Bog's Ability to Withstand Increasing Public Pressure,
W77-07139 5C

DAMS
Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

Spillway Redesign Abates Gas Supersaturation in Columbia River,
W77-07432 5G

DAPHNIA
Effects of Increased Water Temperature on Daphnia Pulex,
W77-07130 5C

The Effect of Food Concentration and Temperature on Respiration and Excretion in Herbivorous Zooplankton,
W77-07502 5C

DATA COLLECTION
Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

DATA COLLECTIONS
Physical Environment Atlas of Coastal Alabama,
W77-07322 2L

Maximum 5-Minute and Hourly Rainfalls on Metromex Network, 1971-1975,
W77-07374 2B

Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

Trophic Relationships Among Ice Inhabiting Phocid Seals,
W77-07407 6G

The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

Beaufort Sea Plankton Studies,
W77-07414 6G

The Economic Basis of Resource Information Systems: The Case of Streamflow Data Network Design,
W77-07534 7A

DDD
The Distribution of Residual Quantities of DDT in the Organs and Tissues of Fish of the Kiev Reservoir, (In Russian),
W77-07572 5B

Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

DDE
Dynamics of Storage of Organochlorine Pollutants in Herring Gulls,
W77-07127 5C

The Distribution of Residual Quantities of DDT in the Organs and Tissues of Fish of the Kiev Reservoir, (In Russian),
W77-07572 5B

Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

DDT
Dynamics of Storage of Organochlorine Pollutants in Herring Gulls,
W77-07127 5C

Effect of DDT on Photosynthesis of Selenstrum Capricornutum,
W77-07444 5C

The Distribution of Residual Quantities of DDT in the Organs and Tissues of Fish of the Kiev Reservoir, (In Russian),
W77-07572 5B

Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

DECHLORINATED WATER
Hematology of Juvenile Striped Bass, Morone Saxatilis (Walbaum), Acclimated to Different Environmental Conditions,
W77-07400 5C

DECISION MAKING
Research and the Quest for Clean Water,
W77-07243 5G

Water Resources Planning and Management Goals,
W77-07523 6B

Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

Reservoir Operation Under Conflicting Objectives,
W77-07536 4A

Scheduling Models for Wilderness Recreation.
W77-07541 6B

Decision-Making for Environmental Resources Management,
W77-07542 6G

Broadening the Approach to Evaluation in Resources Management Decision-Making,
W77-07545 6B

DECISION THEORY
Evaluation of Flood Forecasting-Response Systems,
W77-07524 4A

DECOMPRESSION
The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

DEEP PERCOLATION
Water Movement in Soil from Trickle Source,
W77-07550 2G

DEEP WELLS
Deep Wells for Dewatering Offer Real Advantages, Part I.
W77-07294 8B

DEFOLIANTS
Apparent Potentiation of the Cotton Defoliant DEF by Methyl Parathion in Mosquitofish,
W77-07204 5C

DEGRADATION (DECOMPOSITION)
Pigment Cycle in a North German Lake,
W77-07459 5C

DELAWARE BAY
The Distribution and Ecology of Common Marine and Estuarine Gastropods in the Delaware Bay Area,
W77-07185 5C

DELAWARE RIVER
Present and Historical Spawning Grounds and Nurseries of American Shad, Alosa sapidissima, in the Delaware River,
W77-07131 5C

DELTAS
Aspects of Zoobenthos Ecology of the Mackenzie Delta, N.W.T.,
W77-07499 5C

DENSITY
Hydrographic Properties, MESA New York Bight Atlas Monograph 1,
W77-07328 2L

DESALINATION
The Desalting and Recycling of Waste Waters from Textile Dyeing Operations Using Reverse Osmosis,
W77-07220 5D

The Feasibility of a Water Importation Project for South Florida,
W77-07259 6E

DESIGN
Network Approach to Optimal Wastewater Treatment System Design,
W77-07531 5D

The Economic Basis of Resource Information Systems: The Case of Streamflow Data Network Design,
W77-07534 7A

DESIGN CRITERIA
Design Criteria for Hydrologic Extremes,
W77-07165 8B

Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W77-07217 5D

DETERGENTS
Assay of Detergent Residues in Fresh Water, Sea Water and Waste Waters: Method of Extraction and Concentration of Surfactants by Adsorption on Liquid-Liquid Interface, (In French),
W77-07591 5A

DETOXIFICATION (KRAFT MILLS)
Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W77-07217 5D

DEVELOPING COUNTRIES
Imperatives of Water Resources Planning in the Developing Economy of India,
W77-07555 6A

DEVON ISLAND (CANADA)
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

DEWATERING
Deep Wells for Dewatering Offer Real Advantages, Part I.
W77-07294 8B

DIATOMS
The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

Ecological Studies of the Brussels Urban Ecosystem: Contribution 8. First Survey of the Hydrobiology of the Woluwe Valley in Brussels, (In French),
W77-07292 5C

Influence of Light and Temperature on the Photosynthetic Rate of Marine Benthic Diatoms,
W77-07385 5C

Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

Areal Distribution and Stratigraphy of Diatoms in the Sediments of Lake Sallie, Minnesota,
W77-07481 5C

DICTYOSPHAERIUM PULCHELLUM
The Utilization of the Green Alga Dictyosphaerium Pulchellum as Food for Certain Crustaceans of Fresh Water Plankton,
W77-07468 5C

DIEL TEMPERATURE FLUCTUATIONS
Laboratory Apparatus for Providing Diel Temperature Regimes for Aquatic Animals,
W77-07188 5C

DIFFUSIVITY
Modeling the Annual Thermal Evolution of Mid-Latitude Lakes,
W77-07462 2H

DINOFLAGELLATES
Occurrence of Toxic Bivalves in Association with the Bloom of Gonyaulax sp. in Owase Bay,
W77-07119 5C

Red Tide in the Upwelling Region of Baja California,
W77-07169 5C

DIPHENAMID
Diphenamid Removal from Water and Metabolism by Aquatic Plants,
W77-07193 5C

LIBRARY U. OF I. URBANA-CHAMP. ...

DIPTERA
Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

The Differential Use of Chironomidae and Ceratopogonidae (Diptera) in the Monitoring of Various Aquatic Wastes,
W77-07282 5A

Qualitative and Quantitative Studies on the Meiofauna of a Tropical Fresh Water Stream Subject to Tidal Influence, (In Italian),
W77-07390 5C

Outbreak of Chironomid Midge in a Polluted River and the Chemical Control of the Larvae, (In Japanese),
W77-07585 5G

DISCHARGE BARRIER NET
Gas Bubble Disease Mortality of Atlantic Menhaden at Pilgrim Nuclear Power Station, April, 1975,
W77-07429 5C

DISCHARGE (WATER)
Legal Aspects of Changes Brought About by Buckeye's Pollution Abatement Program, Part II,
W77-07261 6E

DISEASES
Geologists Claim Health Can be Traced to Rocks,
W77-07290 5B

DISINFECTION
Ozonation in a Better Perspective,
W77-07293 5D

Studies on Virus Inactivation by Chlorine During Water Disinfection, (In German),
W77-07595 5F

DISPERSION
Analysis of Flow Against Dispersion in Porous Media,
W77-07150 2F

Convective-Dispersion in Perennial Streams,
W77-07160 5B

DISPOSAL SITES
Leaching Characteristics of Polluted Dredgings,
W77-07158 5B

DISSOLVED GASES
A Hand-Operated In Situ Water Sampler,
W77-07200 5A

DISSOLVED HELIUM
Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

DISSOLVED ORGANIC CARBON
The Release of Dissolved Organic Carbon from Submersed Aquatic Macrophytes: Diel, Seasonal and Community Relationships,
W77-07516 5C

DISSOLVED OXYGEN
A Hand-Operated In Situ Water Sampler,
W77-07200 5A

Anthropogenically Reduced Groundwaters,
W77-07360 5B

Respiratory Responses of Gillichthys Mirabilis to changes in Temperature, Dissolved Oxygen and Salinity,
W77-07401 5C

Dissolved Gas Survey, Pacific Northwest Region.
W77-07423 5C

DISTRIBUTION
Distribution Thickness and Certain Physical and Chemical Properties of Bottom Sediments in the Kiev Reservoir, (In Russian),
W77-07321 2J

Phosphorus and Carbon Distributions in a Polluted Coastal Environment,
W77-07368 5B

DISTRIBUTION PATTERNS
Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

The Structure of Phytoplankton Associations in Lake Tahoe (California-Nevada),
W77-07473 5C

DIURNAL
Laboratory Apparatus for Providing Diel Temperature Regimes for Aquatic Animals,
W77-07188 5C

DRAINAGE
Water Quality and Aquitard Permeability,
W77-07551 5G

Saturated and Unsaturated Flow to Parallel Drains,
W77-07552 4A

DRAINAGE EFFECTS
Nuckolls V Louisiana State Highway Department (Liability for Unauthorized Alteration of Natural Drain),
W77-07277 6E

DRAINS
Saturated and Unsaturated Flow to Parallel Drains,
W77-07552 4A

DREDGES
Leaching Characteristics of Polluted Dredgings,
W77-07158 5B

DREDGING
Leaching Characteristics of Polluted Dredgings,
W77-07158 5B

Florida Statutes, Chapter 253--The 1969 Amendments and Proposed Legislation,
W77-07258 6E

Amdel Pipeline Inc V State of Texas (Statutory Requirement of Payment for Spoil Dredged from Bottom of Approaches to Corporate Loading Docks).
W77-07271 6E

Proceedings of the Seventh Dredging Seminar.
W77-07342 8D

Use of Aerial Remote Sensors to Monitor Dredging Projects,
W77-07344 8D

Dredged Material Disposal Effects and Alternatives,
W77-07345 8D

Parameter Study of Variables Affecting the Performance of a Hydraulic Pipeline Dredge Model,
W77-07346 8D

Maintenance Dredging in the New Orleans District, US Army Corps of Engineers,
W77-07347 8D

The Port of New Orleans and Its Dredging Program,
W77-07348 8D

Compressibility and Strength of Compacted Dredgings,
W77-07350 8D

Permeability and Drainage Characteristics of Dredgings,
W77-07351 8D

Concepts for the Reclamation of Dredged Material,
W77-07352 8D

The Responses of Some Estuarine Organisms to Suspended Solids,
W77-07353 8D

DRILL MONITORS
Downhole Measurements Through Modified Drill Pipe,
W77-07304 8G

DRILL PIPES
Downhole Measurements Through Modified Drill Pipe,
W77-07304 8G

DRILLING
Offshore Oil and Fishery Resources,
W77-07195 5C

The Cable Tool Drilling Machine, Part III,
W77-07286 8C

The Cable Tool Drilling Machine, Part IV,
W77-07287 8C

The Chief Driller's Report on JCCIP,
W77-07288 8C

DRILLING EQUIPMENT
The Cable Tool Drilling Machine, Part III,
W77-07286 8C

The Cable Tool Drilling Machine, Part IV,
W77-07287 8C

The Chief Driller's Report on JCCIP,
W77-07288 8C

New Rig Concept Uses Continuous Drill String.
W77-07298 8G

DROPS (STRUCTURES)
Hydraulic Jumps and Waves at Abrupt Drops,
W77-07163 8B

DROUGHT RESISTANCE
Protein Production by Russian Thistle: Effects of Water and Nitrogen on Protein Yields,
W77-07281 3F

DROUGHTS
Dynamics of Climatic Hazards in Northeast Brazil,
W77-07167 2B

DUNE STABILIZATION
The Dune Book. How to Plant Grasses for Dune Stabilization,
W77-07326 2J

Dune Stabilization with Panicum amarum Along the North Carolina Coast,
W77-07327 2L

DUNES
The Dune Book. How to Plant Grasses for Dune Stabilization,
W77-07326 2J

Dune Stabilization with Panicum amarum Along the North Carolina Coast,
W77-07327 2L

DYES
The Desalting and Recycling of Waste Waters from Textile Dyeing Operations Using Reverse Osmosis,
W77-07220 5D

Dyehouse Water Treatment with Catalytic Oxidation.
W77-07221 5D

DYNAMIC PROGRAMMING
Reliability-Constrained Dynamic Programing and Randomized Release Rules in Reservoir Management,
W77-07535 4A

DYSTROPHY
Experimental Substantiation of Maximum Permissible Propachlor (Ramrod) Concentrations in Water, (In Russian),
W77-07133 5A

E COLI
Data 1973/1974 Regarding Hydrography and Water Quality in the Weser Estuary, Germany, (In German),
W77-07584 5C

EASEMENTS
Schultz v Atkins (Claim for Easement Based on Contract for Water Rights Between Predecessors in Title).
W77-07268 6E

ECOLOGICAL DISTRIBUTION
Morbidity and Mortality of Marine Mammals,
W77-07405 6G

Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

Trophic Relationships Among Ice Inhabiting Phocid Seals,
W77-07407 6G

Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

ECOLOGICAL STUDIES
The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

ECOLOGY
Areal Distribution and Stratigraphy of Diatoms in the Sediments of Lake Sallie, Minnesota,
W77-07481 5C

Literature on Environmental Protection, Management and Hygiene in Sweden 1952-1971: Bibliography and Analysis, (In Swedish),
W77-07586 6G

ECONOMIC ANALYSIS
Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

ECONOMIC EFFICIENCY
Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

Imperatives of Water Resources Planning in the Developing Economy of India,
W77-07555 6A

ECONOMIC FEASIBILITY
Economic Aspects of Pollution Abatement, Part 1,
W77-07260 6E

ECONOMICS
The Economics of Natural Environments, Studies in the Valuation of Commodity and Amenity Resources.
W77-07437 6G

The Evaluation of Simple and Optimal Decision Rules with Misspecified Welfare Functions,
W77-07439 6B

Economic Value of Low Flow Data,
W77-07537 5D

ECOSYSTEMS
Ecological Studies of the Brussels Urban Ecosystem: Contribution 8. First Survey of the Hydrobiology of the Woluwe Valley in Brussels, (In French),
W77-07292 5C

Population Changes in the Aquatic Fauna Inhabiting the Bladderwort, Utricularia Flexuosa Vahl., in a Tropical Swamp, Tasek Bera, Malaysia,
W77-07465 5C

EFFLUENT LIMITATIONS
Proposed Toxic Pollutant Effluent Standard for Polychlorinated Biphenyls,
W77-07253 6E

EFFLUENTS
An Industrial View of Biological Monitoring,
W77-07126 5A

Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

United States V Cutter Laboratories, Inc (Civil Liability of a Permittee for Whom no Industrial Effluent Limitations or Guidelines Exist).
W77-07274 6E

Committee for the Consideration of the Jones Falls Sewage System V Train (Federal Common Law Concerning Water Pollution Applicable to Interstate Controversey Only),
W77-07276 6E

Proceedings, Technology Transfer Seminar on High Quality Effluents,
W77-07330 5D

A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

EGYPTIAN COAST
Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

ELECTRIC POWER
Assessment of Geothermal Resources of the United States--1975.
W77-07476 4B

Reclamation Research in the Seventies, Second Progress Report,
W77-07600 8A

ELECTRIC POWER GENERATION
Geothermal Systems and Power Development,
W77-07302 4B

ELECTRIC POWER INDUSTRY
A Scientific and Legal Look at Thermal Pollution,
W77-07256 6E

ELECTRIC POWER PRODUCTION
Geothermal Power, The 'Sleeper' in the Energy Race,
W77-07296 3E

Electric Power Generation from Geothermal Hot Water Deposits,
W77-07300 8C

Geothermal Energy: Needed, Effective Heat Transfer Equipment,
W77-07301 8G

Geothermal Resources, A New Look,
W77-07477 4B

Pumped Storage Optimization in Generation Systems,
W77-07525 4A

ELECTRICAL WELL LOGGING
Downhole Measurements Through Modified Drill Pipe,
W77-07304 8G

ELECTROLYSIS
Electrolytic Treatment of Chromate and Cyanide Wastes with Packed Bipolar Cell, (In Japanese),
W77-07211 5D

Wastewater and Sludge Control in the Canadian Metal Finishing Industry, Segment Including Chemical, Electrolytic Treatment; Electrochemical Machining and Polishing; Cyanide Hardening,
W77-07333 5D

ELECTRONIC EQUIPMENT
Downhole Measurements Through Modified Drill Pipe,
W77-07304 8G

ELKHORN SLOUGH (CALIF)
Aspects of the Life History of Tresus Nuttallii in Elkhorn Slough,
W77-07388 2L

LIBRARY U. OF I. URBANA-CHAMPAIGN

EMBDEN-MEYERHOF GLUCOSE METABOLISM PATHWAY
The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

EMBRYONIC GROWTH STAGE
Egg and Larval Survival of White Suckers (Catostomus Commersoni) at Low pH,
W77-07184 5C

EMULSIFIERS
Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms-II. Lethal Concentrations of Oil-Spill Emulsifier Components for Marine Phytoplankton, (In Japanese),
W77-07182 5C

ENCROACHMENT
Encroachments on Navigable Lake.
W77-07264 6E

ENDEMIC SPECIES
Some Effects of Channelization on the Fishes and Invertebrates of Rush Creek, Modoc County, California,
W77-07109 5C

ENERGY
Brace Research Institute, Annual Report, (1976),
W77-07242 3A

ENERGY CONVERSION
Geothermal Power, The 'Sleeper' in the Energy Race,
W77-07296 3E

Electric Power Generation from Geothermal Hot Water Deposits,
W77-07300 8C

Geothermal Energy: Needed, Effective Heat Transfer Equipment,
W77-07301 8G

ENERGY RESEARCH
Reclamation Research in the Seventies, Second Progress Report,
W77-07600 8A

ENERGY TRANSFER
Assessment of Geothermal Resources of the United States--1975.
W77-07476 4B

ENGINEERING STRUCTURES
Spillway Redesign Abates Gas Supersaturation in Columbia River,
W77-07432 5G

ENGLAND
Automatic Monitoring of Soil Moisture Conditions in a Hillslope Spur and Hollow,
W77-07146 2G

Interconnection of Surface and Underground Water Resources in Southeast Durham,
W77-07149 4B

ENGLAND (WALTON BACKWATERS)
Phosphorus and Carbon Distributions in a Polluted Coastal Environment,
W77-07368 5B

ENTEROVIRUS
Enterovirus and Bacteriophage Inactivation in Subsurface Waters and Translocation in Soil,
W77-07283 5B

ENVIRONMENT
Modeling Multiple-Use in Natural Areas: Part I -- The Basic Formulation,
W77-07530 6A

Decision-Making for Environmental Resources Management,
W77-07542 6G

ENVIRONMENTAL ASSESSMENT
The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska,
W77-07411 6G

Zooplankton and Micronekton Studies in the Bering - Chukchi/Beaufort Seas,
W77-07412 6G

Phytoplankton Studies in the Bering Sea,
W77-07413 6G

Beaufort Sea Plankton Studies,
W77-07414 6G

ENVIRONMENTAL CONTROL
Literature on Environmental Protection, Management and Hygiene in Sweden 1952-1971: Bibliography and Analysis, (In Swedish),
W77-07586 6G

ENVIRONMENTAL EFFECTS
Offshore Oil and Fishery Resources,
W77-07195 5C

Pollution Susceptibility: An Environmental Parameter for Coastal Zone Management,
W77-07230 5G

Geologists Claim Health Can be Traced to Rocks,
W77-07290 5B

Effects of Combination of Temperature and Hydrostatic Pressure on Asterias rubens,
W77-07308 5C

Observations on Bacteriological Conditions in the Upper Great Lakes 1968-1974,
W77-07340 5A

The Responses of Some Estuarine Organisms to Suspended Solids,
W77-07353 8D

The Influence of Temperature on Scope for Activity in Cutthroat Trout, Salmo Clarki,
W77-07380 5C

Aquatic Organism Contamination by Mercury Residues in the Coatzacoalcos River Estuary, Mexico,
W77-07394 5C

Accumulation and Distribution of Trace Metals and Radionuclides in Marine Organisms (Particularly Tapes Decussatus L.) in the Izmir Bay Area, Turkey,
W77-07395 5C

Comparative Ecophysiology of Gammarids (Crustacea: Amphipoda) From Marine, Brackish and Fresh-Water Habitats, Exposed to the Influence of Salinity-Temperature Combinations. I. Effect on Survival,
W77-07397 5C

Morbidity and Mortality of Marine Mammals,
W77-07405 6G

Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

Trophic Relationships Among Ice Inhabiting Phocid Seals,
W77-07407 6G

Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska,
W77-07411 6G

Zooplankton and Micronekton Studies in the Bering - Chukchi/Beaufort Seas,
W77-07412 6G

Phytoplankton Studies in the Bering Sea,
W77-07413 6G

Beaufort Sea Plankton Studies,
W77-07414 6G

The Structure of Phytoplankton Associations in Lake Tahoe (California-Nevada),
W77-07473 5C

Literature on Environmental Protection, Management and Hygiene in Sweden 1952-1971: Bibliography and Analysis, (In Swedish),
W77-07586 6G

ENVIRONMENTAL ENGINEERING
Far Field Circulation Velocities in Shallow Lakes,
W77-07164 2H

ENVIRONMENTAL IMPACT
The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

Zooplankton and Micronekton Studies in the Bering - Chukchi/Beaufort Seas,
W77-07412 6G

Phytoplankton Studies in the Bering Sea,
W77-07413 6G

Beaufort Sea Plankton Studies,
W77-07414 6G

ENVIRONMENTAL PLANNING
Modeling Multiple-Use in Natural Areas: Part I -- The Basic Formulation,
W77-07530 6A

ENVIRONMENTAL PROTECTION
The Environmentally Concerned Citizen: Some Correlates,
W77-07438 6G

ENVIRONMENTAL SANITATION
A Study of Environment Sanitation on the Wells in Jungneung-Dong Area, Seoul, (In Korean),
W77-07475 5B

EQUATIONS
Solution of Equation for Two-Dimensional Infiltration Problems,
W77-07142 2G

Tripton Sedimentation in Eutrophic Lakes--Sample Correction for the Resuspended Matter,
W77-07463 5C

EQUILIBRIUM
Calculation of Calcium Carbonate-Carbon Dioxide Equilibrium in Water and Mixtures of Water,
W77-07513 5A

EQUIPMENT
A Hand-Operated In Situ Water Sampler,
W77-07200 5A

ERTS
Hydrogeological Applications of Earth Resources Technology Satellite Landsat 1 Imagery,
W77-07339 7B

ESTIMATING
Estimating Above and Below Normal Rainfall Periods Over South Africa, 1972-2000,
W77-07170 2B

Photosynthetic Rates in Lake Superior,
W77-07450 5C

Algal Response to Nutrient Inputs in Some Iowa Lakes,
W77-07515 5C

Sources of Nitrogen as a Water Pollutant: Industrial Waste Water,
W77-07521 5B

ESTUARIES
The Responses of Some Estuarine Organisms to Suspended Solids,
W77-07353 8D

Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

The Response of an Estuary to the Closure of a Mobile Barrier; Richmond Barrier on the Upper Thames Estuary,
W77-07366 2L

Subject Keyword List, (Estuarine and Coastal Marine Science),
W77-07564 2L

Studies on Fungal Propagules in the Weser Estuary (German Bight): I. Quantitative Data 1974, (In German),
W77-07583 5C

Data 1973/1974 Regarding Hydrography and Water Quality in the Weser Estuary, Germany, (In German),
W77-07584 5C

Bacteriologic Analysis in the Arosa, Vigo and Pontevedra Estuaries, (In Spanish),
W77-07589 5A

ESTUARINE ENVIRONMENT
A Natural Pollution Experiment: The Effects of a Sewage Strike on the Fauna of the Thames Estuary,
W77-07124 5C

Subject Keyword List, (Estuarine and Coastal Marine Science),
W77-07564 2L

EUTROPHICATION
Water Quality and Chemical Models,
W77-07246 5C

Ecological Studies of the Brussels Urban Ecosystem: Contribution 8. First Survey of the Hydrobiology of the Woluwe Valley in Brussels, (In French),
W77-07292 5C

Effect of DDT on Photosynthesis of Selenstrum Capricornutum,
W77-07444 5C

Predicting the Impacts of Phosphorus Management Policies on the Eutrophication of Skaha Lake, British Columbia, Canada,
W77-07446 5C

Influence of the Drainage Basin on the Eutrophication of the a-Mesotrophic Lake Piaseczno and Diseutrophication of the Pond Lake Bikcze,
W77-07452 5C

Tripton Sedimentation in Eutrophic Lakes--Sample Correction for the Resuspended Matter,
W77-07463 5C

Effect of Nutrient Enrichment on the Heterotrophic Uptake of Organic Solutes by Microorganisms,
W77-07466 5C

An Organic Carbon Budget for an Oligotrophic Lake In New Hampshire, U.S.A.,
W77-07470 5C

Algal Productivity of Natural and Artificially Enriched Fresh Waters in Malaya,
W77-07471 5C

Areal Distribution and Stratigraphy of Diatoms in the Sediments of Lake Sallie, Minnesota,
W77-07481 5C

Wind Control of Algae Growth in Eutrophic Lakes,
W77-07497 5G

Annual Contribution of Carbon, Nitrogen and Phosphorus by Migrant Canada Geese to a Hardwater Lake,
W77-07505 5C

Algal Response to Nutrient Inputs in Some Iowa Lakes,
W77-07515 5C

The Role of Phosphate in Eutrophication. Stimulation of Plankton Growth and Residence Times of Inorganic Phosphate in Lake Kinneret Water,
W77-07517 5C

Studies on the Typology of Baltic Lakes with Different States of Eutrophication, (In German),
W77-07576 5B

Lake Restoration by Bottom Water Siphoning, (In German),
W77-07577 5G

Models for Simulation of Eutrophication of Lakes for Lake Constance (Bodensee-Obersee): I. Data from Lake Constance used in Simulation Models, (In German),
W77-07579 5C

EVALUATION
The Economics of Natural Environments, Studies in the Valuation of Commodity and Amenity Resources.
W77-07437 6G

Evaluation of Flood Forecasting-Response Systems,
W77-07524 4A

Broadening the Approach to Evaluation in Resources Management Decision-Making,
W77-07545 6B

Power Plant Site Evaluation: The Case of the Sharon Plant in Israel,
W77-07546 6G

Evaluating Alternative Levels of Water and Sanitation Service for Communities in the Northwest Territories,
W77-07557 6A

EVAPORATION
Waste Water Reclamation System Ups Productivity, Cuts Water Use,
W77-07210 5D

Evaporation and Thermal Oxidation of Liquid Effluents--By Burning with Flame in Combustion Chamber.
W77-07227 5D

EVAPORATORS
Evaporation of Wastewater from Mountain Cabins,
W77-07284 5E

EXCESSIVE PRECIPITATION
Predictability of Effects of a Severe Local Storm in Pennsylvania,
W77-07369 2B

EXPLORATION
Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

EXPLOSIONS
The Influence of Underwater Explosion on Fish, (In Japanese),
W77-07316 8H

EYE ABNORMALITIES
Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

FALLOUT
Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

FARM PONDS
Wood V Woodcock (Rights of Adjoining Landowners to Seepage Water from Joint Irrigation Ditch),
W77-07278 6E

FARM WASTES
Relation Between the Amounts of Fertilization and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigau-

LIBRARY U. OF I. URBANA-CHAMPAIGN

ra: 1. On the Relation Between the Amount of Fertilizer Application and the Specific Pollution Loads of Nitrogen and Phosphorus in Main Streams Flowing into Lake Nishiura, (In Japanese),
W77-07568 5B

Relation Between the Amounts of Fertilizer and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: II. On the Relation Between Livestock Waste Per Unit Area of Basin and the Specific Load of Pollutants in Main Streams Flowing into Nishiura Lake Basin, (In Japanese),
W77-07569 5B

An Investigation on the Disposal of Pig Excreta in Kasumigaura Area, (In Japanese),
W77-07571 5B

Bacteriological Quality of Poultry-Farms' Water in Minas Gerais State, Brazil: 1973, (In Portugese),
W77-07594 5F

FEDERAL PROJECT POLICY
Federal Riverbasin Planning in the Coastal Zone: The Long Island Sound Study,
W77-07232 2L

FEDERAL-STATE WATER CONFLICTS
Looking Ahead (Federal Water Pollution Control Act of 1972).
W77-07235 6E

FEDERAL-STATE WATER RIGHTS CONFLICTS
House Committee Marks up HR 9560,
W77-07236 5G

Amend the Federal Boat Safety Act of 1971 (Hearings on S. 3214 to Declare Certain Waters of New Hampshire to Be Non-navigable for Certain Purposes).
W77-07255 6E

FEDERAL WATER POLLUTION CONTROL ACT
P. L. 92-500 V Local Priorities,
W77-07229 5D

Pollution Susceptibility: An Environmental Parameter for Coastal Zone Management,
W77-07230 5G

Control of Agricultural Water Pollution: A Continuing Regulatory Dilema,
W77-07233 5G

The Federal Water Pollution Control Act Amendments of 1972 as Applied to the Surface Mine in West Virginia - Pollutant Discharge Permit Requirements,
W77-07240 5G

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972
Pollution Susceptibility: An Environmental Parameter for Coastal Zone Management,
W77-07230 5G

Looking Ahead (Federal Water Pollution Control Act of 1972).
W77-07235 6E

The Federal Water Pollution Control Act Amendments of 1972 as Applied to the Surface Mine in West Virginia - Pollutant Discharge Permit Requirements,
W77-07240 5G

United States V Ashland Oil and Transportation Company (Use of the Word 'Navigable Waters' in the Federal Water Pollution Control Act Amendments of 1972 Held to Mean 'Waters of the United States').
W77-07273 6E

Committee for the Consideration of the Jones Falls Sewage System V Train (Federal Common Law Concerning Water Pollution Applicable to Interstate Controversey Only),
W77-07276 6E

FEDERAL WATER POLLUTION CONTROL ACT (FWPCA) AMENDMENTS OF 1972
P. L. 92-500 V Local Priorities,
W77-07229 5D

Control of Agricultural Water Pollution: A Continuing Regulatory Dilema,
W77-07233 5G

NCWQ Recommends Changes in Water Pollution Act,
W77-07237 5G

How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

FEDERAL WATER POLLUTION CONTROL ACT OF 1972
Research and the Quest for Clean Water,
W77-07243 5G

FEED LOTS
Control of Agricultural Water Pollution: A Continuing Regulatory Dilema,
W77-07233 5G

FEEDING RATES
The Utilization of the Green Alga Dictyosphaerium Pulchellum as Food for Certain Crustaceans of Fresh Water Plankton,
W77-07468 5C

FERTILIZATION
Nitrate in Ground Water and Its Relation to Fertilization, (In German),
W77-07112 5B

Relation Between the Amounts of Fertilization and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: 1. On the Relation Between the Amount of Fertilizer Application and the Specific Pollution Loads of Nitrogen and Phosphorus in Main Streams Flowing into Lake Nishiura, (In Japanese),
W77-07568 5B

FERTILIZERS
The Effect of the Use of Pesticides and Fertilizers in the Water Protection Zone with Sources of Artificial Replenishment of Underground Water Reserves, (In Russian),
W77-07107 5B

Relation Between the Amounts of Fertilizer and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: II. On the Relation Between Livestock Waste Per Unit Area of Basin and the Specific Load of Pollutants in Main Streams Flowing into Nishiura Lake Basin, (In Japanese),
W77-07569 5B

FILL PERMITS
Florida Statutes, Chapter 253--The 1969 Amendments and Proposed Legislation,
W77-07258 6E

United States V Diamond (Permanent Injunction During Administrative Procedures Justified by Developers Fill of Marshland Without Refuse Act Permit),
W77-07275 6E

FILTERS
Two New Methods of Sludge Removal,
W77-07224 5D

FILTRATION
Ultrafiltration Oil Reclamation Process,
W77-07212 5D

Inline Sensor Tightens Control on Sludge Consistency to Within 1.4-1.5% Solids,
W77-07214 5D

Treating Effluent Containing Ionic Compounds Preferably Dyes--By Adding Salt Generator of Opposite Charge to Effluent Ion Then Ultra-Filtering.
W77-07223 5D

Two New Methods of Sludge Removal,
W77-07224 5D

FINANCING
House Committee Marks up HR 9560,
W77-07236 5G

FINITE DIFFERENCE THEORY
Instability in Tidal Flow Computational Schemes,
W77-07548 2L

FINITE ELEMENT ANALYSIS
Solution of Equation for Two-Dimensional Infiltration Problems,
W77-07142 2G

Finite-Element Analysis of Groundwater Flow in Multiaquifer Systems, I. The Behavior of Hydrological Properties in an Aquitard While Being Pumped,
W77-07148 2F

FIRE HAZARD REDUCTION
Fire Effects on Water Supply, Floods, and Sedimentation,
W77-07318 4C

FISH BEHAVIOR
Responses to Odors by Fingerling Cutthroat Trout from Yellowstone Lake,
W77-07111 5C

Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

Swim Bladder Gas Pressure of Cod in Relation to Hydrostatic Pressure,
W77-07417 5C

Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

Effects of Pressure on Survival of Six Species of Fish,
W77-07424 5C

FISH BLOOD CELLS
Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

FISH DISEASE
Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

FISH DISEASES
Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

FISH EGGS
Egg and Larval Survival of White Suckers (Catostomus Commersoni) at Low pH,
W77-07184 5C

FISH FARMING
Cage Culture of Channel Catfish in a Heated Effluent from a Power Plant, Thomas Hill Reservoir,
W77-07101 5C

FISH FARMING PRODUCTIVITY
Algal Productivity of Natural and Artificially Enriched Fresh Waters in Malaya,
W77-07471 5C

FISH GENETICS
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

FISH HATCHERIES
Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

FISH LADDERS
Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

FISH MIGRATION
Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

FISH MIGRATIONS
Responses to Odors by Fingerling Cutthroat Trout from Yellowstone Lake,
W77-07111 5C

FISH PARASITES
Comparative Characteristics of the Parasite Fauna of Bream in Lakes Dusios, Obelijos, Salvantu and Galstas, Which Have Different Thermal Regimes, (In Russian),
W77-07312 2H

The Larval Spirurid Nematodes of Fresh-Water Crustaceans: I. The Identification and the Examination of Their Pathogenicity,
W77-07458 5C

Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

FISH PASSAGE
Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

FISH PHYSIOLOGY
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

Responses to Odors by Fingerling Cutthroat Trout from Yellowstone Lake,
W77-07111 5C

Alteration in the Toxicity of Tissue Lipids with the Adaptation of Fishes to Osmotic Pressure Changes in the Environment,
W77-07120 5C

Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

Experimental Study of the Nitrogen Excretion of Bass (Dicentrarchus labrax) during Growth. I. Effects of Temperature and Weight on the Excretion of Ammonia and Urea,
W77-07313 5C

The Influence of Underwater Explosion on Fish, (In Japanese),
W77-07316 8H

Experiments on the Resistance of Fish to Rapid Increase in Hydrostatic Pressure,
W77-07416 5C

Swim Bladder Gas Pressure of Cod in Relation to Hydrostatic Pressure,
W77-07417 5C

The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

Effects of Pressure on Survival of Six Species of Fish,
W77-07424 5C

Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

FISH POPULATIONS
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

FISH REPRODUCTION
Effects of Benzene (A Toxic Component of Petroleum) on Spawning Pacific Herring, Clupea harengus pallasi,
W77-07137 5C

FISH TRANSPORT
Spillway Redesign Abates Gas Supersaturation in Columbia River,
W77-07432 5G

FISHERIES ACT (CANADA)
Wastewater and Sludge Control in the Canadian Metal Finishing Industry, Segment Including Chemical, Electrolytic Treatment; Electrochemical Machining and Polishing; Cyanide Hardening,
W77-07333 5D

FISHKILL
Offshore Oil and Fishery Resources,
W77-07195 5C

The Influence of Underwater Explosion on Fish, (In Japanese),
W77-07316 8H

The Effects of High Vacuum on Fish,
W77-07421 5C

FISHWAY
Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

FLOCCULATION
Use of Cation Polyelectrolytes for Water Purification from Viruses, (In Russian),
W77-07108 5F

FLOOD CONTROL
The Evolution of Approaches to Flood Damage Reduction,
W77-07248 6F

FLOOD DAMAGE
Effects of the Catastrophic Flood of December 1966, North Rim Area, Eastern Grand Canyon, Arizona,
W77-07480 2E

Evaluation of Flood Forecasting-Response Systems,
W77-07524 4A

FLOOD DISCHARGE
Regional Study of the Upper Basin of the AAR from its Sources to Bern: Profile of Floods of a Given Return Period at any Point on the River (Etude Regionale du Bassin Superieur de L'Aar de ses Sources Jusqu'a Berne: Profile des Crues de Periode Donnee le Long du Cours d'eau).
W77-07358 2E

FLOOD FLOW
The Evolution of Approaches to Flood Damage Reduction,
W77-07248 6F

FLOOD FORECASTING
Techniques for Estimating Flow Characteristics of Wyoming Streams,
W77-07495 4A

LIBRARY U. OF I. URBANA-CHAMPAIGN

Evaluation of Flood Forecasting-Response Systems,
W77-07524 4A

FLOOD PLAIN INSURANCE
The Evolution of Approaches to Flood Damage Reduction,
W77-07248 6F

FLOOD PLAINS
The Evolution of Approaches to Flood Damage Reduction,
W77-07248 6F

FLOODS
Design Criteria for Hydrologic Extremes,
W77-07165 8B

Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

Effects of the Catastrophic Flood of December 1966, North Rim Area, Eastern Grand Canyon, Arizona,
W77-07480 2E

FLOODWAYS
The Effects of High Vacuum on Fish,
W77-07421 5C

FLORIDA
Nonpoint Source Effects on Water Quality,
W77-07173 5B

A Scientific and Legal Look at Thermal Pollution,
W77-07256 6E

Florida Statutes, Chapter 253--The 1969 Amendments and Proposed Legislation,
W77-07258 6E

The Feasibility of a Water Importation Project for South Florida,
W77-07259 6E

Economic Aspects of Pollution Abatement, Part 1,
W77-07260 6E

Legal Aspects of Changes Brought About by Buckeye's Pollution Abatement Program, Part II,
W77-07261 6E

Life History Patterns in the Coastal Shiner, Notropis Petersoni, Fowler,
W77-07386 5C

Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

FLOTSAM
Long Island Beach Pollution: June 1976,
W77-07325 5B

FLOW
Free Flow Immediately Below Sluice Gates,
W77-07161 8B

Hydraulic Jumps and Waves at Abrupt Drops,
W77-07163 8B

Water Movement in Soil from Trickle Source,
W77-07550 2G

Vacuum Sewer Systems and Their Possible Canadian Applications,
W77-07558 5D

FLOW CHARACTERISTICS
Techniques for Estimating Flow Characteristics of Wyoming Streams,
W77-07495 4A

FLOW RATE
Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

FLUCTUATIONS
Laboratory Apparatus for Providing Diel Temperature Regimes for Aquatic Animals,
W77-07188 5C

FOAM SEPARATION
Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W77-07217 5D

FOOD CHAINS
Survival of Mayfly Larvae Under Mine Acid Conditions,
W77-07128 5C

Preliminary Experiment of Cobalt 60 Pollution of a Marine Food Chain: Results of a Single Ingestion,
W77-07317 5C

The Utilization of the Green Alga Dictyosphaerium Pulchellum as Food for Certain Crustaceans of Fresh Water Plankton,
W77-07468 5C

FOOD PROCESSING INDUSTRY
A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

FOOD WEBS
Preliminary Experiment of Cobalt 60 Pollution of a Marine Food Chain: Results of a Single Ingestion,
W77-07317 5C

FORAGES
Protein Production by Russian Thistle: Effects of Water and Nitrogen on Protein Yields,
W77-07281 3F

FORECASTING
Far Field Circulation Velocities in Shallow Lakes,
W77-07164 2H

Day Degree Growth Models for Intertidal Oysters,
W77-07376 2L

FOREIGN COUNTRIES
Regional Study of the Upper Basin of the AAR from its Sources to Bern: Profile of Floods of a Given Return Period at any Point on the River (Etude Regionale du Bassin Superieur de L'Aar de ses Sources Jusqu'a Berne: Profile des Crues de Periode Donnee le Long du Cours d'eau).
W77-07358 2E

Water Quality Criteria and Waste Water Treatment,
W77-07522 5D

FOREST FIRES
Fire Effects on Water Supply, Floods, and Sedimentation,
W77-07318 4C

FORESTS
Water Flux in Soil and Subsoil on a Steep Forested Slope,
W77-07147 2G

FORFEITURE OF WATER RIGHTS
Gilbert V Smith (Loss of Senior Appropriation Rights Through Abandonment, Forfeiture, or Adverse Possession),
W77-07279 6E

FOULING
Use of Quicklime to Increase Oyster Seed Production,
W77-07122 5C

FOURMILE RUN WATERSHED (VA)
Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

FRANCE (MASSIF-CENTRAL)
Primary Production and Biomass of Algae Populations in an Oligotrophic Lake in the French Massif Central, (In French),
W77-07398 5C

FRANCE (MELARCHEZ BASIN)
Application of Nitrogen-Isotope Studies to Hydrology and Hydrogeology--Analysis of the Peculiar Case of the Melarchez Basin (Seine-et-Marne, France) (Application de L'Etude Isotopique de L'Azote en Hydrologie et en Hydrogeologie--Analyse des Resultats Obtenus Sur un Exemple Precis: Le Bassin de Melarchez (Seine-et-Marne, France)),
W77-07154 5B

FRAZIL ICE
Frazil--The Invisible Strangler,
W77-07177 2C

FREE SURFACES
Location of Free Surface in Porous Media,
W77-07162 2F

FRESHWATER
Florida Statutes, Chapter 253--The 1969 Amendments and Proposed Legislation,
W77-07258 6E

Rappl and Hoenig Company, Incorporated v. New York State Department of Environmental Conservation (Applicability of Fresh Water Wetlands Act to Artificially Created Wetlands).
W77-07269 6E

FRESHWATER FISH
The Effects of High Vacuum on Fish,
W77-07421 5C

FROGS
The Evaluation of Toxic Effects of Chemicals in Fresh Water by Using Frog Embryos and Larvae,
W77-07132 5C

FRUIT AND VEGETABLE PROCESSING INDUSTRY
Review of Treatment Technology in the Fruit and Vegetable Processing Industry in Canada.
W77-07341 5D

FUNGAL PROPAGULES
Studies on Fungal Propagules in the Weser Estuary (German Bight): I. Quantitative Data 1974, (In German),
W77-07583 5C

FWPCA AMENDMENTS OF 1972
House Committee Marks up HR 9560,
W77-07236 5G

GALAXID
Breeding Biology of a Non-Diadromous Galaxiid, Galaxias Vulgaris Stokell, in a New Zealand River,
W77-07389 5C

GALVESTON ENTRANCE CHANNEL
Salvops-Hopper Dredge 'A. Mackenzie',
W77-07343 8D

GAME THEORY
Reservoir Operation Under Conflicting Objectives,
W77-07536 4A

GAMMARIDS
Comparative Ecophysiology of Gammarids (Crustacea: Amphipoda) From Marine, Brackish and Fresh-Water Habitats, Exposed to the Influence of Salinity-Temperature Combinations. I. Effect on Survival,
W77-07397 5C

GAMMARUS SALINUS
Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

GAS BUBBLE DISEASE
Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

Gas Bubble Disease Mortality of Atlantic Menhaden at Pilgrim Nuclear Power Station, April, 1975,
W77-07429 5C

Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

Spillway Redesign Abates Gas Supersaturation in Columbia River,
W77-07432 5G

Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

GAS CHROMATOGRAPHY
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

GAS SOLUBILITY
The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

GASES
Swim Bladder Gas Pressure of Cod in Relation to Hydrostatic Pressure,
W77-07417 5C

GASTROPODS
The Distribution and Ecology of Common Marine and Estuarine Gastropods in the Delaware Bay Area,
W77-07185 5C

GATUN LAKE (PANAMA CANAL ZONE)
Grazing Effects on Nannoplankton in Gatun Lake, Panama,
W77-07507 5C

GEESE (WILD)
Annual Contribution of Carbon, Nitrogen and Phosphorus by Migrant Canada Geese to a Hardwater Lake,
W77-07505 5C

GEOCHEMISTRY
Geochemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07489 2K

GEOGRAPHY
Hydrogeological Applications of Earth Resources Technology Satellite Landsat 1 Imagery,
W77-07339 7B

GEORGIA
United States V Diamond (Permanent Injunction During Administrative Procedures Justified by Developers Fill of Marshland Without Refuse Act Permit),
W77-07275 6E

Wassaw Island Erosion Study. Part 1: Sedimentary Framework of a Channel Margin Shoal of an Ebb Delta, Wassaw Sound, Georgia,
W77-07324 2L

GEORGIAN BAY (1968 TO 1974)
Observations on Bacteriological Conditions in the Upper Great Lakes 1968-1974,
W77-07340 5A

GEOTHERMAL ENERGY
Assessment of Geothermal Resources of the United States--1975.
W77-07476 4B

GEOTHERMAL RESOURCES (USA)
Assessment of Geothermal Resources of the United States--1975.
W77-07476 4B

GEOTHERMAL STUDIES
Geothermal Power, The 'Sleeper' in the Energy Race,
W77-07296 3E

Electric Power Generation from Geothermal Hot Water Deposits,
W77-07300 8C

Geothermal Energy: Needed, Effective Heat Transfer Equipment,
W77-07301 8G

Geothermal Systems and Power Development,
W77-07302 4B

Physical Modeling of Combined Forced and Natural Convection in Wet Geothermal Formations,
W77-07303 4B

Assessment of Geothermal Resources of the United States--1975.
W77-07476 4B

Geothermal Resources, A New Look,
W77-07477 4B

Chemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07487 2K

Convective Heat Flow from Hot Springs in the Long Valley Caldera, Mono County, California,
W77-07488 2K

Geochemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07489 2K

Reclamation Research in the Seventies, Second Progress Report,
W77-07600 8A

GILLICHTHYS MIRABILIS
Respiratory Responses of Gillichthys Mirabilis to changes in Temperature, Dissolved Oxygen and Salinity,
W77-07401 5C

GLACIERS
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

GLOSSARIES
Subject Keyword List, (Estuarine and Coastal Marine Science),
W77-07564 2L

GLUCOSE METABOLISM
The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

GOCZALKOWICE RESERVOIR (POLAND)
Preliminary Investigations on Bivalves Bivalvia of the Dam Reservoir at Goczalkowice,
W77-07440 5C

GONAD TUMORS
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

GONADAL TUMOURS
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

GONYAULAX CATENELLA
Occurrence of Toxic Bivalves in Association with the Bloom of Gonyaulax sp. in Owase Bay,
W77-07119 5C

GORKI LAKES REGION (USSR)
Planktonic Infusoria in Two Lakes of the Gorki Oblast, (In Russian),
W77-07234 5C

GOVERNMENT POLICIES
Water Resources Planning and Management Goals,
W77-07523 6B

GOVERNMENT SUPPORTS
Report of a Study of Control Agency Revenue Fees,
W77-07435 5G

LIBRARY U. OF I. URBANA-CHAMPAIGN

GOVERNMENTAL INTERRELATIONS
Federal Riverbasin Planning in the Coastal Zone: The Long Island Sound Study,
W77-07232 2L

Committee for the Consideration of the Jones Falls Sewage System V Train (Federal Common Law Concerning Water Pollution Applicable to Interstate Controversey Only),
W77-07276 6E

Report of a Study of Control Agency Revenue Fees,
W77-07435 5G

GRAND CANYON (ARIZ)
Effects of the Catastrophic Flood of December 1966, North Rim Area, Eastern Grand Canyon, Arizona,
W77-07480 2E

GRANTS
Looking Ahead (Federal Water Pollution Control Act of 1972).
W77-07235 6E

GRASSES
The Dune Book. How to Plant Grasses for Dune Stabilization,
W77-07326 2J

Study on the Herbicidal Properties of Benthiocarb; Factors Affecting Herbicidal Activity and Its Behavior in Soil, (In Japanese),
W77-07387 5B

GRAZING
Grazing Effects on Nannoplankton in Gatun Lake, Panama,
W77-07507 5C

GREAT LAKES
A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

Transports in Lake Superior,
W77-07176 5B

Frazil--The Invisible Strangler,
W77-07177 2C

Residues of 3-trifluoromethyl-4-nitrophenol (TFM) Undetected in Lake Trout and Chinook Salmon from the Upper Great Lakes,
W77-07187 5A

Observations on Bacteriological Conditions in the Upper Great Lakes 1968-1974,
W77-07340 5A

Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

GREAT LAKES BASIN COMMISSION
Evolution and Objectives of River Basin Commissions in the United States,
W77-07249 6E

GREAT LAKES HARBORS
Leaching Characteristics of Polluted Dredgings,
W77-07158 5B

GREENLAND
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

GREIFENSEE (SWITZERLAND)
Heavy Metals (Fe, Mn, Cd, Cr, Cu, Pb and Zn) in the Pelagic Zone of Lake Constance (Obersee and Untersee) and the Greifensee, (In German),
W77-07580 5A

GROSSER PLOENER SEE (GERMANY)
Changes in Phytoplankton Species Composition Since 1894 in Two Lakes in East-Holstein, Germany,
W77-07501 5C

GROUNDWATER
Nitrate in Ground Water and Its Relation to Fertilization, (In German),
W77-07112 5B

Nitrogen Contamination Sources in Shallow Ground Water, Las Vegas Area, Nevada,
W77-07141 5B

Non-Equilibrium Thermodynamics of Groundwater Flow Systems: Symmetry Properties of Phenomenological Coefficients and Considerations of Hydrodynamic Dispersion,
W77-07143 2F

Consumptive Use of Ground Water,
W77-07257 6E

Effects of Man's Activities on Groundwater Quality,
W77-07359 5B

Anthropogenically Reduced Groundwaters,
W77-07360 5B

Ground-Water Levels in Massachusetts, 1936-74,
W77-07485 4B

Water Resources Data for California, Water Year 1975--Volume 1. Colorado River Basin, Southern Great Basin from Mexican Border to Mono Lake Basin, and Pacific Slope Basins from Tijuana River to Santa Maria River.
W77-07491 7C

Water Resources Data for California, Water Year 1975--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W77-07492 7C

Water Quality and Aquitard Permeability,
W77-07551 5G

Saturated and Unsaturated Flow to Parallel Drains,
W77-07552 4A

GROUNDWATER AVAILABILITY
Preliminary Maps Showing Ground-Water Resources in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W77-07478 7C

GROUNDWATER MOVEMENT
Non-Equilibrium Thermodynamics of Groundwater Flow Systems: Symmetry Properties of Phenomenological Coefficients and Considerations of Hydrodynamic Dispersion,
W77-07143 2F

Finite-Element Analysis of Groundwater Flow in Multiaquifer Systems, I. The Behavior of Hydrological Properties in an Aquitard While Being Pumped,
W77-07148 2F

Analog-Model Analysis of Regional Three-Dimensional Flow in the Ground-Water Reservoir of Long Island, New York,
W77-07479 2F

Water Movement in Soil from Trickle Source,
W77-07550 2G

GROUNDWATER RECHARGE
Interconnection of Surface and Underground Water Resources in Southeast Durham,
W77-07149 4B

Consumptive Use of Ground Water,
W77-07257 6E

GROUNDWATER RESOURCES
Preliminary Maps Showing Ground-Water Resources in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W77-07478 7C

Major Aquifers in Deuel and Hamlin Counties, South Dakota,
W77-07483 4B

Management Model for Ground Water Development,
W77-07529 4B

GROWTH RATE
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

GROWTH RATES
Cage Culture of Channel Catfish in a Heated Effluent from a Power Plant, Thomas Hill Reservoir,
W77-07101 5C

Comparison of Artificial and Natural Sea Water as Culture Media for Juvenile Lobsters,
W77-07118 5C

Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Day Degree Growth Models for Intertidal Oysters,
W77-07376 2L

Summer Growth Depression in the Striped Mullet, Mugil Cephalus L.,
W77-07378 5C

Response of the Marine Angiosperm Phyllospadix Torreyi to Certain Environmental Variables: A Preliminary Study,
W77-07379 5C

Aspects of the Life History of Tresus Nuttallii in Elkhorn Slough,
W77-07388 2L

Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

Synergistic Effects of Phosphate and Manganese on Growth of Lake Superior Algae,
W77-07448 5C

GROWTH STAGES
Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

Development of Eggs and Embryos of the Surf Clam, Spisula Solidissima, in Synthetic Seawater,
W77-07396 5C

GULF OF ALASKA
Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska,
W77-07411 6G

GULF OF MAINE
Predicting Changes in Tidal Regime: The Open Boundary Problem,
W77-07370 8B

GULLS
Dynamics of Storage of Organochlorine Pollutants in Herring Gulls,
W77-07127 5C

HARBOR SEAL
Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

HARBORS
The Port of New Orleans and Its Dredging Program,
W77-07348 8D

HARRIS RIVER (NWT)
Experimental Sediment Addition Studies on the Harris River, N.W.T., Canada: The Effect on Macroinvertebrate Drift,
W77-07455 5C

HARVESTING
Lake Restoration Through Mechanical Harvesting of Aquatic Vegetation,
W77-07451 5G

HAWAII
City and County of Honolulu V Bennett (Determination of Private Ownership Rights in Offshore Islands and Beach Parcels),
W77-07280 6E

HAZARDOUS SUBSTANCES (POLLUTION)
Rules and Regulations for Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Domestic Trade,
W77-07254 5G

HAZARDS
Salvops-Hopper Dredge 'A. Mackenzie',
W77-07343 8D

HEAT
Thermal Pollution and Its Control,
W77-07245 5G

HEAT BALANCE
Evaporation of Wastewater from Mountain Cabins,
W77-07284 5E

HEAT FLOW
Physical Modeling of Combined Forced and Natural Convection in Wet Geothermal Formations,
W77-07303 4B

HEATED WATER
A Scientific and Legal Look at Thermal Pollution,
W77-07256 6E

HEAVY METALS
The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Uptake and Accumulation of the Nickel Ion by Mytilus edulis,
W77-07198 5C

Subtidal and Intertidal Marine Fouling on Artificial Substrata in Northern Puget Sound, Washington,
W77-07201 5C

Large-Scale Reverse Osmosis Processing of Metal Finishing Rinse Waters,
W77-07207 5D

Waste Water Reclamation System Ups Productivity, Cuts Water Use,
W77-07210 5D

Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

Heavy Metals (Fe, Mn, Cd, Cr, Cu, Pb and Zn) in the Pelagic Zone of Lake Constance (Obersee and Untersee) and the Greifensee, (In German),
W77-07580 5A

HEINZ BODY HEMOLYTIC ANEMIA
Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

HELIUM
A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

HEMATOLOGIC CHANGES
Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

HEMATOLOGY
Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

Hematology of Juvenile Striped Bass, Morone Saxatilis (Walbaum), Acclimated to Different Environmental Conditions,
W77-07400 5C

Seasonal Changes in Hematology of Rainbow Trout, Salmo Gairdneri,
W77-07403 5C

HEMOGLOBIN
Seasonal Changes in Hematology of Rainbow Trout, Salmo Gairdneri,
W77-07403 5C

HERBICIDES
Occurrence and Determination of a Herbicide Benthiocarb in Rivers and Agricultural Drainages,
W77-07361 5A

Study on the Herbicidal Properties of Benthiocarb; Factors Affecting Herbicidal Activity and Its Behavior in Soil, (In Japanese),
W77-07387 5B

HERRING
Effects of Benzene (A Toxic Component of Petroleum) on Spawning Pacific Herring, Clupea harengus pallasi,
W77-07137 5C

HERRING GULLS
Dynamics of Storage of Organochlorine Pollutants in Herring Gulls,
W77-07127 5C

HEXOSE MONOPHOSPHATE SHUNT
The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

HIERARCHICAL APPROACH
Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

HIGH QUALITY EFFLUENTS
Proceedings, Technology Transfer Seminar on High Quality Effluents,
W77-07330 5D

HIGH VACUUM
The Effects of High Vacuum on Fish,
W77-07421 5C

HISTOPATHOLOGY
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

HISTORIC FLOODS
Apparent Regional Skew,
W77-07484 2E

HUMAN DISEASES
Geologists Claim Health Can be Traced to Rocks,
W77-07290 5B

A Study of Environment Sanitation on the Wells in Jungneung-Dong Area, Seoul, (In Korean),
W77-07475 5B

HUMIC ACIDS
Interactions of Cupric Ion with Humic Acid,
W77-07104 5B

HUMUS
A Study on Standing Crops in Phragmites Communis Communities and Their Environmental Factors, (In Korean),
W77-07335 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

HURRICANE AGNES
Predictability of Effects of a Severe Local Storm in Pennsylvania,
W77-07369 2B

HYDRAULIC CONDUCTIVITY
Horizon Hydraulic Conductivities Determined In Situ for the Wilderness, Mexico and Menfro Soils and Used to Predict Soil Water Content,
W77-07103 2G

HYDRAULIC JUMP
Hydraulic Jumps and Waves at Abrupt Drops,
W77-07163 8B

HYDRAULICS
Parameter Study of Variables Affecting the Performance of a Hydraulic Pipeline Dredge Model,
W77-07346 8D

Instability in Tidal Flow Computational Schemes,
W77-07548 2L

HYDROBIOLOGY
A Bibliography of Soviet Literature on Freshwater Hydrobiology and Related Problems for 1975: Part 21, (In Russian),
W77-07402 5C

Annotated Bibliography on Hydrobiology and Hydrochemistry of the Kara Kum Canal 1955-74, (In Russian),
W77-07540 2I

HYDRODYNAMIC DISPERSION
Non-Equilibrium Thermodynamics of Groundwater Flow Systems: Symmetry Properties of Phenomenological Coefficients and Considerations of Hydrodynamic Dispersion,
W77-07143 2F

HYDROELECTRIC POWER
Experiments on the Resistance of Fish to Rapid Increase in Hydrostatic Pressure,
W77-07416 5C

Effects of Pressure on Survival of Six Species of Fish,
W77-07424 5C

Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

HYDROGEN ION CONCENTRATION
Egg and Larval Survival of White Suckers (Catostomus Commersoni) at Low pH,
W77-07184 5C

The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

HYDROGEN IONS
Study of the State of Water on the Surface of H+, NA+, MG2+ Saturated Kaolinite by the NMR Method, (In Russian),
W77-07241 2G

HYDROGEN SULFIDE
Mineralizing Microbial Activity in Lake Faro,
W77-07418 5C

HYDROLOGIC DATA
Water Resources Data for California, Water Year 1975--Volume 1. Colorado River Basin, Southern Great Basin from Mexican Border to Mono Lake Basin, and Pacific Slope Basins from Tijuana River to Santa Maria River.
W77-07491 7C

Water Resources Data for California, Water Year 1975--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W77-07492 7C

Surface Water Supply of the United States, 1966-70--Part 15. Alaska.
W77-07493 7C

Economic Value of Low Flow Data,
W77-07537 5D

HYDROLOGIC PROPERTIES
Hydrographic Properties, MESA New York Bight Atlas Monograph 1,
W77-07328 2L

HYDROLOGY
Hydrology Research Division, Annual Progress Reports and Short Research Notes 1975-76.
W77-07336 6E

Systems Approach and Watershed Models,
W77-07556 2A

Snow and Ice Hydrology in the United States--Current Status and Future Directions,
W77-07565 2C

HYDROSTATIC PRESSURE
Effects of Combination of Temperature and Hydrostatic Pressure on Asterias rubens,
W77-07308 5C

Swim Bladder Gas Pressure of Cod in Relation to Hydrostatic Pressure,
W77-07417 5C

The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

Effects of Pressure on Survival of Six Species of Fish,
W77-07424 5C

Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

HYDROSTATIC PRESSURE INCREASE
Experiments on the Resistance of Fish to Rapid Increase in Hydrostatic Pressure,
W77-07416 5C

HYPOLIMNION
Sediment Respiration in Six Italian Lakes in Different Trophic Conditions,
W77-07461 5C

Lake Restoration by Bottom Water Siphoning, (In German),
W77-07577 5G

ICE
Parameterization of Depositional Ice Growth,
W77-07171 2B

Snow and Ice Hydrology in the United States--Current Status and Future Directions,
W77-07565 2C

ICE CAPS
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

ICE COVER
Rectilinear Leads and Internal Motions in the Ice Pack of the Western Arctic Ocean,
W77-07373 2C

ICE LEADS
Rectilinear Leads and Internal Motions in the Ice Pack of the Western Arctic Ocean,
W77-07373 2C

ICE PACKS
Rectilinear Leads and Internal Motions in the Ice Pack of the Western Arctic Ocean,
W77-07373 2C

IDAHO
Encroachments on Navigable Lake.
W77-07264 6E

Appropriation of Water--Permits, Certificates and Licenses--Survey.
W77-07265 6E

Schultz v Atkins (Claim for Easement Based on Contract for Water Rights Between Predecessors in Title).
W77-07268 6E

Olson V Bedke (Failure of Tenant to Put Water on Leased Land to Beneficial Use).
W77-07272 6E

Gilbert V Smith (Loss of Senior Appropriation Rights Through Abandonment, Forfeiture, or Adverse Possession),
W77-07279 6E

IDOTEA BALTICA
Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

IDRONOVA HYDRODYNAMIC FILTERS
Two New Methods of Sludge Removal,
W77-07224 5D

ILLINOIS
Design Criteria for Hydrologic Extremes,
W77-07165 8B

Maximum 5-Minute and Hourly Rainfalls on Metromex Network, 1971-1975,
W77-07374 2B

IMPORTED WATER
The Feasibility of a Water Importation Project for South Florida,
W77-07259 6E

INCINERATION
Evaporation and Thermal Oxidation of Liquid Effluents--By Burning with Flame in Combustion Chamber.
W77-07227 5D

INCIPIENT LETHAL LEVEL
Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

INCOME
Report of a Study of Control Agency Revenue Fees,
W77-07435 5G

INDEXING
Subject Keyword List, (Estuarine and Coastal Marine Science),
W77-07564 2L

INDIA
Imperatives of Water Resources Planning in the Developing Economy of India,
W77-07555 6A

INDUSTRIAL NITROGEN SOURCES
Sources of Nitrogen as a Water Pollutant: Industrial Waste Water,
W77-07521 5B

INDUSTRIAL WASTES
An Industrial View of Biological Monitoring,
W77-07126 5A

Toxic Waste Disposal,
W77-07209 5G

How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

Proposed Toxic Pollutant Effluent Standard for Polychlorinated Biphenyls,
W77-07253 6E

Economic Aspects of Pollution Abatement, Part 1,
W77-07260 6E

Legal Aspects of Changes Brought About by Buckeye's Pollution Abatement Program, Part II,
W77-07261 6E

United States V Cutter Laboratories, Inc (Civil Liability of a Permittee for Whom no Industrial Effluent Limitations or Guidelines Exist).
W77-07274 6E

Wastewater and Sludge Control in the Canadian Metal Finishing Industry, Segment Including Chemical, Electrolytic Treatment; Electrochemical Machining and Polishing; Cyanide Hardening,
W77-07333 5D

Sources of Nitrogen as a Water Pollutant: Industrial Waste Water,
W77-07521 5B

Water Quality Criteria and Waste Water Treatment,
W77-07522 5D

Proceedings, Water Pollution Abatement Technology in the Pulp and Paper Industry, (1975),
W77-07562 5D

INFILTRATION
Solution of Equation for Two-Dimensional Infiltration Problems,
W77-07142 2G

Suction Head at Wet Front in Unsaturated-Flow Problems--A New Definition,
W77-07144 2G

Solutions to Green-Ampt Infiltration Equation,
W77-07553 4A

INFORMATION RETRIEVAL
Subject Keyword List, (Estuarine and Coastal Marine Science),
W77-07564 2L

INFORMATION SYSTEMS
The Economic Basis of Resource Information Systems: The Case of Streamflow Data Network Design,
W77-07534 7A

INHIBITORS
The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

INJECTION WELLS
Deep Well Injection: Sweeping the Problem Under the Carpet,
W77-07295 5G

INJUNCTIVE RELIEF
Port Acres Sportman's Club V Mann (Public's Right to Use Navigable Waters Over Privately Owned Submerged Lands).
W77-07270 6E

United States V Diamond (Permanent Injunction During Administrative Procedures Justified by Developers Fill of Marshland Without Refuse Act Permit),
W77-07275 6E

INLAND WATERWAYS
Proceedings of the Seventh Dredging Seminar.
W77-07342 8D

Salvops-Hopper Dredge 'A. Mackenzie',
W77-07343 8D

INSECTICIDES
The Effect of the Use of Pesticides and Fertilizers in the Water Protection Zone with Sources of Artificial Replenishment of Underground Water Reserves, (In Russian),
W77-07107 5B

Apparent Potentiation of the Cotton Defoliant DEF by Methyl Parathion in Mosquitofish,
W77-07204 5C

Fate of the Organophosphate Insecticide Parathion in the Freshwater Invertebrates,
W77-07285 5C

Outbreak of Chironomid Midge in a Polluted River and the Chemical Control of the Larvae, (In Japanese),
W77-07585 5G

INSTALLATION
Installation Tips on Large Submersibles,
W77-07289 8C

INSTITUTIONAL CONSTRAINTS
Federal Riverbasin Planning in the Coastal Zone: The Long Island Sound Study,
W77-07232 2L

INSTREAM FLOW REGIMENS
Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources,
W77-07192 5C

INSTRUMENTATION
A Light-Weight and Cheap Depth Sampler,
W77-07155 5A

Digital Raingage Recorder,
W77-07172 2B

Acoustic Measurement of Sediment Transport,
W77-07338 2J

INTAKE STRUCTURES
Frazil--The Invisible Strangler,
W77-07177 2C

INTERMONTANE LAKES
Upwelling in a Model of an Intermontane Lake,
W77-07469 5B

INTERNATIONAL BOUNDARY AND WATER COMMISSION
Some Suggestions for the Management of International River Basins,
W77-07250 6E

INTERNATIONAL CONFERENCE ON MARINE POLLUTION
The 1973 IMCO Convention: Tightening the Controls on Operational Oil Pollution from Tankers,
W77-07244 5G

INTERNATIONAL HYDROLOGIC DECADE
Snow and Ice Hydrology in the United States--Current Status and Future Directions,
W77-07565 2C

INTERNATIONAL LAW
Scientific and Scenic Rivers Act: Commentary and Model Statute,
W77-07231 6G

Some Suggestions for the Management of International River Basins,
W77-07250 6E

INTERNATIONAL WATERS
Rules and Regulations for Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Domestic Trade,
W77-07254 5G

INTERSTATE COMPACT
Pecos River Compact.
W77-07262 6E

INVERTEBRATES
The Distribution and Ecology of Common Marine and Estuarine Gastropods in the Delaware Bay Area,
W77-07185 5C

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

Fate of the Organophosphate Insecticide Parathion in the Freshwater Invertebrates,
W77-07285 5C

Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

ION EXCHANGE
Treating Effluent Containing Ionic Compounds Preferably Dyes--By Adding Salt Generator of Opposite Charge to Effluent Ion Then Ultra-Filtering.
W77-07223 5D

Seasonal Variation in Sediment-Water Exchange of Nutrient Ions in Lake Esrom,
W77-07467 5C

IONS
The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

IOWA
Algal Response to Nutrient Inputs in Some Iowa Lakes,
W77-07515 5C

IRON
The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

IRON

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

Calcium Carbonate in the Revomal of Iron and Lead from Dilute Waste Water,
W77-07208 5D

Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

IRRIGATION
Olson V Bedke (Failure of Tenant to Put Water on Leased Land to Beneficial Use).
W77-07272 6E

Water Movement in Soil from Trickle Source,
W77-07550 2G

Solutions to Green-Ampt Infiltration Equation,
W77-07553 4A

IRRIGATION DITCHES
Wood V Woodcock (Rights of Adjoining Landowners to Seepage Water from Joint Irrigation Ditch),
W77-07278 6E

IRRIGATION SYSTEMS
Olson V Bedke (Failure of Tenant to Put Water on Leased Land to Beneficial Use).
W77-07272 6E

Reducing Power Consumption in Irrigation Systems with the Aid of a Mathematical Model for Pipe Dimensioning,
W77-07547 3F

IRRIGATION WELLS
The Chief Driller's Report on JCCIP,
W77-07288 8C

Water-Level Records for the Northern High Plains of Colorado, 1973-77,
W77-07486 4B

ISLANDS
City and County of Honolulu V Bennett (Determination of Private Ownership Rights in Offshore Islands and Beach Parcels),
W77-07280 6E

ISOTOPIC STUDIES
Application of Nitrogen-Isotope Studies to Hydrology and Hydrogeology--Analysis of the Peculiar Case of the Melarchez Basin (Seine-et-Marne, France) (Application de L'Etude Isotopique de L'Azote en Hydrologie et en Hydrogeologie--Analyse des Resultats Obtenus Sur un Exemple Precis: Le Bassin de Melarchez (Seine-et-Marne, France)),
W77-07154 5B

Thermal and Isotopic Studies on the Crater Lakes of Monticchio (Lucania, Italy), (In Italian),
W77-07392 2H

ISRAEL
Power Plant Site Evaluation: The Case of the Sharon Plant in Israel,
W77-07546 6G

ITALY
Sediment Respiration in Six Italian Lakes in Different Trophic Conditions,
W77-07461 5C

IVORY-COAST (LAMTO SAVANNA)
Deposition of Mineral Nitrogen by Rain in the Lamto Savanna, (In French),
W77-07574 5B

IZMIR BAY (TURKEY)
Accumulation and Distribution of Trace Metals and Radionuclides in Marine Organisms (Particularly Tapes Decussatus L.) in the Izmir Bay Area, Turkey,
W77-07395 5C

JAPAN
Occurrence and Determination of a Herbicide Benthiocarb in Rivers and Agricultural Drainages,
W77-07361 5A

JAPAN (KASUMIGAURA AREA)
An Investigation on the Disposal of Pig Excreta in Kasumigaura Area, (In Japanese),
W77-07571 5B

JOINT OPERATION
Gains from Joint Operation of Multiple Reservoir Systems,
W77-07533 4A

JOINTS (CONNECTIONS)
Installation Tips on Large Submersibles,
W77-07289 8C

JONES FALLS (MD)
Committee for the Consideration of the Jones Falls Sewage System V Train (Federal Common Law Concerning Water Pollution Applicable to Interstate Controversey Only),
W77-07276 6E

JP5 JET FUEL
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

JUDICIAL DECISIONS
Wood V Woodcock (Rights of Adjoining Landowners to Seepage Water from Joint Irrigation Ditch),
W77-07278 6E

Gilbert V Smith (Loss of Senior Appropriation Rights Through Abandonment, Forfeiture, or Adverse Possession),
W77-07279 6E

Legal Decisions and Opinions in Pollution Cases,
W77-07436 5G

JUNGNEUNG-DONG (KOREA)
A Study of Environment Sanitation on the Wells in Jungneung-Dong Area, Seoul, (In Korean),
W77-07475 5B

JUVENILE FISH
Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

Experimental Study of the Nitrogen Excretion of Bass (Dicentrarchus labrax) during Growth. I. Effects of Temperature and Weight on the Excretion of Ammonia and Urea,
W77-07313 5C

JUVENILE GROWTH STAGE
Comparison of Artificial and Natural Sea Water as Culture Media for Juvenile Lobsters,
W77-07118 5C

JUVENILE SALMONIDS
Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

JUVENILE STEELHEAD
Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

KANSAS
Artesian Wells and Storage Reservoirs, and Works Connected Therewith.
W77-07263 6E

KAOLINITE
Study of the State of Water on the Surface of H+, NA+, MG2+ Saturated Kaolinite by the NMR Method, (In Russian),
W77-07241 2G

KARA-KUM CANAL (TURKMEN-SSR)
Annotated Bibliography on Hydrobiology and Hydrochemistry of the Kara Kum Canal 1955-74, (In Russian),
W77-07540 2I

KAWARTHA LAKES (ONTARIO)
Lake Restoration Through Mechanical Harvesting of Aquatic Vegetation,
W77-07451 5G

KENTUCKY
United States V Ashland Oil and Transportation Company (Use of the Word 'Navigable Waters' in the Federal Water Pollution Control Act Amendments of 1972 Held to Mean 'Waters of the United States').
W77-07273 6E

KIEV RESERVOIR (UKRANIAN SSR)
Distribution Thickness and Certain Physical and Chemical Properties of Bottom Sediments in the Kiev Reservoir, (In Russian),
W77-07321 2I

KIEV RESERVOIR (USSR)
The Distribution of Residual Quantities of DDT in the Organs and Tissues of Fish of the Kiev Reservoir, (In Russian),
W77-07572 5B

KINETICS
Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

Effect of Nutrient Enrichment on the Heterotrophic Uptake of Organic Solutes by Microorganisms,
W77-07466 5C

KJELDHAL NITROGEN MEASUREMENTS
Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

KONAKOVO POWER STATION (USSR)
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

KUBAN (USSR)
The Effect of Collector Discharge Water from Rice Fields on the Zooplankton of Some Kuban Estuaries, (In Russian),
W77-07331 5C

KURTLI RESERVOIR (USSR)
Phytomicrobenthos of the Kurtli Reservoir, (In Russian),
W77-07596 5C

LABORATORY EQUIPMENT
Laboratory Apparatus for Providing Diel Temperature Regimes for Aquatic Animals,
W77-07188 5C

LABORATORY TESTS
Specific Yield Determinations from a Consolidated Sandstone Aquifer,
W77-07153 2F

Compressibility and Strength of Compacted Dredgings,
W77-07350 8D

Permeability and Drainage Characteristics of Dredgings,
W77-07351 8D

Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

The Effects of High Vacuum on Fish,
W77-07421 5C

Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

LABRADOR
Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

LAC HERTEL (QUEBEC)
Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

LAGOONS
Wind and Current Patterns in an Arctic Coast Lagoon,
W77-07323 2L

LAKE ANDSJON (SWEDEN)
Macrophytes and Phosphorus in Lake Andsjon, Central Sweden, (In Swedish),
W77-07582 5C

LAKE BASINS
Post-Glacial History of Mirror Lake and Its Watershed In New Hampshire, U.S.A.: An Initial Report,
W77-07472 5C

LAKE CONSTANCE (SWITZERLAND)
Models for Simulation of Eutrophication of Lakes for Lake Constance (Bodensee-Obersee): I. Data from Lake Constance used in Simulation Models, (In German),
W77-07579 5C

Heavy Metals (Fe, Mn, Cd, Cr, Cu, Pb and Zn) in the Pelagic Zone of Lake Constance (Obersee and Untersee) and the Greifensee, (In German),
W77-07580 5A

LAKE DOJRAN (YUGOSLAVIA)
Composition and Dynamics of the Bottom Animals in the Littoral Zone of Dojran Lake, Macedonia,
W77-07457 5C

LAKE ERIE
A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

LAKE ESROM (DENMARK)
Seasonal Variation in Sediment-Water Exchange of Nutrient Ions in Lake Esrom,
W77-07467 5C

LAKE FARO (ITALY)
Mineralizing Microbial Activity in Lake Faro,
W77-07418 5C

LAKE GEORGE (NY)
The Effect of Food Concentration and Temperature on Respiration and Excretion in Herbivorous Zooplankton,
W77-07502 5C

LAKE HURON
A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

Observations on Bacteriological Conditions in the Upper Great Lakes 1968-1974,
W77-07340 5A

Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

LAKE IZABAL (GUATEMALA)
Lake Izabal, Guatemala,
W77-07504 5C

LAKE KASUMIGAURA BASIN (JAPAN)
Relation Between the Amounts of Fertilization and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: 1. On the Relation Between the Amount of Fertilizer Application and the Specific Pollution Loads of Nitrogen and Phosphorus in Main Streams Flowing into Lake Nishiura, (In Japanese),
W77-07568 5B

LAKE KINNERET (ISRAEL)
The Role of Phosphate in Eutrophication. Stimulation of Plankton Growth and Residence Times of Inorganic Phosphate in Lake Kinneret Water,
W77-07517 5C

LAKE MICHIGAN
Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

LAKE OBELIJA (LITHUANIA SSR)
Comparative Characteristics of the Parasite Fauna of Bream in Lakes Dusios, Obelijos, Salvantu and Galstas, Which Have Different Thermal Regimes, (In Russian),
W77-07312 2H

LAKE ONTARIO
A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

Effect of Nutrient Enrichment on the Heterotrophic Uptake of Organic Solutes by Microorganisms,
W77-07466 5C

Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-07549 2H

Satellite Observations of Water Quality,
W77-07554 5A

LAKE PICCOLO (ITALY)
Thermal and Isotopic Studies on the Crater Lakes of Monticchio (Lucania, Italy), (In Italian),
W77-07392 2H

LAKE PLUSSEE (GERMANY)
The Influence of Spring Circulation on Zooplankton Dynamics in the Plussee,
W77-07518 5C

LAKE RENEWAL
Influence of the Drainage Basin on the Eutrophication of the a-Mesotrophic Lake Piaseczno and Diseutrophication of the Pond Lake Bikcze,
W77-07452 5C

LAKE RESTORATION
Lake Restoration Through Mechanical Harvesting of Aquatic Vegetation,
W77-07451 5G

Response to Eutrophic Shagawa Lake, Minnesota, U.S.A., to Point-Source, Phosphorus Reduction,
W77-07519 5C

Lake Restoration by Bottom Water Siphoning, (In German),
W77-07577 5G

LAKE SALLIE (MINN)
Areal Distribution and Stratigraphy of Diatoms in the Sediments of Lake Sallie, Minnesota,
W77-07481 5C

LAKE SEDIMENTS
Nitrogen, Phosphorus, Particulate and Colloidal Carbon Content of Sedimenting Seston of a Hard-Water Lake,
W77-07441 5C

Sediment Respiration in Six Italian Lakes in Different Trophic Conditions,
W77-07461 5C

LAKE SIBAYA (SOUTH AFRICA)
Preliminary Estimates of Production by a Calanoid Copepod in Subtropical Lake Sibaya,
W77-07500 5C

LAKE SUPERIOR
Transports in Lake Superior,
W77-07176 5B

Observations on Bacteriological Conditions in the Upper Great Lakes 1968-1974,
W77-07340 5A

U. OF I. URBANA-CHAMP.

LAKE SUPERIOR

Sub-Thermocline Biomass Concentration Detected by Transmissometer in Lake Superior,
W77-07447 5C

Synergistic Effects of Phosphate and Manganese on Growth of Lake Superior Algae,
W77-07448 5C

Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

Photosynthetic Rates in Lake Superior,
W77-07450 5C

LAKE TAHOE (CAL-NEV)

Spatial and Temporal Changes in the Primary Productivity of Lake Tahoe, California-Nevada Between 1959 and 1971,
W77-07443 5C

LAKE TAHOE (CALIF-NEV)

The Structure of Phytoplankton Associations in Lake Tahoe (California-Nevada),
W77-07473 5C

LAKE TITICACA (PERU)

A Survey of the Biological Limnology of Lake Titicaca,
W77-07503 5C

LAKE TITICACA (PERU-BOLIVIA)

A Survey of the Physical and Chemical Limnology of Lake Titicaca,
W77-07460 5C

LAKE TROUT

Residues of 3-trifluoromethyl-4-nitrophenol (TFM) Undetected in Lake Trout and Chinook Salmon from the Upper Great Lakes,
W77-07187 5A

Effects of Pressure on Survival of Six Species of Fish,
W77-07424 5C

LAKES

Far Field Circulation Velocities in Shallow Lakes,
W77-07164 2H

Water Quality and Chemical Models,
W77-07246 5C

Succession Rates in Lake Phytoplankton Communities,
W77-07442 5C

Lake Restoration Through Mechanical Harvesting of Aquatic Vegetation,
W77-07451 5G

Composition and Dynamics of the Bottom Animals in the Littoral Zone of Dojran Lake, Macedonia,
W77-07457 5C

Pigment Cycle in a North German Lake,
W77-07459 5C

A Survey of the Physical and Chemical Limnology of Lake Titicaca,
W77-07460 5C

Modeling the Annual Thermal Evolution of Mid-Latitude Lakes,
W77-07462 2H

An Organic Carbon Budget for an Oligotrophic Lake In New Hampshire, U.S.A.,
W77-07470 5C

Areal Distribution and Stratigraphy of Diatoms in the Sediments of Lake Sallie, Minnesota,
W77-07481 5C

Surface Water Supply of the United States, 1966-70--Part 15. Alaska.
W77-07493 7C

Lake Izabal, Guatemala,
W77-07504 5C

Strategies for Existence of Zooplankton Prey in Homogeneous Environments,
W77-07509 5C

Similarities and Differences in the Chemical Composition of Waters from West, Central, and East Africa,
W77-07510 5A

Response to Eutrophic Shagawa Lake, Minnesota, U.S.A., to Point-Source, Phosphorus Reduction,
W77-07519 5C

Meromixis in Ulmener Maar (Germany).
W77-07520 5C

LAMPREYS

Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

Oxygen Consumption, Ventilatory Frequency and Heart Rate of Lampreys (Lampetra Fluviatilis) During Their Spawning Run,
W77-07399 5C

LAND RECLAMATION

Concepts for the Reclamation of Dredged Material,
W77-07352 8D

LAND RESOURCES

Hydrogeological Applications of Earth Resources Technology Satellite Landsat 1 Imagery,
W77-07339 7B

LANDFILLS

United States V Diamond (Permanent Injunction During Administrative Procedures Justified by Developers Fill of Marshland Without Refuse Act Permit),
W77-07275 6E

LANDSAT 1

Hydrogeological Applications of Earth Resources Technology Satellite Landsat 1 Imagery,
W77-07339 7B

LANDSAT-1 DATA

Satellite Observations of Water Quality,
W77-07554 5A

LANDSAT DATA

Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

LARVAE

Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

LARVAL GROWTH STAGE

The Effect of Salinity and Cyclic Temperature on Larval Development of the Mud-Crab Rhithropanopeus Harrisii (Brachyura: Xanthidae) Reared in the Laboratory,
W77-07384 5C

LARVICIDE

Residues of 3-trifluoromethyl-4-nitrophenol (TFM) Undetected in Lake Trout and Chinook Salmon from the Upper Great Lakes,
W77-07187 5A

LARVICIDES

Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

LAS VEGAS VALLEY (NEV)

Nitrogen Contamination Sources in Shallow Ground Water, Las Vegas Area, Nevada,
W77-07141 5B

LATENT MORTALITY

Survival and Reproduction of Gammarus spp. (Amphipoda) Following Short-Term Exposure to Elevated Temperatures,
W77-07125 5C

LAWRENCE LAKE (MICH)

Nitrogen, Phosphorus, Particulate and Colloidal Carbon Content of Sedimenting Seston of a Hard-Water Lake,
W77-07441 5C

The Release of Dissolved Organic Carbon from Submersed Aquatic Macrophytes: Diel, Seasonal and Community Relationships,
W77-07516 5C

LEACHING

Interactions of Cupric Ion with Humic Acid,
W77-07104 5B

LEACHING CHARACTERISTICS

Leaching Characteristics of Polluted Dredgings,
W77-07158 5B

LEAD

Variations in the Lead, Zinc and Calcium Content of Dendrobaena rubida (Oligochaeta) in a Base Metal Mining Area,
W77-07135 5C

Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

Calcium Carbonate in the Revomal of Iron and Lead from Dilute Waste Water,
W77-07208 5D

Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

LEAKY AQUIFER FUNCTION

Calculation of the Leaky Aquifer Function,
W77-07156 2F

LEAKY AQUIFERS

Type Curves for Analysis of Pump Tests in Leaky Strip Aquifers,
W77-07145 2F

LEGAL ASPECTS

Legal Decisions and Opinions in Pollution Cases,
W77-07436 5G

LEGISLATION
The Evolution of Approaches to Flood Damage Reduction,
W77-07248 6F

LETHAL DECOMPRESSION
The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

LETHAL LIMIT
Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

Hygienic Standardization of Disodium Salts of Meta-and Para-Diisoprop ylbenzene in Water Bodies, (In Russian),
W77-07590 5C

LETHAL LIMITS
Effects of Increased Water Temperature on Daphnia Pulex,
W77-07130 5C

LEVANTINE SEA
Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

LICENSES
Schultz v Atkins (Claim for Easement Based on Contract for Water Rights Between Predecessors in Title).
W77-07268 6E

LICHENS
Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

LIFE HISTORY STUDIES
A Contribution to the Life History of the Cunner, Tautogolabrus Adspersus, in Fishers Island Sound, Connecticut,
W77-07377 5C

Life History Patterns in the Coastal Shiner, Notropis Petersoni, Fowler,
W77-07386 5C

Aspects of the Life History of Tresus Nuttallii in Elkhorn Slough,
W77-07388 2L

Life History Notes for a Population of Slimy Sculpin (Cottus Cognatus) in an Alaskan Arctic Stream,
W77-07393 5C

LIGHT
Influence of Light and Temperature on the Photosynthetic Rate of Marine Benthic Diatoms,
W77-07385 5C

Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

LIGHT PENETRATION
Sub-Thermocline Biomass Concentration Detected by Transmissometer in Lake Superior,
W77-07447 5C

LIMESTONE
Horizon Hydraulic Conductivities Determined In Situ for the Wilderness, Mexico and Menfro Soils and Used to Predict Soil Water Content,
W77-07103 2G

LIMNODRILUS
The Oligochaete Communities of a Lowland Stream and Their Value as Indicators of Organic Pollution,
W77-07307 5C

LIMNOLOGY
Lake Izabal, Guatemala,
W77-07504 5C

The Lentic and Lotic Freshwater Types of Marion Island (Sub-Antarctic): A Limnological Study,
W77-07514 5C

LIPIDS
Alteration in the Toxicity of Tissue Lipids with the Adaptation of Fishes to Osmotic Pressure Changes in the Environment,
W77-07120 5C

Oil-Oxidizing Bacteria of the River Yenisei, (In Russian),
W77-07532 5C

LIQUID WASTES
Electrolytic Treatment of Chromate and Cyanide Wastes with Packed Bipolar Cell, (In Japanese),
W77-07211 5D

LITTORAL
The Differential Use of Chironomidae and Ceratopogonidae (Diptera) in the Monitoring of Various Aquatic Wastes,
W77-07282 5A

Composition and Dynamics of the Bottom Animals in the Littoral Zone of Dojran Lake, Macedonia,
W77-07457 5C

LOACH
Uptake of Dissolved Ammonium and Nitrate Ion by the Fry of Common Carp, Crucian Carp and Loach from Surrounding Water, (In Japanese),
W77-07314 5C

LOBSTERS
Comparison of Artificial and Natural Sea Water as Culture Media for Juvenile Lobsters,
W77-07118 5C

LOCAL GOVERNMENTS
Report of a Study of Control Agency Revenue Fees,
W77-07435 5G

LOCAL POPULATION
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

LONG COVE (MAINE)
The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

LONG ISLAND
Long Island Beach Pollution: June 1976,
W77-07325 5B

LONG ISLAND (NY)
Analog-Model Analysis of Regional Three-Dimensional Flow in the Ground-Water Reservoir of Long Island, New York,
W77-07479 2F

LONG ISLAND SOUND STUDY
Federal Riverbasin Planning in the Coastal Zone: The Long Island Sound Study,
W77-07232 2L

LONG VALLEY CALDERA (CALIF)
Convective Heat Flow from Hot Springs in the Long Valley Caldera, Mono County, California,
W77-07488 2K

LONG VALLEY (CALIF)
Chemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07487 2K

Geochemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07489 2K

LOUISIANA
Nuckolls V Louisiana State Highway Department (Liability for Unauthorized Alteration of Natural Drain),
W77-07277 6E

Nutrient Transformations in Louisiana Salt Marsh Soils,
W77-07319 5C

Maintenance Dredging in the New Orleans District, US Army Corps of Engineers,
W77-07347 8D

The Port of New Orleans and Its Dredging Program,
W77-07348 8D

LOW FLOW
Economic Value of Low Flow Data,
W77-07537 5D

LOWER COLORADO RIVER REGION
Preliminary Maps Showing Ground-Water Resources in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W77-07478 7C

LOWER RIO BERMEJO BASIN (ARG-PARA)
Reconnaissance of Sediment Transport and Channel Morphology in the Lower Rio Bermejo Basin, Argentina--With a Section on Reconnaissance of the Lower Rio Pilcomayo Basin, Argentina and Paraguay,
W77-07490 2J

LOWER RIO PILCOMAYO BASIN (ARG)
Reconnaissance of Sediment Transport and Channel Morphology in the Lower Rio Bermejo Basin, Argentina--With a Section on Reconnaissance of the Lower Rio Pilcomayo Basin, Argentina and Paraguay,
W77-07490 2J

LUNZER OBERSEE (AUSTRIA)
The Vertical Distribution of Plankton Rotifers in a Small Alpine Lake with a Sharp Oxygen Depletion (Lunzer Obersee),
W77-07456 5C

MACKENZIE DELTA (NWT)
Aspects of Zoobenthos Ecology of the Mackenzie Delta, N.W.T.,
W77-07499 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

MACROPHYTES
Macrophytes and Phosphorus in Lake Andsjon, Central Sweden, (In Swedish),
W77-07582 5C

MAGNE-SET
New Lost Circulation Remedy is Easy to Use.
W77-07299 8G

MAGNESIUM IONS
Study of the State of Water on the Surface of H+, NA+, MG2+ Saturated Kaolinite by the NMR Method, (In Russian),
W77-07241 2G

MAINE
The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

Effects of Pressure on Survival of Six Species of Fish,
W77-07424 5C

MAINTENANCE
Maintenance Dredging in the New Orleans District, US Army Corps of Engineers,
W77-07347 8D

MALAYA
Algal Productivity of Natural and Artificially Enriched Fresh Waters in Malaya,
W77-07471 5C

MANAGEMENT
Water Resources Planning and Management Goals,
W77-07523 6B

Decision-Making for Environmental Resources Management,
W77-07542 6G

Towards System Models for Water Resource Management,
W77-07544 6A

MANGANESE
The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Environmental Dependence of Manganese and Zinc in the Scales of Atlantic Salmon, Salmo Salar (L) and Brown Trout, Salmo Trutta (L),
W77-07203 5C

Synergistic Effects of Phosphate and Manganese on Growth of Lake Superior Algae,
W77-07448 5C

Effect of Organic Acids on Experimental Manganese Isolation from Bottom Sediments, (In Russian),
W77-07597 5B

MANNINGS EQUATION
Manning N and the Overland Flow Equation,
W77-07371 2E

MAPPING
Preliminary Maps Showing Ground-Water Resources in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W77-07478 7C

Symap Computer Projections of Summer Zooplankton Populations in Van Lake, Montana,
W77-07511 7C

MAPS
Physical Environment Atlas of Coastal Alabama,
W77-07322 2L

Preliminary Maps Showing Ground-Water Resources in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W77-07478 7C

MARINE ALGAE
Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms-II. Lethal Concentrations of Oil-Spill Emulsifier Components for Marine Phytoplankton, (In Japanese),
W77-07182 5C

MARINE ANIMALS
Subtidal and Intertidal Marine Fouling on Artificial Substrata in Northern Puget Sound, Washington,
W77-07201 5C

MARINE FISH
The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

Swim Bladder Gas Pressure of Cod in Relation to Hydrostatic Pressure,
W77-07417 5C

MARINE FOULING
Subtidal and Intertidal Marine Fouling on Artificial Substrata in Northern Puget Sound, Washington,
W77-07201 5C

MARINE PLANTS
Response of the Marine Angiosperm Phyllospadix Torreyi to Certain Environmental Variables: A Preliminary Study,
W77-07379 5C

MARION ISLAND (SOUTH ATLANTIC OCEAN)
The Lentic and Lotic Freshwater Types of Marion Island (Sub-Antarctic): A Limnological Study,
W77-07514 5C

MARSHES
United States V Diamond (Permanent Injunction During Administrative Procedures Justified by Developers Fill of Marshland Without Refuse Act Permit),
W77-07275 6E

MARYLAND
Property-Coastal Shores-Private Property Rights Upheld over Claimed Public Right to Recreational use of Beach-Implied Dedication, Easement by Prescription, Public Trust Through Custom and Grant, and Doctrine of Submergence not Applicable. Department of Natural Resources V. Mayor and Council of Ocean City, 274 Md. 1, 332 A.2d 630 (1975).
W77-07239 6E

Committee for the Consideration of the Jones Falls Sewage System V Train (Federal Common Law Concerning Water Pollution Applicable to Interstate Controversey Only),
W77-07276 6E

MASS TRANSFER
An Ozone Reactor for Color Removal from Pulp Bleachery Wastes,
W77-07216 5D

MASSACHUSETTS
Ground-Water Levels in Massachusetts, 1936-74,
W77-07485 4B

MATHEMATICAL MODELS
Type Curves for Analysis of Pump Tests in Leaky Strip Aquifers,
W77-07145 2F

Calculation of the Leaky Aquifer Function,
W77-07156 2F

A Reconsideration and a Generalization of Lawrance and Fiering Two-Station Models,
W77-07157 2E

Location of Free Surface in Porous Media,
W77-07162 2F

Far Field Circulation Velocities in Shallow Lakes,
W77-07164 2H

Parameterization of Depositional Ice Growth,
W77-07171 2B

Mathematical Modeling of Sedimentation Transients in Sand-Bed Channels,
W77-07354 2J

Simulation of a Series of Daily Areal Mean Rainfalls for a Basin Using Rainfall Observations at a Reference Station Located Outside the Basin,
W77-07356 2B

The Response of an Estuary to the Closure of a Mobile Barrier; Richmond Barrier on the Upper Thames Estuary,
W77-07366 2L

Predicting Changes in Tidal Regime: The Open Boundary Problem,
W77-07370 8B

Day Degree Growth Models for Intertidal Oysters,
W77-07376 2L

The Evaluation of Simple and Optimal Decision Rules with Misspecified Welfare Functions,
W77-07439 6B

Modeling the Annual Thermal Evolution of Mid-Latitude Lakes,
W77-07462 2H

Management Model for Ground Water Development,
W77-07529 4B

Mathematical Models of Strontium-90 Behavior in 'Water-Fresh Water Fish Spawn' System for Particular Cases of Radioactive Contamination of Reservoirs, (In Russian),
W77-07539 5C

Scheduling Models for Wilderness Recreation.
W77-07541 6B

Instability in Tidal Flow Computational Schemes,
W77-07548 2L

Systems Approach and Watershed Models,
W77-07556 2A

MAXIMUM PROBABLE FLOOD
Effects of the Catastrophic Flood of December 1966, North Rim Area, Eastern Grand Canyon, Arizona,
W77-07480 2E

MAYFLIES
Survival of Mayfly Larvae Under Mine Acid Conditions,
W77-07128 5C

MEASUREMENT
Acoustic Measurement of Sediment Transport,
W77-07338 2J

Pigment Cycle in a North German Lake,
W77-07459 5C

Effect of Nutrient Enrichment on the Heterotrophic Uptake of Organic Solutes by Microorganisms,
W77-07466 5C

MEAT
A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

MECHANICAL CONTROL
Wind Control of Algae Growth in Eutrophic Lakes,
W77-07497 5G

MEDITERRANEAN SEA
Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

MELTING
Land Application of Digested Sludge Under Adverse Conditions.
W77-07337 5D

MEMBRANE PROCESSES
Phenol-Selective, Highly Resistant Ro-Membranes Made from PVA for the Purification of Toxic Industrial Wastes,
W77-07206 5D

Ultrafiltration Oil Reclamation Process,
W77-07212 5D

MERCURY
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

Aquatic Organism Contamination by Mercury Residues in the Coatzacoalcos River Estuary, Mexico,
W77-07394 5C

MEROMIXIS
Meromixis in Ulmener Maar (Germany).
W77-07520 5C

METABOLISM
Aspects of Reservoir-Power Station Interactions: Some Effects of Heat on Physico-Chemistry, Aufwuchs Ecology and Plankton Metabolism,
W77-07102 5C

The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

Diphenamid Removal from Water and Metabolism by Aquatic Plants,
W77-07193 5C

The Influence of Temperature on Scope for Activity in Cutthroat Trout, Salmo Clarki,
W77-07380 5C

The Effect of Food Concentration and Temperature on Respiration and Excretion in Herbivorous Zooplankton,
W77-07502 5C

METAL FINISHING INDUSTRY WASTES
Wastewater and Sludge Control in the Canadian Metal Finishing Industry, Segment Including Chemical, Electrolytic Treatment; Electrochemical Machining and Polishing; Cyanide Hardening,
W77-07333 5D

METAL FINISHING WASTES
Large-Scale Reverse Osmosis Processing of Metal Finishing Rinse Waters,
W77-07207 5D

METALS
The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

Calcium Carbonate in the Revomal of Iron and Lead from Dilute Waste Water,
W77-07208 5D

Toxic Waste Disposal,
W77-07209 5G

Wastewater and Sludge Control in the Canadian Metal Finishing Industry, Segment Including Chemical, Electrolytic Treatment; Electrochemical Machining and Polishing; Cyanide Hardening,
W77-07333 5D

Accumulation and Distribution of Trace Metals and Radionuclides in Marine Organisms (Particularly Tapes Decussatus L.) in the Izmir Bay Area, Turkey,
W77-07395 5C

METHODOLOGY
Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

The Evaluation of Toxic Effects of Chemicals in Fresh Water by Using Frog Embryos and Larvae,
W77-07132 5C

Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources,
W77-07192 5C

Surber Sampling in Deep Water for Bottom Organisms,
W77-07199 7B

Public Participation Techniques and Methodologies: A resume,
W77-07332 6B

Power Plant Site Evaluation: The Case of the Sharon Plant in Israel,
W77-07546 6G

Evaluating Alternative Levels of Water and Sanitation Service for Communities in the Northwest Territories,
W77-07557 6A

METHYL PARATHION
Apparent Potentiation of the Cotton Defoliant DEF by Methyl Parathion in Mosquitofish,
W77-07204 5C

METROMEX
Maximum 5-Minute and Hourly Rainfalls on Metromex Network, 1971-1975,
W77-07374 2B

MEXICO
Red Tide in the Upwelling Region of Baja California,
W77-07169 5C

Aquatic Organism Contamination by Mercury Residues in the Coatzacoalcos River Estuary, Mexico,
W77-07394 5C

MICHIGAN
Nitrogen, Phosphorus, Particulate and Colloidal Carbon Content of Sedimenting Seston of a Hard-Water Lake,
W77-07441 5C

The Release of Dissolved Organic Carbon from Submersed Aquatic Macrophytes: Diel, Seasonal and Community Relationships,
W77-07516 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

MICHIGAN

MICROALGAE
Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

MICROBIAL DEGRADATION
The Rate of Microbial Degradation of Oil in a Beach Gravel Column,
W77-07138 5B

MICROORGANISMS
Use of Quantitative Correlations Between Microorganisms for River Pollution Evaluation, (In Russian),
W77-07482 5B

MIDDLE ATLANTIC BIGHT
Hydrographic Properties, MESA New York Bight Atlas Monograph 1,
W77-07328 2L

MIDGES
The Differential Use of Chironomidae and Ceratopogonidae (Diptera) in the Monitoring of Various Aquatic Wastes,
W77-07282 5A

Outbreak of Chironomid Midge in a Polluted River and the Chemical Control of the Larvae, (In Japanese),
W77-07585 5G

MINE ACIDS
Survival of Mayfly Larvae Under Mine Acid Conditions,
W77-07128 5C

MINERALOGY
Mineralizing Microbial Activity in Lake Faro,
W77-07418 5C

In Vitro Effect of Organic Nitrogen and Potassium Additions on Nitrogen Mineralization and on Exchanges Between the Mud and Water of a Pond, (In French),
W77-07575 5B

MINING
Variations in the Lead, Zinc and Calcium Content of Dendrobaena rubida (Oligochaeta) in a Base Metal Mining Area,
W77-07135 5C

MINNEAPOLIS AREA (MINN)
Public Participation in Water Resource Development,
W77-07526 6B

MINNESOTA
Areal Distribution and Stratigraphy of Diatoms in the Sediments of Lake Sallie, Minnesota,
W77-07481 5C

Response to Eutrophic Shagawa Lake, Minnesota, U.S.A., to Point-Source, Phosphorus Reduction,
W77-07519 5C

Public Participation in Water Resource Development,
W77-07526 6B

MIRROR LAKE (NH)
An Organic Carbon Budget for an Oligotrophic Lake In New Hampshire, U.S.A.,
W77-07470 5C

Post-Glacial History of Mirror Lake and Its Watershed In New Hampshire, U.S.A.: An Initial Report,
W77-07472 5C

MISSISSIPPI RIVER
Maintenance Dredging in the New Orleans District, US Army Corps of Engineers,
W77-07347 8D

The Port of New Orleans and Its Dredging Program,
W77-07348 8D

MISSOURI
Aspects of Reservoir-Power Station Interactions: Some Effects of Heat on Physico-Chemistry, Aufwuchs Ecology and Plankton Metabolism,
W77-07102 5C

Maximum 5-Minute and Hourly Rainfalls on Metromex Network, 1971-1975,
W77-07374 2B

MISSOURI RIVER
Missouri River Power Curve Regression Equations,
W77-07152 2E

MISSPECIFIED WELFARE FUNCTIONS (ECONOMICS)
The Evaluation of Simple and Optimal Decision Rules with Misspecified Welfare Functions,
W77-07439 6B

MIXED INTEGER PROGRAMMING
Pumped Storage Optimization in Generation Systems,
W77-07525 4A

MIXING
Upwelling in a Model of an Intermontane Lake,
W77-07469 5B

The Influence of Spring Circulation on Zooplankton Dynamics in the Plussee,
W77-07518 5C

MOBILE BARRIER
The Response of an Estuary to the Closure of a Mobile Barrier; Richmond Barrier on the Upper Thames Estuary,
W77-07366 2L

MODE OF ACTION
Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

MODEL BUILDING
Towards System Models for Water Resource Management,
W77-07544 6A

MODEL LEGISLATION
Scientific and Scenic Rivers Act: Commentary and Model Statute,
W77-07231 6G

MODEL STUDIES
Suction Head at Wet Front in Unsaturated-Flow Problems--A New Definition,
W77-07144 2G

Finite-Element Analysis of Groundwater Flow in Multiaquifer Systems, I. The Behavior of Hydrological Properties in an Aquitard While Being Pumped,
W77-07148 2F

Analysis of Flow Against Dispersion in Porous Media,
W77-07150 2F

Calculation of the Leaky Aquifer Function,
W77-07156 2F

A Reconsideration and a Generalization of Lawrance and Fiering Two-Station Models,
W77-07157 2E

Design Criteria for Hydrologic Extremes,
W77-07165 8B

The Effect of Soil Moisture on Circulation and Rainfall in a Tropical Model,
W77-07166 2B

Parameterization of Depositional Ice Growth,
W77-07171 2B

Transports in Lake Superior,
W77-07176 5B

Water Quality and Chemical Models,
W77-07246 5C

Physical Modeling of Combined Forced and Natural Convection in Wet Geothermal Formations,
W77-07303 4B

Parameter Study of Variables Affecting the Performance of a Hydraulic Pipeline Dredge Model,
W77-07346 8D

Simulation of a Series of Daily Areal Mean Rainfalls for a Basin Using Rainfall Observations at a Reference Station Located Outside the Basin,
W77-07356 2B

Dynamics of O2 and CO2 Exchange, Photosynthesis, and Respiration in Rivers from Time-Delayed Correlations with Ideal Sunlight,
W77-07364 5C

Predicting Changes in Tidal Regime: The Open Boundary Problem,
W77-07370 8B

Manning N and the Overland Flow Equation,
W77-07371 2E

A Nitrogen Gas (N2) Model for the Lower Columbia River, Final Report,
W77-07422 5B

A Model of the Phosphorus Cycle and Phytoplankton Growth in Skaha Lake, British Columbia, Canada,
W77-07445 5C

Upwelling in a Model of an Intermontane Lake,
W77-07469 5B

Analog-Model Analysis of Regional Three-Dimensional Flow in the Ground-Water Reservoir of Long Island, New York,
W77-07479 2F

Decision-Making for Environmental Resources Management,
W77-07542 6G

Towards System Models for Water Resource Management,
W77-07544 6A

Models for Simulation of Eutrophication of Lakes for Lake Constance (Bodensee-Obersee): I. Data from Lake Constance used in Simulation Models, (In German),
W77-07579 5C

MOLLUSKS
Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

The Distribution and Ecology of Common Marine and Estuarine Gastropods in the Delaware Bay Area,
W77-07185 5C

Preliminary Experiment of Cobalt 60 Pollution of a Marine Food Chain: Results of a Single Ingestion,
W77-07317 5C

Preliminary Investigations on Bivalves Bivalvia of the Dam Reservoir at Goczalkowice,
W77-07440 5C

An Investigation of Colloidal Organic Particles Isolated from Different Populations of Bivalves,
W77-07498 5A

Bacteriologic Analysis in the Arosa, Vigo and Pontevedra Estuaries, (In Spanish),
W77-07589 5A

MONITORING

An Industrial View of Biological Monitoring,
W77-07126 5A

Guidelines Establishing Test Procedures for the Analysis of Pollutants,
W77-07252 5A

The Differential Use of Chironomidae and Ceratopogonidae (Diptera) in the Monitoring of Various Aquatic Wastes,
W77-07282 5A

Use of Aerial Remote Sensors to Monitor Dredging Projects,
W77-07344 8D

MONSOONS

Population Changes in the Aquatic Fauna Inhabiting the Bladderwort, Utricularia Flexuosa Vahl., in a Tropical Swamp, Tasek Bera, Malaysia,
W77-07465 5C

MONTANA

Symap Computer Projections of Summer Zooplankton Populations in Van Lake, Montana,
W77-07511 7C

MORBIDITY

Morbidity and Mortality of Marine Mammals,
W77-07405 6G

MORPHOLOGICAL CHANGES

The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

MORTALITIES

The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

MORTALITY

Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

Survival and Reproduction of Gammarus spp. (Amphipoda) Following Short-Term Exposure to Elevated Temperatures,
W77-07125 5C

Effects of Passage Through Power Plant Cooling Systems on Estuarine Copepods,
W77-07134 5C

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

Morbidity and Mortality of Marine Mammals,
W77-07405 6G

Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

The Effects of High Vacuum on Fish,
W77-07421 5C

Effect of Silt and Salinity on the Mortality of Meretrix Lusoria (Roeding), (In Korean),
W77-07428 5C

Gas Bubble Disease Mortality of Atlantic Menhaden at Pilgrim Nuclear Power Station, April, 1975,
W77-07429 5C

MOSQUITO LARVAE

The Differential Use of Chironomidae and Ceratopogonidae (Diptera) in the Monitoring of Various Aquatic Wastes,
W77-07282 5A

MOSQUITOFISH

Apparent Potentiation of the Cotton Defoliant DEF by Methyl Parathion in Mosquitofish,
W77-07204 5C

MUD-WATER INTERFACES

Role of Oligochaetes in the Circulation of Water and Solutes Across the Mud-Water Interface,
W77-07508 5C

MUDFLOWS

Effects of the Catastrophic Flood of December 1966, North Rim Area, Eastern Grand Canyon, Arizona,
W77-07480 2E

MULLETS

Summer Growth Depression in the Striped Mullet, Mugil Cephalus L.,
W77-07378 5C

MULTIAQUIFER SYSTEMS

Finite-Element Analysis of Groundwater Flow in Multiaquifer Systems, I. The Behavior of Hydrological Properties in an Aquitard While Being Pumped,
W77-07148 2F

MULTIPLE OBJECTIVES

Accounting for Non-Economic Goals in Benefit-Cost Analysis,
W77-07543 6B

MULTIPLE-PURPOSE PROJECTS

Accounting for Non-Economic Goals in Benefit-Cost Analysis,
W77-07543 6B

MULTIPLE-PURPOSE RESERVOIRS

Reservoir Operation Under Conflicting Objectives,
W77-07536 4A

MULTIPLE USE

Modeling Multiple-Use in Natural Areas: Part I -- The Basic Formulation,
W77-07530 6A

MUSSELS

Role of Mussels Mytilus edulis in Removal of Petroleum Products from Seawater (Under Experimental Conditions),
W77-07116 5C

Uptake and Accumulation of the Nickel Ion by Mytilus edulis,
W77-07198 5C

The Influence of Temperature and Time of Year on the Oxygen Uptake of the Sea Mussel Mytilus Edulis,
W77-07383 5C

MYCELIA-FORMING FUNGI

Studies on Fungal Propagules in the Weser Estuary (German Bight): I. Quantitative Data 1974, (In German),
W77-07583 5C

MYCOBACTERIUM-SP

Oil-Oxidizing Bacteria of the River Yenisei, (In Russian),
W77-07532 5C

NANNOPLANKTON

Grazing Effects on Nannoplankton in Gatun Lake, Panama,
W77-07507 5C

NATIONAL COMMISSION ON WATER QUALITY (NCWQ)

NCWQ Recommends Changes in Water Pollution Act,
W77-07237 5G

NATIONAL ENVIRONMENTAL POLICY ACT

P. L. 92-500 V Local Priorities,
W77-07229 5D

NATIONAL INCOME MAXIMIZATION

Accounting for Non-Economic Goals in Benefit-Cost Analysis,
W77-07543 6B

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

The Federal Water Pollution Control Act Amendments of 1972 as Applied to the Surface Mine in West Virginia - Pollutant Discharge Permit Requirements,
W77-07240 5G

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT

United States V Cutter Laboratories, Inc (Civil Liability of a Permittee for Whom no Industrial Effluent Limitations or Guidelines Exist).
W77-07274 6E

NATURAL AREAS

Modeling Multiple-Use in Natural Areas: Part I -- The Basic Formulation,
W77-07530 6A

NATURAL RESOURCES

The Economics of Natural Environments, Studies in the Valuation of Commodity and Amenity Resources.
W77-07437 6G

NAVIGABLE WATERS

Florida Statutes, Chapter 253--The 1969 Amendments and Proposed Legislation,
W77-07258 6E

LIBRARY U. OF I. URBANA-CHAMPAIGN

Encroachments on Navigable Lake.
W77-07264 6E

Port Acres Sportman's Club V Mann (Public's Right to Use Navigable Waters Over Privately Owned Submerged Lands).
W77-07270 6E

NAVIGATION
Salvops-Hopper Dredge 'A. Mackenzie',
W77-07343 8D

Maintenance Dredging in the New Orleans District, US Army Corps of Engineers,
W77-07347 8D

NEGATIVE PRESSURE
Swim Bladder Gas Pressure of Cod in Relation to Hydrostatic Pressure,
W77-07417 5C

The Effects of High Vacuum on Fish,
W77-07421 5C

NEMATODES
Qualitative and Quantitative Studies on the Meiofauna of a Tropical Fresh Water Stream Subject to Tidal Influence, (In Italian),
W77-07390 5C

The Larval Spirurid Nematodes of Fresh-Water Crustaceans: I. The Identification and the Examination of Their Pathogenicity,
W77-07458 5C

NEON
Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

NETWORK ALGORITHM
Network Approach to Optimal Wastewater Treatment System Design,
W77-07531 5D

NETWORKS
The Economic Basis of Resource Information Systems: The Case of Streamflow Data Network Design,
W77-07534 7A

NEVADA
Nitrogen Contamination Sources in Shallow Ground Water, Las Vegas Area, Nevada,
W77-07141 5B

Final Report on The Pyramid Lake Pilot Project, 1970-1975, Volume 1, Text of Report,
W77-07566 3B

Final Report on the Pyramid Lake Pilot Project, 1970-1975, Volume 2, Appendices,
W77-07567 3B

NEW HAMPSHIRE
Amend the Federal Boat Safety Act of 1971 (Hearings on S. 3214 to Declare Certain Waters of New Hampshire to Be Non-navigable for Certain Purposes).
W77-07255 6E

An Organic Carbon Budget for an Oligotrophic Lake In New Hampshire, U.S.A.,
W77-07470 5C

Post-Glacial History of Mirror Lake and Its Watershed In New Hampshire, U.S.A.: An Initial Report,
W77-07472 5C

NEW MEXICO
Pecos River Compact.
W77-07262 6E

Enterovirus and Bacteriophage Inactivation in Subsurface Waters and Translocation in Soil,
W77-07283 5B

NEW ORLEANS (LA)
The Port of New Orleans and Its Dredging Program,
W77-07348 8D

NEW YORK
Offshore Oil and Fishery Resources,
W77-07195 5C

Rappl and Hoenig Company, Incorporated v. New York State Department of Environmental Conservation (Applicability of Fresh Water Wetlands Act to Artificially Created Wetlands).
W77-07269 6E

NEW YORK BIGHT
Long Island Beach Pollution: June 1976,
W77-07325 5B

Hydrographic Properties, MESA New York Bight Atlas Monograph 1,
W77-07328 2L

NEW ZEALAND
Breeding Biology of a Non-Diadromous Galaxiid, Galaxias Vulgaris Stokell, in a New Zealand River,
W77-07389 5C

NICKEL
Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

Uptake and Accumulation of the Nickel Ion by Mytilus edulis,
W77-07198 5C

NILE RIVER
Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

NITRATES
Nitrate in Ground Water and Its Relation to Fertilization, (In German),
W77-07112 5B

Nitrogen Contamination Sources in Shallow Ground Water, Las Vegas Area, Nevada,
W77-07141 5B

Application of Nitrogen-Isotope Studies to Hydrology and Hydrogeology--Analysis of the Peculiar Case of the Melarchez Basin (Seine-et-Marne, France) (Application de L'Etude Isotopique de L'Azote en Hydrologie et en Hydrogeologie--Analyse des Resultats Obtenus Sur un Exemple Precis: Le Bassin de Melarchez (Seine-et-Marne, France)),
W77-07154 5B

Protein Production by Russian Thistle: Effects of Water and Nitrogen on Protein Yields,
W77-07281 3F

Uptake of Dissolved Ammonium and Nitrate Ion by the Fry of Common Carp, Crucian Carp and Loach from Surrounding Water, (In Japanese),
W77-07314 5C

The Role of Phosphate in Eutrophication. Stimulation of Plankton Growth and Residence Times of Inorganic Phosphate in Lake Kinneret Water,
W77-07517 5C

The Changes in Inorganic Nitrogen Concentration of Drinking Water from Wells Over a Two Year Period in Ani-Machi, Ibaraki Prefecture, (In Japanese),
W77-07570 5B

NITROCELLULOSE
How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

NITROGEN
Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

A Nitrogen Gas (N2) Model for the Lower Columbia River, Final Report,
W77-07422 5B

Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

Nitrogen, Phosphorus, Particulate and Colloidal Carbon Content of Sedimenting Seston of a Hard-Water Lake,
W77-07441 5C

The Effect of Food Concentration and Temperature on Respiration and Excretion in Herbivorous Zooplankton,
W77-07502 5C

Annual Contribution of Carbon, Nitrogen and Phosphorus by Migrant Canada Geese to a Hardwater Lake,
W77-07505 5C

Sources of Nitrogen as a Water Pollutant: Industrial Waste Water,
W77-07521 5B

Relation Between the Amounts of Fertilization and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: 1. On the Relation Between the Amount of Fertilizer Application and the Specific Pollution Loads of Nitrogen and Phosphorus in Main Streams Flowing into Lake Nishiura, (In Japanese),
W77-07568 5B

Relation Between the Amounts of Fertilizer and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: II. On the Relation Between Livestock Waste Per Unit Area of Basin and the Specific Load of Pollutants in Main Streams Flowing into Nishiura Lake Basin, (In Japanese),
W77-07569 5B

The Changes in Inorganic Nitrogen Concentration of Drinking Water from Wells Over a Two Year Period in Ani-Machi, Ibaraki Prefecture, (In Japanese),
W77-07570 5B

Deposition of Mineral Nitrogen by Rain in the Lamto Savanna, (In French),
W77-07574 5B

In Vitro Effect of Organic Nitrogen and Potassium Additions on Nitrogen Mineralization and

on Exchanges Between the Mud and Water of a Pond, (In French),
W77-07575 5B

First Information About N, P Nutrients and the Production of Lake Trasimeno, (In Italian),
W77-07593 5C

NITROGEN COMPOUNDS
Experimental Study of the Nitrogen Excretion of Bass (Dicentrarchus labrax) during Growth. I. Effects of Temperature and Weight on the Excretion of Ammonia and Urea,
W77-07313 5C

The Utilization of the Green Alga Dictyosphaerium Pulchellum as Food for Certain Crustaceans of Fresh Water Plankton,
W77-07468 5C

NITROGEN FIXATION
Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

NITROGEN-ISOTOPE STUDIES
Application of Nitrogen-Isotope Studies to Hydrology and Hydrogeology--Analysis of the Peculiar Case of the Melarchez Basin (Seine-et-Marne, France) (Application de L'Etude Isotopique de L'Azote en Hydrologie et en Hydrogeologie--Analyse des Resultats Obtenus Sur un Exemple Precis: Le Bassin de Melarchez (Seine-et-Marne, France)),
W77-07154 5B

NITROGEN SUPERSATURATION
Dissolved Gas Survey, Pacific Northwest Region.
W77-07423 5C

Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

NITROSAMINES
Nitrate in Ground Water and Its Relation to Fertilization, (In German),
W77-07112 5B

NITZSCHIA CLOSTERIUM
Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

NON-EFFICIENCY GOALS
Accounting for Non-Economic Goals in Benefit-Cost Analysis,
W77-07543 6B

NON-NAVIGABLE WATERS
Amend the Federal Boat Safety Act of 1971 (Hearings on S. 3214 to Declare Certain Waters of New Hampshire to Be Non-navigable for Certain Purposes).
W77-07255 6E

Port Acres Sportman's Club V Mann (Public's Right to Use Navigable Waters Over Privately Owned Submerged Lands).
W77-07270 6E

NON-POINT POLLUTION
Annual Contribution of Carbon, Nitrogen and Phosphorus by Migrant Canada Geese to a Hardwater Lake,
W77-07505 5C

NON-POINT SOURCES (POLLUTION)
Pollution Susceptibility: An Environmental Parameter for Coastal Zone Management,
W77-07230 5G

NONPOINT SOURCES OF POLLUTION
Nonpoint Source Effects on Water Quality,
W77-07173 5B

NORTH CAROLINA
Circulation and Surge Modeling in Pamlico Sound, N.C.,
W77-07320 2L

The Dune Book. How to Plant Grasses for Dune Stabilization,
W77-07326 2J

Dune Stabilization with Panicum amarum Along the North Carolina Coast,
W77-07327 2L

Life History Patterns in the Coastal Shiner, Notropis Petersoni, Fowler,
W77-07386 5C

An Investigation of Colloidal Organic Particles Isolated from Different Populations of Bivalves,
W77-07498 5A

NORTH DAKOTA
Bibliography and Index of North Dakota Water Resources 1878-1970,
W77-07140 10C

NORTH WALES
The Stability During Many Years of the Mid-Tidal Shore at Penrhyn Bay, North Wales, and a Note on the Peat Beds at Rhos-on-Sea,
W77-07367 2L

NORTHERN ANCHOVY
Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

NORTHERN HIGH PLAINS (COLO)
Water-Level Records for the Northern High Plains of Colorado, 1973-77,
W77-07486 4B

NORTHWEST TERRITORIES (CANADA)
Evaluating Alternative Levels of Water and Sanitation Service for Communities in the Northwest Territories,
W77-07557 6A

NOSTOC
Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

NUCLEAR MAGNETIC RESONANCE
Study of the State of Water on the Surface of H+, NA+, MG2+ Saturated Kaolinite by the NMR Method, (In Russian),
W77-07241 2G

NUCLEAR POWERPLANTS
Gas Bubble Disease Mortality of Atlantic Menhaden at Pilgrim Nuclear Power Station, April, 1975,
W77-07429 5C

NUCLEIC ACIDS
An Investigation of Colloidal Organic Particles Isolated from Different Populations of Bivalves,
W77-07498 5A

NUMBER 2 FUEL OIL
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

NUMERICAL ANALYSIS
Instability in Tidal Flow Computational Schemes,
W77-07548 2L

NUTRIENT BUDGETS
Algal Response to Nutrient Inputs in Some Iowa Lakes,
W77-07515 5C

NUTRIENT REMOVAL
Response to Eutrophic Shagawa Lake, Minnesota, U.S.A., to Point-Source, Phosphorus Reduction,
W77-07519 5C

NUTRIENT REQUIREMENTS
The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

Study of Bacteria Associated with the Rearing of Larvae of Marine Bivalves, (In French),
W77-07599 5C

NUTRIENTS
Nutrient Transformations in Louisiana Salt Marsh Soils,
W77-07319 5C

Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

Effect of Nutrient Enrichment on the Heterotrophic Uptake of Organic Solutes by Microorganisms,
W77-07466 5C

The Utilization of the Green Alga Dictyosphaerium Pulchellum as Food for Certain Crustaceans of Fresh Water Plankton,
W77-07468 5C

Annual Contribution of Carbon, Nitrogen and Phosphorus by Migrant Canada Geese to a Hardwater Lake,
W77-07505 5C

First Information About N, P Nutrients and the Production of Lake Trasimeno, (In Italian),
W77-07593 5C

NUTRITION REQUIREMENTS
Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

OBSERVATION WELLS
Type Curves for Analysis of Pump Tests in Leaky Strip Aquifers,
W77-07145 2F

Ground-Water Levels in Massachusetts, 1936-74,
W77-07485 4B

LIBRARY U. OF I. URBANA-CHAMPAIGN

OCEAN CIRCULATION
Circulation and Surge Modeling in Pamlico Sound, N.C.,
W77-07320 2L

OCEAN CURRENTS
Pollution Susceptibility: An Environmental Parameter for Coastal Zone Management,
W77-07230 5G

ODOR
Responses to Odors by Fingerling Cutthroat Trout from Yellowstone Lake,
W77-07111 5C

OFFSHORE OIL
Offshore Oil and Fishery Resources,
W77-07195 5C

OIL
The Rate of Microbial Degradation of Oil in a Beach Gravel Column,
W77-07138 5B

Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

OIL INDUSTRY
Offshore Oil and Fishery Resources,
W77-07195 5C

Rules for the Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Bulk,
W77-07251 5G

Status Report on Abatement of Water Pollution from the Canadian Petroleum Refining Industry - 1975,
W77-07334 5G

OIL-OXIDIZING BACTERIA
Oil-Oxidizing Bacteria of the River Yenisei, (In Russian),
W77-07532 5C

OIL POLLUTION
Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

Role of Mussels Mytilus edulis in Removal of Petroleum Products from Seawater (Under Experimental Conditions),
W77-07116 5C

Effects of Benzene (A Toxic Component of Petroleum) on Spawning Pacific Herring, Clupea harengus pallasi,
W77-07137 5C

The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms-II. Lethal Concentrations of Oil-Spill Emulsifier Components for Marine Phytoplankton, (In Japanese),
W77-07182 5C

Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

The 1973 IMCO Convention: Tightening the Controls on Operational Oil Pollution from Tankers,
W77-07244 5G

Rules and Regulations for Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Domestic Trade,
W77-07254 5G

Morbidity and Mortality of Marine Mammals,
W77-07405 6G

Uptake and Retention of Kuwait Crude Oil and Its Effects on Oxygen Uptake by the Soft-Shell Clam, Mya Arenaria,
W77-07506 5C

Assay of Detergent Residues in Fresh Water, Sea Water and Waste Waters: Method of Extraction and Concentration of Surfactants by Adsorption on Liquid-Liquid Interface, (In French),
W77-07591 5A

Self-Purification in the Coastal Waters of the Black Sea, (In Russian),
W77-07592 5C

OIL POLLUTION ACT
The 1973 IMCO Convention: Tightening the Controls on Operational Oil Pollution from Tankers,
W77-07244 5G

OIL SPILL
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

OIL SPILLS
The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms-II. Lethal Concentrations of Oil-Spill Emulsifier Components for Marine Phytoplankton, (In Japanese),
W77-07182 5C

The 1973 IMCO Convention: Tightening the Controls on Operational Oil Pollution from Tankers,
W77-07244 5G

Rules and Regulations for Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Domestic Trade,
W77-07254 5G

OIL WASTES
Effects of Benzene (A Toxic Component of Petroleum) on Spawning Pacific Herring, Clupea harengus pallasi,
W77-07137 5C

Offshore Oil and Fishery Resources,
W77-07195 5C

Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

Ultrafiltration Oil Reclamation Process,
W77-07212 5D

Techniques for Purifying Oily Waste Water,
W77-07213 5D

Evaporation and Thermal Oxidation of Liquid Effluents--By Burning with Flame in Combustion Chamber.
W77-07227 5D

The 1973 IMCO Convention: Tightening the Controls on Operational Oil Pollution from Tankers,
W77-07244 5G

Rules for the Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Bulk,
W77-07251 5G

Status Report on Abatement of Water Pollution from the Canadian Petroleum Refining Industry - 1975,
W77-07334 5G

Assay of Detergent Residues in Fresh Water, Sea Water and Waste Waters: Method of Extraction and Concentration of Surfactants by Adsorption on Liquid-Liquid Interface, (In French),
W77-07591 5A

OLIGOCHAETES
Variations in the Lead, Zinc and Calcium Content of Dendrobaena rubida (Oligochaeta) in a Base Metal Mining Area,
W77-07135 5C

The Oligochaete Communities of a Lowland Stream and Their Value as Indicators of Organic Pollution,
W77-07307 5C

Qualitative and Quantitative Studies on the Meiofauna of a Tropical Fresh Water Stream Subject to Tidal Influence, (In Italian),
W77-07390 5C

Role of Oligochaetes in the Circulation of Water and Solutes Across the Mud-Water Interface,
W77-07508 5C

OLIGOTROPHY
Primary Production and Biomass of Algae Populations in an Oligotrophic Lake in the French Massif Central, (In French),
W77-07398 5C

An Organic Carbon Budget for an Oligotrophic Lake In New Hampshire, U.S.A.,
W77-07470 5C

Algal Productivity of Natural and Artificially Enriched Fresh Waters in Malaya,
W77-07471 5C

ONTARIO
Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

OPERATING RULE
Gains from Joint Operation of Multiple Reservoir Systems,
W77-07533 4A

OPTIMIZATION
Pumped Storage Optimization in Generation Systems,
W77-07525 4A

Management Model for Ground Water Development,
W77-07529 4B

Modeling Multiple-Use in Natural Areas: Part I -- The Basic Formulation,
W77-07530 6A

Network Approach to Optimal Wastewater Treatment System Design,
W77-07531 5D

The Economic Basis of Resource Information Systems: The Case of Streamflow Data Network Design,
W77-07534 7A

Reservoir Operation Under Conflicting Objectives,
W77-07536 4A

Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

Reducing Power Consumption in Irrigation Systems with the Aid of a Mathematical Model for Pipe Dimensioning,
W77-07547 3F

OREGON
Water Flux in Soil and Subsoil on a Steep Forested Slope,
W77-07147 2G

Wood V Woodcock (Rights of Adjoining Landowners to Seepage Water from Joint Irrigation Ditch),
W77-07278 6E

ORGANIC ACIDS
Effect of Organic Acids on Experimental Manganese Isolation from Bottom Sediments, (In Russian),
W77-07597 5B

ORGANIC CARBON BUDGET
An Organic Carbon Budget for an Oligotrophic Lake In New Hampshire, U.S.A.,
W77-07470 5C

ORGANIC COMPOUNDS
Diphenamid Removal from Water and Metabolism by Aquatic Plants,
W77-07193 5C

ORGANIC MATTER
Qualitative and Quantitative Studies on the Meiofauna of a Tropical Fresh Water Stream Subject to Tidal Influence, (In Italian),
W77-07390 5C

Use of Quantitative Correlations Between Microorganisms for River Pollution Evaluation, (In Russian),
W77-07482 5B

ORGANIC SOLUTES
Effect of Nutrient Enrichment on the Heterotrophic Uptake of Organic Solutes by Microorganisms,
W77-07466 5C

ORGANIC WASTES
Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

ORGANOCHLORINE CHEMICALS
Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

ORGANOLEPTIC PROPERTIES
Experimental Substantiation of Maximum Permissible Propachlor (Ramrod) Concentrations in Water, (In Russian),
W77-07133 5A

Hygienic Standardization of Disodium Salts of Meta-and Para-Diisopropylbenzene in Water Bodies, (In Russian),
W77-07590 5C

OTTAWA RIVER (ONTARIO)
Comparison of Primary Productivity (14C) per Unit Biomass Between Phytoplankton and Periphyton in the Ottawa River Near Ottawa, Canada,
W77-07454 5C

OUTER CONTINENTAL SHELF
Morbidity and Mortality of Marine Mammals,
W77-07405 6G

Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

Trophic Relationships Among Ice Inhabiting Phocid Seals,
W77-07407 6G

Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska,
W77-07411 6G

Zooplankton and Micronekton Studies in the Bering - Chukchi/Beaufort Seas,
W77-07412 6G

Phytoplankton Studies in the Bering Sea,
W77-07413 6G

Beaufort Sea Plankton Studies,
W77-07414 6G

OVERFLOW
Nuckolls V Louisiana State Highway Department (Liability for Unauthorized Alteration of Natural Drain),
W77-07277 6E

OVERLAND FLOW
Manning N and the Overland Flow Equation,
W77-07371 2E

OWASE BAY (JAPAN)
Occurrence of Toxic Bivalves in Association with the Bloom of Gonyaulax sp. in Owase Bay,
W77-07119 5C

OWNERSHIP OF BEDS
Port Acres Sportman's Club V Mann (Public's Right to Use Navigable Waters Over Privately Owned Submerged Lands).
W77-07270 6E

OXIDATION
Dyehouse Water Treatment with Catalytic Oxidation.
W77-07221 5D

Purifying Waste Liquor Containing Sulphide, Sulphite and Thiosulphate-Alkaline Oxidation Followed by Acid Oxidation, Using Oxygen.
W77-07226 5D

Evaporation and Thermal Oxidation of Liquid Effluents--By Burning with Flame in Combustion Chamber.
W77-07227 5D

Influence of an Ozonisation Plant on the Bacterial Content in Water of a Demonstration Aquarium,
W77-07311 5C

OXYGEN
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

Dynamics of O2 and CO2 Exchange, Photosynthesis, and Respiration in Rivers from Time-Delayed Correlations with Ideal Sunlight,
W77-07364 5C

Interaction of Temperature and Salinity on Oxygen Consumption of the Estuarine Crab Panopeus Herbstii,
W77-07375 5C

The Influence of Temperature and Time of Year on the Oxygen Uptake of the Sea Mussel Mytilus Edulis,
W77-07383 5C

U. of I. Urbana-Champaign

OXYGEN

Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

OXYGEN-18
Thermal and Isotopic Studies on the Crater Lakes of Monticchio (Lucania, Italy), (In Italian),
W77-07392 2H

OXYGEN ISOTOPES
Thermal and Isotopic Studies on the Crater Lakes of Monticchio (Lucania, Italy), (In Italian),
W77-07392 2H

OXYGEN-NITROGEN RATIOS
Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

OXYGEN REQUIREMENTS
Oxygen Consumption, Ventilatory Frequency and Heart Rate of Lampreys (Lampetra Fluviatilis) During Their Spawning Run,
W77-07399 5C

OXYGEN SAG
The Vertical Distribution of Plankton Rotifers in a Small Alpine Lake with a Sharp Oxygen Depletion (Lunzer Obersee),
W77-07456 5C

OYSTER SPAT
Use of Quicklime to Increase Oyster Seed Production,
W77-07122 5C

OYSTERS
Use of Quicklime to Increase Oyster Seed Production,
W77-07122 5C

The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Day Degree Growth Models for Intertidal Oysters,
W77-07376 2L

OZONATION
Ozonation in a Better Perspective,
W77-07293 5D

OZONATION PLANTS
Influence of an Ozonisation Plant on the Bacterial Content in Water of a Demonstration Aquarium,
W77-07311 5C

OZONE
An Ozone Reactor for Color Removal from Pulp Bleachery Wastes,
W77-07216 5D

Ozonation in a Better Perspective,
W77-07293 5D

Influence of an Ozonisation Plant on the Bacterial Content in Water of a Demonstration Aquarium,
W77-07311 5C

OZONE REACTORS
An Ozone Reactor for Color Removal from Pulp Bleachery Wastes,
W77-07216 5D

P. L. 92-500
P. L. 92-500 V Local Priorities,
W77-07229 5D

PACIFIC NORTHWEST
Dissolved Gas Survey, Pacific Northwest Region.
W77-07423 5C

PACIFIC NORTHWEST US
Fire Effects on Water Supply, Floods, and Sedimentation,
W77-07318 4C

PACIFIC SLOPE BASINS (CALIF)
Water Resources Data for California, Water Year 1975--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W77-07492 7C

PACKING PLANTS
A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

PALEOLIMNOLOGY
Post-Glacial History of Mirror Lake and Its Watershed In New Hampshire, U.S.A.: An Initial Report,
W77-07472 5C

PAMLICO RIVER ESTUARY (NC)
The Utilization of Dissolved Free Amino Acids by Estuarine Microorganisms,
W77-07117 5C

PAMLICO SOUND (NC)
Circulation and Surge Modeling in Pamlico Sound, N.C.,
W77-07320 2L

PANICUM AMARUM
Dune Stabilization with Panicum amarum Along the North Carolina Coast,
W77-07327 2L

PARAGUAY
Reconnaissance of Sediment Transport and Channel Morphology in the Lower Rio Bermejo Basin, Argentina--With a Section on Reconnaissance of the Lower Rio Pilcomayo Basin, Argentina and Paraguay,
W77-07490 2J

PARASITISM
The Larval Spirurid Nematodes of Fresh-Water Crustaceans: I. The Identification and the Examination of Their Pathogenicity,
W77-07458 5C

PARATHION
Fate of the Organophosphate Insecticide Parathion in the Freshwater Invertebrates,
W77-07285 5C

PARKS
City and County of Honolulu V Bennett (Determination of Private Ownership Rights in Offshore Islands and Beach Parcels),
W77-07280 6E

PATAPSCO RIVER
Committee for the Consideration of the Jones Falls Sewage System V Train (Federal Common Law Concerning Water Pollution Applicable to Interstate Controversey Only),
W77-07276 6E

PATENTS
Purification of Industrial Waste Water Containing Organic Impurities--By Contacting with Adsorbent Polymer Material in Solvated Gel State.
W77-07222 5D

Treating Effluent Containing Ionic Compounds Preferably Dyes--By Adding Salt Generator of Opposite Charge to Effluent Ion Then Ultra-Filtering.
W77-07223 5D

Purifying Waste Liquor Containing Sulphide, Sulphite and Thiosulphate-Alkaline Oxidation Followed by Acid Oxidation, Using Oxygen.
W77-07226 5D

Evaporation and Thermal Oxidation of Liquid Effluents--By Burning with Flame in Combustion Chamber.
W77-07227 5D

PATH OF POLLUTANTS
The Effect of the Use of Pesticides and Fertilizers in the Water Protection Zone with Sources of Artificial Replenishment of Underground Water Reserves, (In Russian),
W77-07107 5B

Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Analysis of Flow Against Dispersion in Porous Media,
W77-07150 2F

Application of Nitrogen-Isotope Studies to Hydrology and Hydrogeology--Analysis of the Peculiar Case of the Melarchez Basin (Seine-et-Marne, France) (Application de L'Etude Isotopique de L'Azote en Hydrologie et en Hydrogeologie--Analyse des Resultats Obtenus Sur un Exemple Precis: Le Bassin de Melarchez (Seine-et-Marne, France)),
W77-07154 5B

Convective-Dispersion in Perennial Streams,
W77-07160 5B

Nonpoint Source Effects on Water Quality,
W77-07173 5B

Transports in Lake Superior,
W77-07176 5B

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

Uptake and Accumulation of the Nickel Ion by Mytilus edulis,
W77-07198 5C

Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

Environmental Dependence of Manganese and Zinc in the Scales of Atlantic Salmon, Salmo Salar (L) and Brown Trout, Salmo Trutta (L),
W77-07203 5C

Enterovirus and Bacteriophage Inactivation in Subsurface Waters and Translocation in Soil,
W77-07283 5B

Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

Preliminary Experiment of Cobalt 60 Pollution of a Marine Food Chain: Results of a Single Ingestion,
W77-07317 5C

Phosphorus and Carbon Distributions in a Polluted Coastal Environment,
W77-07368 5B

PATH OF POLLUTIONS
PCB Contents in the Muscle of Marine Animals Collected in the Sea near Hakodate (In Japanese),
W77-07315 5C

PATHOLOGY
Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

Morbidity and Mortality of Marine Mammals,
W77-07405 6G

PATTERN RECOGNITION
Satellite Observations of Water Quality,
W77-07554 5A

PEAK DISCHARGE
Techniques for Estimating Flow Characteristics of Wyoming Streams,
W77-07495 4A

PEAT
Observations on a Peat Bog's Ability to Withstand Increasing Public Pressure,
W77-07139 5C

The Stability During Many Years of the Mid-Tidal Shore at Penrhyn Bay, North Wales, and a Note on the Peat Beds at Rhos-on-Sea,
W77-07367 2L

PEAT BOGS
Observations on a Peat Bog's Ability to Withstand Increasing Public Pressure,
W77-07139 5C

PEBBLES
Acoustic Measurement of Sediment Transport,
W77-07338 2J

PECOS RIVER COMPACT
Pecos River Compact.
W77-07262 6E

PECOS RIVER (TES-N MEX)
Pecos River Compact.
W77-07262 6E

PELAGIC WATERS
Strategies for Existence of Zooplankton Prey in Homogeneous Environments,
W77-07509 5C

PELTIGERA
Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

PENNSYLVANIA
Predictability of Effects of a Severe Local Storm in Pennsylvania,
W77-07369 2B

PENRHYN BAY
The Stability During Many Years of the Mid-Tidal Shore at Penrhyn Bay, North Wales, and a Note on the Peat Beds at Rhos-on-Sea,
W77-07367 2L

PERCH
Effects of Pressure on Survival of Six Species of Fish,
W77-07424 5C

PERIPHYTON
Aspects of Reservoir-Power Station Interactions: Some Effects of Heat on Physico-Chemistry, Aufwuchs Ecology and Plankton Metabolism,
W77-07102 5C

Comparison of Primary Productivity (14C) per Unit Biomass Between Phytoplankton and Periphyton in the Ottawa River Near Ottawa, Canada,
W77-07454 5C

PERMEABILITY
Leaching Characteristics of Polluted Dredgings,
W77-07158 5B

Water Quality and Aquitard Permeability,
W77-07551 5G

PERMITS
Looking Ahead (Federal Water Pollution Control Act of 1972).
W77-07235 6E

Guidelines Establishing Test Procedures for the Analysis of Pollutants,
W77-07252 5A

Appropriation of Water--Permits, Certificates and Licenses--Survey.
W77-07265 6E

Bunger v. Uncompahgre Valley Water Users Association (Conditional Water Permits).
W77-07267 6E

Rappl and Hoenig Company, Incorporated v. New York State Department of Environmental Conservation (Applicability of Fresh Water Wetlands Act to Artificially Created Wetlands).
W77-07269 6E

Amdel Pipeline Inc V State of Texas (Statutory Requirement of Payment for Spoil Dredged from Bottom of Approaches to Corporate Loading Docks).
W77-07271 6E

United States V Cutter Laboratories, Inc (Civil Liability of a Permittee for Whom no Industrial Effluent Limitations or Guidelines Exist).
W77-07274 6E

PESTICIDE
Residues of 3-trifluoromethyl-4-nitrophenol (TFM) Undetected in Lake Trout and Chinook Salmon from the Upper Great Lakes,
W77-07187 5A

PESTICIDE KINETICS
Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

PESTICIDE RESIDUES
The Effect of the Use of Pesticides and Fertilizers in the Water Protection Zone with Sources of Artificial Replenishment of Underground Water Reserves, (In Russian),
W77-07107 5B

Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

Control of Agricultural Water Pollution: A Continuing Regulatory Dilema,
W77-07233 5G

Fate of the Organophosphate Insecticide Parathion in the Freshwater Invertebrates,
W77-07285 5C

The Effect of Collector Discharge Water from Rice Fields on the Zooplankton of Some Kuban Estuaries, (In Russian),
W77-07331 5C

The Distribution of Residual Quantities of DDT in the Organs and Tissues of Fish of the Kiev Reservoir, (In Russian),
W77-07572 5B

Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

PESTICIDE TOXICITY
Experimental Substantiation of Maximum Permissible Propachlor (Ramrod) Concentrations in Water, (In Russian),
W77-07133 5A

PESTICIDES
Use of Quicklime to Increase Oyster Seed Production,
W77-07122 5C

Diphenamid Removal from Water and Metabolism by Aquatic Plants,
W77-07193 5C

PETROLEUM HYDROCARBONS
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

PETROLEUM OXIDIZING BACTERIA
Self-Purification in the Coastal Waters of the Black Sea, (In Russian),
W77-07592 5C

PHENALEN-1-ONE
Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

PHENOLS
Phenol-Selective, Highly Resistant Ro-Membranes Made from PVA for the Purification of Toxic Industrial Wastes,
W77-07206 5D

PHOCID SEALS
Trophic Relationships Among Ice Inhabiting Phocid Seals,
W77-07407 6G

LIBRARY U. OF I. URBANA-CHAMPAIGN

PHOSPHATES
Synergistic Effects of Phosphate and Manganese on Growth of Lake Superior Algae,
W77-07448 5C

The Role of Phosphate in Eutrophication. Stimulation of Plankton Growth and Residence Times of Inorganic Phosphate in Lake Kinneret Water,
W77-07517 5C

Models for Simulation of Eutrophication of Lakes for Lake Constance (Bodensee-Obersee): I. Data from Lake Constance used in Simulation Models, (In German),
W77-07579 5C

PHOSPHORUS
Phosphorus and Carbon Distributions in a Polluted Coastal Environment,
W77-07368 5B

Nitrogen, Phosphorus, Particulate and Colloidal Carbon Content of Sedimenting Seston of a Hard-Water Lake,
W77-07441 5C

A Model of the Phosphorus Cycle and Phytoplankton Growth in Skaha Lake, British Columbia, Canada,
W77-07445 5C

Predicting the Impacts of Phosphorus Management Policies on the Eutrophication of Skaha Lake, British Columbia, Canada,
W77-07446 5C

The Effect of Food Concentration and Temperature on Respiration and Excretion in Herbivorous Zooplankton,
W77-07502 5C

Annual Contribution of Carbon, Nitrogen and Phosphorus by Migrant Canada Geese to a Hardwater Lake,
W77-07505 5C

Algal Response to Nutrient Inputs in Some Iowa Lakes,
W77-07515 5C

Response to Eutrophic Shagawa Lake, Minnesota, U.S.A., to Point-Source, Phosphorus Reduction,
W77-07519 5C

Relation Between the Amounts of Fertilization and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: 1. On the Relation Between the Amount of Fertilizer Application and the Specific Pollution Loads of Nitrogen and Phosphorus in Main Streams Flowing into Lake Nishiura, (In Japanese),
W77-07568 5B

Relation Between the Amounts of Fertilizer and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: II. On the Relation Between Livestock Waste Per Unit Area of Basin and the Specific Load of Pollutants in Main Streams Flowing into Nishiura Lake Basin, (In Japanese),
W77-07569 5B

Models for Simulation of Eutrophication of Lakes for Lake Constance (Bodensee-Obersee): I. Data from Lake Constance used in Simulation Models, (In German),
W77-07579 5C

Macrophytes and Phosphorus in Lake Andsjon, Central Sweden, (In Swedish),
W77-07582 5C

First Information About N, P Nutrients and the Production of Lake Trasimeno, (In Italian),
W77-07593 5C

PHOSPHORUS CYCLE
A Model of the Phosphorus Cycle and Phytoplankton Growth in Skaha Lake, British Columbia, Canada,
W77-07445 5C

PHOTOSYNTHESIS
Influence of Light and Temperature on the Photosynthetic Rate of Marine Benthic Diatoms,
W77-07385 5C

Effect of DDT on Photosynthesis of Selenstrum Capricornutum,
W77-07444 5C

Photosynthetic Rates in Lake Superior,
W77-07450 5C

Effect of Zooplankton Grazing on Photosynthetic Activity and Composition of Phytoplankton,
W77-07453 5C

The Release of Dissolved Organic Carbon from Submersed Aquatic Macrophytes: Diel, Seasonal and Community Relationships,
W77-07516 5C

PHOTOSYNTHETIC RATES
Photosynthetic Rates in Lake Superior,
W77-07450 5C

PHRAGMITES-COMMUNIS
A Study on Standing Crops in Phragmites Communis Communities and Their Environmental Factors, (In Korean),
W77-07335 5C

Macrophytes and Phosphorus in Lake Andsjon, Central Sweden, (In Swedish),
W77-07582 5C

PHYLLOSPADIX TORREYI
Response of the Marine Angiosperm Phyllospadix Torreyi to Certain Environmental Variables: A Preliminary Study,
W77-07379 5C

PHYSICAL PROPERTIES
A Survey of the Physical and Chemical Limnology of Lake Titicaca,
W77-07460 5C

PHYTOPLANKTON
Aspects of Reservoir-Power Station Interactions: Some Effects of Heat on Physico-Chemistry, Aufwuchs Ecology and Plankton Metabolism,
W77-07102 5C

Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms-II. Lethal Concentrations of Oil-Spill Emulsifier Components for Marine Phytoplankton, (In Japanese),
W77-07182 5C

The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

Succession Rates in Lake Phytoplankton Communities,
W77-07442 5C

Predicting the Impacts of Phosphorus Management Policies on the Eutrophication of Skaha Lake, British Columbia, Canada,
W77-07446 5C

Effect of Zooplankton Grazing on Photosynthetic Activity and Composition of Phytoplankton,
W77-07453 5C

Comparison of Primary Productivity (14C) per Unit Biomass Between Phytoplankton and Periphyton in the Ottawa River Near Ottawa, Canada,
W77-07454 5C

Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

The Structure of Phytoplankton Associations in Lake Tahoe (California-Nevada),
W77-07473 5C

A Comparison of Spectrophotometric Methods for the Determination of Phytoplankton Pigments, (In French),
W77-07581 5A

First Information About N, P Nutrients and the Production of Lake Trasimeno, (In Italian),
W77-07593 5C

PIG EXCRETA
An Investigation on the Disposal of Pig Excreta in Kasumigaura Area, (In Japanese),
W77-07571 5B

PIGMENTS
Pigment Cycle in a North German Lake,
W77-07459 5C

PILOT PLANTS
Dyehouse Water Treatment with Catalytic Oxidation.
W77-07221 5D

PIPELINES
Problems Associated with Construction of Submarine Pipelines,
W77-07349 8D

PIPES
Installation Tips on Large Submersibles,
W77-07289 8C

Reducing Power Consumption in Irrigation Systems with the Aid of a Mathematical Model for Pipe Dimensioning,
W77-07547 3F

PLANKTON
Preliminary Experiment of Cobalt 60 Pollution of a Marine Food Chain: Results of a Single Ingestion,
W77-07317 5C

Beaufort Sea Plankton Studies,
W77-07414 6G

The Utilization of the Green Alga Dictyosphaerium Pulchellum as Food for Certain Crustaceans of Fresh Water Plankton,
W77-07468 5C

PLANKTONIC
Planktonic Infusoria in Two Lakes of the Gorki Oblast, (In Russian),
W77-07234 5C

PLANNING
Public Participation Techniques and Methodologies: A resume,
W77-07332 6B

Water Resources Planning and Management Goals,
W77-07523 6B

Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

Accounting for Non-Economic Goals in Benefit-Cost Analysis,
W77-07543 6B

Towards System Models for Water Resource Management,
W77-07544 6A

PLANT PHYSIOLOGY
Diphenamid Removal from Water and Metabolism by Aquatic Plants,
W77-07193 5C

PLANT PIGMENTS
A Comparison of Spectrophotometric Methods for the Determination of Phytoplankton Pigments, (In French),
W77-07581 5A

PLASTIC PIPES
The Chief Driller's Report on JCCIP,
W77-07288 8C

PLUSS SEE (GERMANY)
Pigment Cycle in a North German Lake,
W77-07459 5C

PLUSSEE (GERMANY)
Changes in Phytoplankton Species Composition Since 1894 in Two Lakes in East-Holstein, Germany,
W77-07501 5C

PLUTONIUM
Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

POLICY-MAKING PROCESS
Broadening the Approach to Evaluation in Resources Management Decision-Making,
W77-07545 6B

POLIOVIRUS 1
Enterovirus and Bacteriophage Inactivation in Subsurface Waters and Translocation in Soil,
W77-07283 5B

POLLUTANT IDENTIFICATION
An Industrial View of Biological Monitoring,
W77-07126 5A

Experimental Substantiation of Maximum Permissible Propachlor (Ramrod) Concentrations in Water, (In Russian),
W77-07133 5A

Quest for an Index of Community Structure Sensitive to Water Pollution,
W77-07136 5A

A Light-Weight and Cheap Depth Sampler,
W77-07155 5A

Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

Guidelines Establishing Test Procedures for the Analysis of Pollutants,
W77-07252 5A

Proposed Toxic Pollutant Effluent Standard for Polychlorinated Biphenyls,
W77-07253 6E

The Differential Use of Chironomidae and Ceratopogonidae (Diptera) in the Monitoring of Various Aquatic Wastes,
W77-07282 5A

The Oligochaete Communities of a Lowland Stream and Their Value as Indicators of Organic Pollution,
W77-07307 5C

Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

Long Island Beach Pollution: June 1976,
W77-07325 5B

Occurrence and Determination of a Herbicide Benthiocarb in Rivers and Agricultural Drainages,
W77-07361 5A

The Analysis of Ammonia in Polluted Sea Water,
W77-07362 5A

Inorganic Contaminants in Rural Drinking Waters,
W77-07372 5A

The Larval Spirurid Nematodes of Fresh-Water Crustaceans: I. The Identification and the Examination of Their Pathogenicity,
W77-07458 5C

An Organic Carbon Budget for an Oligotrophic Lake In New Hampshire, U.S.A.,
W77-07470 5C

A Study of Environment Sanitation on the Wells in Jungneung-Dong Area, Seoul, (In Korean),
W77-07475 5B

Reaeration-Coefficient Measurements of 10 Small Streams in Wisconsin Using Radioactive Tracers--with a Section on the Energy-Dissipation Model.
W77-07496 5A

Similarities and Differences in the Chemical Composition of Waters from West, Central, and East Africa,
W77-07510 5A

Calculation of Calcium Carbonate-Carbon Dioxide Equilibrium in Water and Mixtures of Water,
W77-07513 5A

Satellite Observations of Water Quality,
W77-07554 5A

Limitations of Single Water Samples in Representing Mean Water Quality 1. Thompson River at Shaw Spring, British Columbia,
W77-07563 5A

Heavy Metals (Fe, Mn, Cd, Cr, Cu, Pb and Zn) in the Pelagic Zone of Lake Constance (Obersee and Untersee) and the Greifensee, (In German),
W77-07580 5A

A Comparison of Spectrophotometric Methods for the Determination of Phytoplankton Pigments, (In French),
W77-07581 5A

Bacteriological and Colimetric Examination of the Water Supplied to the Slaughterhouses Situated Near Salvador, Bahia, Brazil, (In Portugese),
W77-07587 5A

Assay of Detergent Residues in Fresh Water, Sea Water and Waste Waters: Method of Extraction and Concentration of Surfactants by Adsorption on Liquid-Liquid Interface, (In French),
W77-07591 5A

POLLUTANT REMOVAL
Application of Vascular Aquatic Plants for Pollution Removal, Energy and Food Production in a Biological System,
W77-07474 5D

POLLUTANTS
Effects of Man's Activities on Groundwater Quality,
W77-07359 5B

POLLUTION ABATEMENT
Toxic Waste Disposal,
W77-07209 5G

Reduced Water Demand--Result of Swedish Anti-Pollution Program,
W77-07215 5D

Great Lakes Paper Launches First Closed-Cycle Kraft Pulp Mill.
W77-07218 5D

A Mini-Pollution Tannery,
W77-07225 5D

Economic Aspects of Pollution Abatement, Part 1,
W77-07260 6E

Influence of an Ozonisation Plant on the Bacterial Content in Water of a Demonstration Aquarium,
W77-07311 5C

Status Report on Abatement of Water Pollution from the Canadian Petroleum Refining Industry - 1975,
W77-07334 5G

LIBRARY U. OF I. URBANA-CHAMPAIGN

Application of Vascular Aquatic Plants for Pollution Removal, Energy and Food Production in a Biological System,
W77-07474 5D

Proceedings, Water Pollution Abatement Technology in the Pulp and Paper Industry, (1975),
W77-07562 5D

Lake Restoration by Bottom Water Siphoning, (In German),
W77-07577 5G

POLLUTION CONTROL AGENCY GRANTS
Report of a Study of Control Agency Revenue Fees,
W77-07435 5G

POLLUTION IDENTIFICATION
Phosphorus and Carbon Distributions in a Polluted Coastal Environment,
W77-07368 5B

POLYCHLORINATED BIPHENYLS
Dynamics of Storage of Organochlorine Pollutants in Herring Gulls,
W77-07127 5C

PCB Contents in the Muscle of Marine Animals Collected in the Sea near Hakodate (In Japanese),
W77-07315 5C

POLYCHLORINATED BIPHENYLS (PCB'S)
Proposed Toxic Pollutant Effluent Standard for Polychlorinated Biphenyls,
W77-07253 6E

POLYELECTROLYTES
Use of Cation Polyelectrolytes for Water Purification from Viruses, (In Russian),
W77-07108 5F

POLYMERS
Techniques for Purifying Oily Waste Water,
W77-07213 5D

Purification of Industrial Waste Water Containing Organic Impurities--By Contacting with Adsorbent Polymer Material in Solvated Gel State.
W77-07222 5D

POLYVINYLALCOHOL MEMBRANES
Phenol-Selective, Highly Resistant Ro-Membranes Made from PVA for the Purification of Toxic Industrial Wastes,
W77-07206 5D

POROUS MEDIA
Analysis of Flow Against Dispersion in Porous Media,
W77-07150 2F

Location of Free Surface in Porous Media,
W77-07162 2F

POTABLE WATER
Inorganic Contaminants in Rural Drinking Waters,
W77-07372 5A

The Changes in Inorganic Nitrogen Concentration of Drinking Water from Wells Over a Two Year Period in Ani-Machi, Ibaraki Prefecture, (In Japanese),
W77-07570 5B

POTASSIUM
In Vitro Effect of Organic Nitrogen and Potassium Additions on Nitrogen Mineralization and on Exchanges Between the Mud and Water of a Pond, (In French),
W77-07575 5B

POTENTIAL WATER SUPPLY
The Feasibility of a Water Importation Project for South Florida,
W77-07259 6E

POULTRY
Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

Bacteriological Quality of Poultry-Farms' Water in Minas Gerais State, Brazil: 1973, (In Portugese),
W77-07594 5F

POWER PLANTS
Subtidal and Intertidal Marine Fouling on Artificial Substrata in Northern Puget Sound, Washington,
W77-07201 5C

POWERPLANTS
Pumped Storage Optimization in Generation Systems,
W77-07525 4A

Power Plant Site Evaluation: The Case of the Sharon Plant in Israel,
W77-07546 6G

PRECIPITATION (ATMOSPHERIC)
Physical Problems of Weather Modification,
W77-07357 3B

Predictability of Effects of a Severe Local Storm in Pennsylvania,
W77-07369 2B

Final Report on The Pyramid Lake Pilot Project, 1970-1975, Volume 1, Text of Report,
W77-07566 3B

PREDATION
Strategies for Existence of Zooplankton Prey in Homogeneous Environments,
W77-07509 5C

PREFERRED TEMPERATURES
Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

PRESCRIBED BURNING
Fire Effects on Water Supply, Floods, and Sedimentation,
W77-07318 4C

PRESCRIPTIVE RIGHTS
Schultz v Atkins (Claim for Easement Based on Contract for Water Rights Between Predecessors in Title).
W77-07268 6E

PRESSURE
The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

PRESUMPTIONS (LEGAL)
City and County of Honolulu V Bennett (Determination of Private Ownership Rights in Offshore Islands and Beach Parcels),
W77-07280 6E

PREY BEHAVIOR
Strategies for Existence of Zooplankton Prey in Homogeneous Environments,
W77-07509 5C

PRIMARY PRODUCTIVITY
Primary Production and Biomass of Algae Populations in an Oligotrophic Lake in the French Massif Central, (In French),
W77-07398 5C

Spatial and Temporal Changes in the Primary Productivity of Lake Tahoe, California-Nevada Between 1959 and 1971,
W77-07443 5C

Comparison of Primary Productivity (14C) per Unit Biomass Between Phytoplankton and Periphyton in the Ottawa River Near Ottawa, Canada,
W77-07454 5C

Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

Effect of Nutrient Enrichment on the Heterotrophic Uptake of Organic Solutes by Microorganisms,
W77-07466 5C

A Survey of the Biological Limnology of Lake Titicaca,
W77-07503 5C

PRIOR APPROPRIATION
Gilbert V Smith (Loss of Senior Appropriation Rights Through Abandonment, Forfeiture, or Adverse Possession),
W77-07279 6E

PRIORITIES
P. L. 92-500 V Local Priorities,
W77-07229 5D

Gilbert V Smith (Loss of Senior Appropriation Rights Through Abandonment, Forfeiture, or Adverse Possession),
W77-07279 6E

Water Resources Planning and Management Goals,
W77-07523 6B

PROCESSING PLANTS
Review of Treatment Technology in the Fruit and Vegetable Processing Industry in Canada.
W77-07341 5D

PRODUCTIVITY
Evaluation of Two Methods for Calculating Freshwater Zooplankton Production, (In Russian),
W77-07228 7B

Planktonic Infusoria in Two Lakes of the Gorki Oblast, (In Russian),
W77-07234 5C

Nutrient Transformations in Louisiana Salt Marsh Soils,
W77-07319 5C

The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

Population Changes in the Aquatic Fauna Inhabiting the Bladderwort, Utricularia Flexuosa Vahl., in a Tropical Swamp, Tasek Bera, Malaysia,
W77-07465 5C

Preliminary Estimates of Production by a Calanoid Copepod in Subtropical Lake Sibaya,
W77-07500 5C

PROGRAMS
Hydrology Research Division, Annual Progress Reports and Short Research Notes 1975-76.
W77-07336 6E

Dredged Material Disposal Effects and Alternatives,
W77-07345 8D

PROJECT PLANNING
Broadening the Approach to Evaluation in Resources Management Decision-Making,
W77-07545 6B

PROJECTIONS
Predicting the Impacts of Phosphorus Management Policies on the Eutrophication of Skaha Lake, British Columbia, Canada,
W77-07446 5C

PROJECTS
Hydrology Research Division, Annual Progress Reports and Short Research Notes 1975-76.
W77-07336 6E

PROPACHLOR
Experimental Substantiation of Maximum Permissible Propachlor (Ramrod) Concentrations in Water, (In Russian),
W77-07133 5A

PROPELLER PUMPS
The Chief Driller's Report on JCCIP,
W77-07288 8C

PROPERTY INTERESTS
Right to Accretion Built up from One Tract of Land and Extending Laterally in Front of Adjoining Tract Without Being Contiguous Thereto.
W77-07266 6E

Schultz v Atkins (Claim for Easement Based on Contract for Water Rights Between Predecessors in Title).
W77-07268 6E

Olson V Bedke (Failure of Tenant to Put Water on Leased Land to Beneficial Use).
W77-07272 6E

PROPERTY RIGHTS
Schultz v Atkins (Claim for Easement Based on Contract for Water Rights Between Predecessors in Title).
W77-07268 6E

PROTEINS
Protein Production by Russian Thistle: Effects of Water and Nitrogen on Protein Yields,
W77-07281 3F

PROTOCOCCAL ALGAE
Phytomicrobenthos of the Kurtli Reservoir, (In Russian),
W77-07596 5C

PROTOZOA
The Ciliates of Two Bulgarian Tributaries of the Danube which are Polluted: The Rivers Vit and Ossam, (In French),
W77-07573 5B

PSEUDODIAPTOMUS HESSEI
Preliminary Estimates of Production by a Calanoid Copepod in Subtropical Lake Sibaya,
W77-07500 5C

PUBLIC BENEFITS
Public Participation in Water Resource Development,
W77-07526 6B

PUBLIC OPINION
Public Participation in Water Resource Development,
W77-07526 6B

PUBLIC OPINION SAMPLING
The Environmentally Concerned Citizen: Some Correlates,
W77-07438 6G

PUBLIC PARTICIPATION
Public Participation Techniques and Methodologies: A resume,
W77-07332 6B

Public Participation in Water Resource Development,
W77-07526 6B

PUBLIC RIGHTS
Property-Coastal Shores-Private Property Rights Upheld over Claimed Public Right to Recreational use of Beach-Implied Dedication, Easement by Prescription, Public Trust Through Custom and Grant, and Doctrine of Submergence not Applicable. Department of Natural Resources V. Mayor and Council of Ocean City, 274 Md. 1, 332 A.2d 630 (1975).
W77-07239 6E

PUBLIC WORKS
Public Participation in Water Resource Development,
W77-07526 6B

PUBLICATIONS
Bibliography and Index of North Dakota Water Resources 1878-1970,
W77-07140 10C

Proceedings of the Seventh Dredging Seminar.
W77-07342 8D

PUGET SOUND (WASH)
Subtidal and Intertidal Marine Fouling on Artificial Substrata in Northern Puget Sound, Washington,
W77-07201 5C

PULP AND PAPER INDUSTRY
Proceedings, Water Pollution Abatement Technology in the Pulp and Paper Industry, (1975),
W77-07562 5D

PULP WASTES
Inline Sensor Tightens Control on Sludge Consistency to Within 1.4-1.5% Solids,
W77-07214 5D

An Ozone Reactor for Color Removal from Pulp Bleachery Wastes,
W77-07216 5D

Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W77-07217 5D

Great Lakes Paper Launches First Closed-Cycle Kraft Pulp Mill.
W77-07218 5D

Proceedings, Water Pollution Abatement Technology in the Pulp and Paper Industry, (1975),
W77-07562 5D

PUMPED STORAGE
Pumped Storage Optimization in Generation Systems,
W77-07525 4A

PUMPING
Type Curves for Analysis of Pump Tests in Leaky Strip Aquifers,
W77-07145 2F

PUMPS
The Chief Driller's Report on JCCIP,
W77-07288 8C

Installation Tips on Large Submersibles,
W77-07289 8C

Parameter Study of Variables Affecting the Performance of a Hydraulic Pipeline Dredge Model,
W77-07346 8D

PYRAMID LAKE PROJECT
Final Report on The Pyramid Lake Pilot Project, 1970-1975, Volume 1, Text of Report,
W77-07566 3B

Final Report on the Pyramid Lake Pilot Project, 1970-1975, Volume 2, Appendices,
W77-07567 3B

RADIOACTIVE WASTES
Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

RADIOACTIVITY
Mathematical Models of Strontium-90 Behavior in 'Water-Fresh Water Fish Spawn' System for Particular Cases of Radioactive Contamination of Reservoirs, (In Russian),
W77-07539 5C

RADIOACTIVITY TECHNIQUES
Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

Reaeration-Coefficient Measurements of 10 Small Streams in Wisconsin Using Radioactive Tracers--with a Section on the Energy-Dissipation Model.
W77-07496 5A

RADIOISOTOPES
A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

Accumulation and Distribution of Trace Metals and Radionuclides in Marine Organisms (Particularly Tapes Decussatus L.) in the Izmir Bay Area, Turkey,
W77-07395 5C

Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

RAIN
Land Application of Digested Sludge Under Adverse Conditions.
W77-07337 5D

RAIN GAGES
Digital Raingage Recorder,
W77-07172 2B

RAINBOW TROUT
Seasonal Changes in Hematology of Rainbow Trout, Salmo Gairdneri,
W77-07403 5C

Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

RAINFALL
The Effect of Soil Moisture on Circulation and Rainfall in a Tropical Model,
W77-07166 2B

Dynamics of Climatic Hazards in Northeast Brazil,
W77-07167 2B

Estimating Above and Below Normal Rainfall Periods Over South Africa, 1972-2000,
W77-07170 2B

Digital Raingage Recorder,
W77-07172 2B

Utilization of the Results from Representative and Experimental Basins with a View to the Management of Water Resources,
W77-07355 4A

Simulation of a Series of Daily Areal Mean Rainfalls for a Basin Using Rainfall Observations at a Reference Station Located Outside the Basin,
W77-07356 2B

Predictability of Effects of a Severe Local Storm in Pennsylvania,
W77-07369 2B

Maximum 5-Minute and Hourly Rainfalls on Metromex Network, 1971-1975,
W77-07374 2B

Deposition of Mineral Nitrogen by Rain in the Lamto Savanna, (In French),
W77-07574 5B

RAMROD
Experimental Substantiation of Maximum Permissible Propachlor (Ramrod) Concentrations in Water, (In Russian),
W77-07133 5A

RANKING METHODOLOGIES
Similarities and Differences in the Chemical Composition of Waters from West, Central, and East Africa,
W77-07510 5A

RATES
Succession Rates in Lake Phytoplankton Communities,
W77-07442 5C

REAERATION
Reaeration-Coefficient Measurements of 10 Small Streams in Wisconsin Using Radioactive Tracers--with a Section on the Energy-Dissipation Model.
W77-07496 5A

REAL PROPERTY LAW
Right to Accretion Built up from One Tract of Land and Extending Laterally in Front of Adjoining Tract Without Being Contiguous Thereto.
W77-07266 6E

RECLAMATION
Lake Restoration Through Mechanical Harvesting of Aquatic Vegetation,
W77-07451 5G

RECORDERS
Digital Raingage Recorder,
W77-07172 2B

RECREATION
Property-Coastal Shores-Private Property Rights Upheld over Claimed Public Right to Recreational use of Beach-Implied Dedication, Easement by Prescription, Public Trust Through Custom and Grant, and Doctrine of Submergence not Applicable. Department of Natural Resources V. Mayor and Council of Ocean City, 274 Md. 1, 332 A.2d 630 (1975).
W77-07239 6E

Scheduling Models for Wilderness Recreation.
W77-07541 6B

RECREATION FACILITIES
City and County of Honolulu V Bennett (Determination of Private Ownership Rights in Offshore Islands and Beach Parcels),
W77-07280 6E

RECYCLING
The Desalting and Recycling of Waste Waters from Textile Dyeing Operations Using Reverse Osmosis,
W77-07220 5D

RED TIDE
Red Tide in the Upwelling Region of Baja California,
W77-07169 5C

Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

REDUCTION (CHEMICAL)
Anthropogenically Reduced Groundwaters,
W77-07360 5B

REED COMMUNITIES
A Study on Standing Crops in Phragmites Communis Communities and Their Environmental Factors, (In Korean),
W77-07335 5C

REFINERIES
Status Report on Abatement of Water Pollution from the Canadian Petroleum Refining Industry - 1975,
W77-07334 5G

REGIONAL ANALYSIS
Apparent Regional Skew,
W77-07484 2E

REGIONAL ECONOMICS
Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

REGOESSION ANALYSIS
Use of Quantitative Correlations Between Microorganisms for River Pollution Evaluation, (In Russian),
W77-07482 5B

REGRESSION ANALYSIS
Missouri River Power Curve Regression Equations,
W77-07152 2E

Stochastic Properties of Daily Temperature in Rivers,
W77-07159 5B

REGULATION
House Committee Marks up HR 9560,
W77-07236 5G

Rules for the Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Bulk,
W77-07251 5G

RELATIVE TOLERANCE
Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

RELIABILITY
Quest for an Index of Community Structure Sensitive to Water Pollution,
W77-07136 5A

REMOTE SENSING
Hydrogeological Applications of Earth Resources Technology Satellite Landsat 1 Imagery,
W77-07339 7B

Use of Aerial Remote Sensors to Monitor Dredging Projects,
W77-07344 8D

Rectilinear Leads and Internal Motions in the Ice Pack of the Western Arctic Ocean,
W77-07373 2C

Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

Test of Landsat-Based Urban Hydrologic Modeling,
W77-07528 6A

Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-07549 2H

Satellite Observations of Water Quality,
W77-07554 5A

REPRODUCTION
Effects of Increased Water Temperature on Daphnia Pulex,
W77-07130 5C

Breeding Biology of a Non-Diadromous Galaxiid, Galaxias Vulgaris Stokell, in a New Zealand River,
W77-07389 5C

Studies on the Effect of Temperature on the Egg Laying of Three Species of Calanoid Copepods in the Laboratory (Acartia Tonsa, Temora Longicornis, and Pseudocalanus Elongatus),
W77-07391 5C

RESEARCH AND DEVELOPMENT
Brace Research Institute, Annual Report, (1976),
W77-07242 3A

Hydrology Research Division, Annual Progress Reports and Short Research Notes 1975-76.
W77-07336 6E

Dredged Material Disposal Effects and Alternatives,
W77-07345 8D

Reclamation Research in the Seventies, Second Progress Report,
W77-07600 8A

RESEARCH NEEDS
Snow and Ice Hydrology in the United States--Current Status and Future Directions,
W77-07565 2C

RESEARCH PRIORITIES
The Economics of Natural Environments, Studies in the Valuation of Commodity and Amenity Resources.
W77-07437 6G

Snow and Ice Hydrology in the United States--Current Status and Future Directions,
W77-07565 2C

RESERVOIR OPERATION
Gains from Joint Operation of Multiple Reservoir Systems,
W77-07533 4A

Reliability-Constrained Dynamic Programing and Randomized Release Rules in Reservoir Management,
W77-07535 4A

Reservoir Operation Under Conflicting Objectives,
W77-07536 4A

RESERVOIR RELEASES
Reliability-Constrained Dynamic Programing and Randomized Release Rules in Reservoir Management,
W77-07535 4A

RESERVOIRS
Experiments on the Resistance of Fish to Rapid Increase in Hydrostatic Pressure,
W77-07416 5C

Preliminary Investigations on Bivalves Bivalvia of the Dam Reservoir at Goczalkowice,
W77-07440 5C

RESOURCE ALLOCATION
The Economics of Natural Environments, Studies in the Valuation of Commodity and Amenity Resources.
W77-07437 6G

RESOURCES DEVELOPMENT
Dredged Material Disposal Effects and Alternatives,
W77-07345 8D

Morbidity and Mortality of Marine Mammals,
W77-07405 6G

Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

Trophic Relationships Among Ice Inhabiting Phocid Seals,
W77-07407 6G

Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska,
W77-07411 6G

Zooplankton and Micronekton Studies in the Bering - Chukchi/Beaufort Seas,
W77-07412 6G

Phytoplankton Studies in the Bering Sea,
W77-07413 6G

Beaufort Sea Plankton Studies,
W77-07414 6G

RESPIRATION
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

Study on Respiratory Metabolism Modifications in Acartia clausi (Crustacea: Copepoda) Populations after Passage through the Cooling Circuit of a Power Plant,
W77-07305 5C

Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

The Influence of Temperature and Time of Year on the Oxygen Uptake of the Sea Mussel Mytilus Edulis,
W77-07383 5C

Respiratory Responses of Gillichthys Mirabilis to changes in Temperature, Dissolved Oxygen and Salinity,
W77-07401 5C

Sediment Respiration in Six Italian Lakes in Different Trophic Conditions,
W77-07461 5C

The Effect of Food Concentration and Temperature on Respiration and Excretion in Herbivorous Zooplankton,
W77-07502 5C

The Release of Dissolved Organic Carbon from Submersed Aquatic Macrophytes: Diel, Seasonal and Community Relationships,
W77-07516 5C

RETENTION
Concepts for the Reclamation of Dredged Material,
W77-07352 8D

REVERSE OSMOSIS
Phenol-Selective, Highly Resistant Ro-Membranes Made from PVA for the Purification of Toxic Industrial Wastes,
W77-07206 5D

Large-Scale Reverse Osmosis Processing of Metal Finishing Rinse Waters,
W77-07207 5D

Waste Water Reclamation System Ups Productivity, Cuts Water Use,
W77-07210 5D

The Desalting and Recycling of Waste Waters from Textile Dyeing Operations Using Reverse Osmosis,
W77-07220 5D

REVIEWS
Quest for an Index of Community Structure Sensitive to Water Pollution,
W77-07136 5A

Public Participation Techniques and Methodologies: A resume,
W77-07332 6B

Review of Treatment Technology in the Fruit and Vegetable Processing Industry in Canada.
W77-07341 5D

Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

RHOS-ON-SEA
The Stability During Many Years of the Mid-Tidal Shore at Penrhyn Bay, North Wales, and a Note on the Peat Beds at Rhos-on-Sea,
W77-07367 2L

RIPARIAN LAND
Right to Accretion Built up from One Tract of Land and Extending Laterally in Front of Adjoining Tract Without Being Contiguous Thereto.
W77-07266 6E

RIPARIAN RIGHTS
Some Suggestions for the Management of International River Basins,
W77-07250 6E

Right to Accretion Built up from One Tract of Land and Extending Laterally in Front of Adjoining Tract Without Being Contiguous Thereto.
W77-07266 6E

RISKS
Offshore Oil and Fishery Resources,
W77-07195 5C

Legal Decisions and Opinions in Pollution Cases,
W77-07436 5G

RIVER BASIN COMMISSIONS
Evolution and Objectives of River Basin Commissions in the United States,
W77-07249 6E

Some Suggestions for the Management of International River Basins,
W77-07250 6E

RIVER BASINS
Evolution and Objectives of River Basin Commissions in the United States,
W77-07249 6E

RIVER MEDLOCK (ENG)
Seasonal Changes of Invertebrate Populations in the Polluted River Medlock,
W77-07121 5C

RIVER OSSAM (BULG)
The Ciliates of Two Bulgarian Tributaries of the Danube which are Polluted: The Rivers Vit and Ossam, (In French),
W77-07573 5B

RIVER SKERNE
Interconnection of Surface and Underground Water Resources in Southeast Durham,
W77-07149 4B

RIVER SYSTEMS
Scientific and Scenic Rivers Act: Commentary and Model Statute,
W77-07231 6G

Scheduling Models for Wilderness Recreation.
W77-07541 6B

RIVER VIT (BULG)
The Ciliates of Two Bulgarian Tributaries of the Danube which are Polluted: The Rivers Vit and Ossam, (In French),
W77-07573 5B

RIVER YENISEI (USSR)
Oil-Oxidizing Bacteria of the River Yenisei, (In Russian),
W77-07532 5C

RIVERS
Interconnection of Surface and Underground Water Resources in Southeast Durham,
W77-07149 4B

Stochastic Properties of Daily Temperature in Rivers,
W77-07159 5B

Scientific and Scenic Rivers Act: Commentary and Model Statute,
W77-07231 6G

Dynamics of O2 and CO2 Exchange, Photosynthesis, and Respiration in Rivers from Time-Delayed Correlations with Ideal Sunlight,
W77-07364 5C

Similarities and Differences in the Chemical Composition of Waters from West, Central, and East Africa,
W77-07510 5A

RIVERS AND HARBORS ACT
United States V Diamond (Permanent Injunction During Administrative Procedures Justified by Developers Fill of Marshland Without Refuse Act Permit),
W77-07275 6E

ROCK PROPERTIES
Geologists Claim Health Can be Traced to Rocks,
W77-07290 5B

ROCKFISH
The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

RODOPHYTA
Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

ROTARY DRILLING
New Rig Concept Uses Continuous Drill String.
W77-07298 8G

New Lost Circulation Remedy is Easy to Use.
W77-07299 8G

ROTARY FILTERS
Two New Methods of Sludge Removal,
W77-07224 5D

ROTIFERS
The Vertical Distribution of Plankton Rotifers in a Small Alpine Lake with a Sharp Oxygen Depletion (Lunzer Obersee),
W77-07456 5C

RUNOFF
Utilization of the Results from Representative and Experimental Basins with a View to the Management of Water Resources,
W77-07355 4A

Regional Study of the Upper Basin of the AAR from its Sources to Bern: Profile of Floods of a Given Return Period at any Point on the River (Etude Regionale du Bassin Superieur de L'Aar de ses Sources Jusqu'a Berne: Profile des Crues de Periode Donnee le Long du Cours d'eau).
W77-07358 2E

RURAL AREAS
Inorganic Contaminants in Rural Drinking Waters,
W77-07372 5A

RUSSIAN THISTLE
Protein Production by Russian Thistle: Effects of Water and Nitrogen on Protein Yields,
W77-07281 3F

SAFE YIELD
Gains from Joint Operation of Multiple Reservoir Systems,
W77-07533 4A

SAHARA
The Effect of Soil Moisture on Circulation and Rainfall in a Tropical Model,
W77-07166 2B

SAHEL (AFRICA)
The Effect of Soil Moisture on Circulation and Rainfall in a Tropical Model,
W77-07166 2B

Utilization of the Results from Representative and Experimental Basins with a View to the Management of Water Resources,
W77-07355 4A

SALICYLANILIDE
Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

SALINE WATER INTRUSION
Water Quality and Aquitard Permeability,
W77-07551 5G

SALINITY
Alteration in the Toxicity of Tissue Lipids with the Adaptation of Fishes to Osmotic Pressure Changes in the Environment,
W77-07120 5C

Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

Hydrographic Properties, MESA New York Bight Atlas Monograph 1,
W77-07328 2L

Interaction of Temperature and Salinity on Oxygen Consumption of the Estuarine Crab Panopeus Herbstii,
W77-07375 5C

The Effect of Salinity and Cyclic Temperature on Larval Development of the Mud-Crab Rhithropanopeus Harrisii (Brachyura: Xanthidae) Reared in the Laboratory,
W77-07384 5C

Comparative Ecophysiology of Gammarids (Crustacea: Amphipoda) From Marine, Brackish and Fresh-Water Habitats, Exposed to the Influence of Salinity-Temperature Combinations. I. Effect on Survival,
W77-07397 5C

Hematology of Juvenile Striped Bass, Morone Saxatilis (Walbaum), Acclimated to Different Environmental Conditions,
W77-07400 5C

Respiratory Responses of Gillichthys Mirabilis to changes in Temperature, Dissolved Oxygen and Salinity,
W77-07401 5C

Effect of Silt and Salinity on the Mortality of Meretrix Lusoria (Roeding), (In Korean),
W77-07428 5C

SALMON
Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

Spillway Redesign Abates Gas Supersaturation in Columbia River,
W77-07432 5G

SALMONELLA
Bacteriological Studies in the Cienaga Grande (Great Marsh) of Santa Maria, Columbia, (In Spanish),
W77-07512 5C

A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

SALMONIDS
Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

Environmental Dependence of Manganese and Zinc in the Scales of Atlantic Salmon, Salmo Salar (L) and Brown Trout, Salmo Trutta (L),
W77-07203 5C

Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

SALT MARSHES
Nutrient Transformations in Louisiana Salt Marsh Soils,
W77-07319 5C

An Investigation of Colloidal Organic Particles Isolated from Different Populations of Bivalves,
W77-07498 5A

Bacteriological Studies in the Cienaga Grande (Great Marsh) of Santa Maria, Columbia, (In Spanish),
W77-07512 5C

SALTS
Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

SALVADOR (BRAZIL)
Bacteriological and Colimetric Examination of the Water Supplied to the Slaughterhouses Situated Near Salvador, Bahia, Brazil, (In Portugese),
W77-07587 5A

SAMPLING
A Light-Weight and Cheap Depth Sampler,
W77-07155 5A

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

Surber Sampling in Deep Water for Bottom Organisms,
W77-07199 7B

Post-Glacial History of Mirror Lake and Its Watershed In New Hampshire, U.S.A.: An Initial Report,
W77-07472 5C

Limitations of Single Water Samples in Representing Mean Water Quality 1. Thompson River at Shaw Spring, British Columbia,
W77-07563 5A

Improved Method for the Determination of ATP in Lakewater, (In German),
W77-07578 5A

SAND-BED CHANNELS
Mathematical Modeling of Sedimentation Transients in Sand-Bed Channels,
W77-07354 2J

SANDSTONES
Specific Yield Determinations from a Consolidated Sandstone Aquifer,
W77-07153 2F

SATELLITES
Hydrogeological Applications of Earth Resources Technology Satellite Landsat 1 Imagery,
W77-07339 7B

SATURATED FLOW
Saturated and Unsaturated Flow to Parallel Drains,
W77-07552 4A

SCALING
Geothermal Energy: Needed, Effective Heat Transfer Equipment,
W77-07301 8G

SCHEDULING
Scheduling Models for Wilderness Recreation.
W77-07541 6B

SCIENTIFIC AND SCENIC RIVERS ACT
Scientific and Scenic Rivers Act: Commentary and Model Statute,
W77-07231 6G

SCULPINS
Some Effects of Channelization on the Fishes and Invertebrates of Rush Creek, Modoc County, California,
W77-07109 5C

Life History Notes for a Population of Slimy Sculpin (Cottus Cognatus) in an Alaskan Arctic Stream,
W77-07393 5C

SEA ICE
Rectilinear Leads and Internal Motions in the Ice Pack of the Western Arctic Ocean,
W77-07373 2C

Phytoplankton Studies in the Bering Sea,
W77-07413 6G

SEA LIONS
Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

SEA WATER
The Analysis of Ammonia in Polluted Sea Water,
W77-07362 5A

SEASONAL
Seasonal Changes of Invertebrate Populations in the Polluted River Medlock,
W77-07121 5C

A Contribution to the Life History of the Cunner, Tautogolabrus Adspersus, in Fishers Island Sound, Connecticut,
W77-07377 5C

Seasonal Changes in Hematology of Rainbow Trout, Salmo Gairdneri,
W77-07403 5C

Seasonal Variation in Sediment-Water Exchange of Nutrient Ions in Lake Esrom,
W77-07467 5C

SEASONAL VARIATIONS
Hydrographic Properties, MESA New York Bight Atlas Monograph 1,
W77-07328 2L

SEDIMENT DISTRIBUTION
Distribution Thickness and Certain Physical and Chemical Properties of Bottom Sediments in the Kiev Reservoir, (In Russian),
W77-07321 2J

Wassaw Island Erosion Study. Part 1: Sedimentary Framework of a Channel Margin Shoal of an Ebb Delta, Wassaw Sound, Georgia,
W77-07324 2L

SEDIMENT THICKNESS
Distribution Thickness and Certain Physical and Chemical Properties of Bottom Sediments in the Kiev Reservoir, (In Russian),
W77-07321 2J

SEDIMENT TRANSPORT
Transports in Lake Superior,
W77-07176 5B

Acoustic Measurement of Sediment Transport,
W77-07338 2J

Mathematical Modeling of Sedimentation Transients in Sand-Bed Channels,
W77-07354 2J

Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

Reconnaissance of Sediment Transport and Channel Morphology in the Lower Rio Bermejo Basin, Argentina--With a Section on Reconnaissance of the Lower Rio Pilcomayo Basin, Argentina and Paraguay,
W77-07490 2J

SEDIMENT-WATER INTERFACES
Seasonal Variation in Sediment-Water Exchange of Nutrient Ions in Lake Esrom,
W77-07467 5C

SEDIMENT YIELD
Reconnaissance of Sediment Transport and Channel Morphology in the Lower Rio Bermejo Basin, Argentina--With a Section on Reconnaissance of the Lower Rio Pilcomayo Basin, Argentina and Paraguay,
W77-07490 2J

SEDIMENTATION
Wassaw Island Erosion Study. Part 1: Sedimentary Framework of a Channel Margin Shoal of an Ebb Delta, Wassaw Sound, Georgia,
W77-07324 2L

Experimental Sediment Addition Studies on the Harris River, N.W.T., Canada: The Effect on Macroinvertebrate Drift,
W77-07455 5C

Tripton Sedimentation in Eutrophic Lakes--Sample Correction for the Resuspended Matter,
W77-07463 5C

Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

SEDIMENTATION RATES
Tripton Sedimentation in Eutrophic Lakes--Sample Correction for the Resuspended Matter,
W77-07463 5C

SEDIMENTS
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

Nitrogen, Phosphorus, Particulate and Colloidal Carbon Content of Sedimenting Seston of a Hard-Water Lake,
W77-07441 5C

Areal Distribution and Stratigraphy of Diatoms in the Sediments of Lake Sallie, Minnesota,
W77-07481 5C

Water Quality and Aquitard Permeability,
W77-07551 5G

Bacteriologic Analysis in the Arosa, Vigo and Pontevedra Estuaries, (In Spanish),
W77-07589 5A

SEEPAGE
Water Movement in Soil from Trickle Source,
W77-07550 2G

SELECTIVITY
Strategies for Existence of Zooplankton Prey in Homogeneous Environments,
W77-07509 5C

SELF PURIFICATION
Hygienic Standardization of Disodium Salts of Meta-and Para-Diisopropylbenzene in Water Bodies, (In Russian),
W77-07590 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

Self-Purification in the Coastal Waters of the Black Sea, (In Russian),
W77-07592 5C

SEPARATION TECHNIQUES
Assay of Detergent Residues in Fresh Water, Sea Water and Waste Waters: Method of Extraction and Concentration of Surfactants by Adsorption on Liquid-Liquid Interface, (In French),
W77-07591 5A

SESTON
Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

Nitrogen, Phosphorus, Particulate and Colloidal Carbon Content of Sedimenting Seston of a Hard-Water Lake,
W77-07441 5C

SETTLING BASINS
Concepts for the Reclamation of Dredged Material,
W77-07352 8D

SEWAGE
Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

Land Application of Digested Sludge Under Adverse Conditions.
W77-07337 5D

SEWAGE DISPOSAL
Committee for the Consideration of the Jones Falls Sewage System V Train (Federal Common Law Concerning Water Pollution Applicable to Interstate Controversey Only),
W77-07276 6E

SEWAGE EFFLUENTS
A Natural Pollution Experiment: The Effects of a Sewage Strike on the Fauna of the Thames Estuary,
W77-07124 5C

SEWAGE TREATMENT
Water Quality Criteria and Waste Water Treatment,
W77-07522 5D

SEWERS
Evaluating Alternative Levels of Water and Sanitation Service for Communities in the Northwest Territories,
W77-07557 6A

Vacuum Sewer Systems and Their Possible Canadian Applications,
W77-07558 5D

SHAD
Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

SHAGAWA LAKE (MINN.)
Response to Eutrophic Shagawa Lake, Minnesota, U.S.A., to Point-Source, Phosphorus Reduction,
W77-07519 5C

SHALLOW GROUNDWATER
Nitrogen Contamination Sources in Shallow Ground Water, Las Vegas Area, Nevada,
W77-07141 5B

SHELLFISH
Offshore Oil and Fishery Resources,
W77-07195 5C

SHELLFISH FARMING
Use of Quicklime to Increase Oyster Seed Production,
W77-07122 5C

Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

SHINERS
Life History Patterns in the Coastal Shiner, Notropis Petersoni, Fowler,
W77-07386 5C

SHIPS
The 1973 IMCO Convention: Tightening the Controls on Operational Oil Pollution from Tankers,
W77-07244 5G

SHORE PROTECTION
Dune Stabilization with Panicum amarum Along the North Carolina Coast,
W77-07327 2L

SHRIMP
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

SIERRA CLUB
The Environmentally Concerned Citizen: Some Correlates,
W77-07438 6G

SILTS
Effect of Silt and Salinity on the Mortality of Meretrix Lusoria (Roeding), (In Korean),
W77-07428 5C

SILVER
Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

SILVER IODIDE
Final Report on the Pyramid Lake Pilot Project, 1970-1975, Volume 2, Appendices,
W77-07567 3B

SIMULATION
A Nitrogen Gas (N2) Model for the Lower Columbia River, Final Report,
W77-07422 5B

SIMULATION ANALYSIS
Predicting the Impacts of Phosphorus Management Policies on the Eutrophication of Skaha Lake, British Columbia, Canada,
W77-07446 5C

Models for Simulation of Eutrophication of Lakes for Lake Constance (Bodensee-Obersee): I. Data from Lake Constance used in Simulation Models, (In German),
W77-07579 5C

SIPHONING (BOTTOM WATER)
Lake Restoration by Bottom Water Siphoning, (In German),
W77-07577 5G

SIPHONS
The Effects of High Vacuum on Fish,
W77-07421 5C

SITES
Power Plant Site Evaluation: The Case of the Sharon Plant in Israel,
W77-07546 6G

SKAHA LAKE (BRITISH COLUMBIA)
A Model of the Phosphorus Cycle and Phytoplankton Growth in Skaha Lake, British Columbia, Canada,
W77-07445 5C

Predicting the Impacts of Phosphorus Management Policies on the Eutrophication of Skaha Lake, British Columbia, Canada,
W77-07446 5C

SKELETONEMA COSTATUM
Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

SKEW ESTIMATES
Apparent Regional Skew,
W77-07484 2E

SLOPES
Water Flux in Soil and Subsoil on a Steep Forested Slope,
W77-07147 2G

SLUDGE
Wastewater and Sludge Control in the Canadian Metal Finishing Industry, Segment Including Chemical, Electrolytic Treatment; Electrochemical Machining and Polishing; Cyanide Hardening,
W77-07333 5D

Land Application of Digested Sludge Under Adverse Conditions.
W77-07337 5D

SLUDGE TREATMENT
Inline Sensor Tightens Control on Sludge Consistency to Within 1.4-1.5% Solids,
W77-07214 5D

Two New Methods of Sludge Removal,
W77-07224 5D

SLUICE GATE
Free Flow Immediately Below Sluice Gates,
W77-07161 8B

SLURRIES
New Lost Circulation Remedy is Easy to Use.
W77-07299 8G

SNAILS
Fate of the Organophosphate Insecticide Parathion in the Freshwater Invertebrates,
W77-07285 5C

SNAKE RIVER
Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

SNOW
Snow and Ice Hydrology in the United States--Current Status and Future Directions,
W77-07565 2C

SOCIAL PARTICIPATION
Public Participation Techniques and Methodologies: A resume,
W77-07332 6B

The Environmentally Concerned Citizen: Some Correlates,
W77-07438 6G

Public Participation in Water Resource Development,
W77-07526 6B

SOCIAL VALUES
The Environmentally Concerned Citizen: Some Correlates,
W77-07438 6G

SOCKEYE SALMON
Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

SODIUM
Water Quality and Aquitard Permeability,
W77-07551 5G

SODIUM CHLORIDE
Effect of the Presence of Sodium Chloride in the Medium on Growth, Development and Distribution of Chlorine and Sodium in Sorghum Dochna F., (In French),
W77-07291 3C

SODIUM IONS
Study of the State of Water on the Surface of H+, NA+, MG2+ Saturated Kaolinite by the NMR Method, (In Russian),
W77-07241 2G

SODIUM NITRATE
How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

SODIUM PENTACHLOROPHENOL
Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

SOFT CLAM
The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

SOFT CLAMS
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

SOIL ANALYSIS
Study of the State of Water on the Surface of H+, NA+, MG2+ Saturated Kaolinite by the NMR Method, (In Russian),
W77-07241 2G

SOIL CHEMICAL PROPERTIES
Geologists Claim Health Can be Traced to Rocks,
W77-07290 5B

SOIL CONTAMINATION
Variations in the Lead, Zinc and Calcium Content of Dendrobaena rubida (Oligochaeta) in a Base Metal Mining Area,
W77-07135 5C

SOIL MATRIX POTENTIAL
Horizon Hydraulic Conductivities Determined In Situ for the Wilderness, Mexico and Menfro Soils and Used to Predict Soil Water Content,
W77-07103 2G

SOIL MOISTURE
Suction Head at Wet Front in Unsaturated-Flow Problems--A New Definition,
W77-07144 2G

Automatic Monitoring of Soil Moisture Conditions in a Hillslope Spur and Hollow,
W77-07146 2G

The Effect of Soil Moisture on Circulation and Rainfall in a Tropical Model,
W77-07166 2B

SOIL PHYSICAL PROPERTIES
Compressibility and Strength of Compacted Dredgings,
W77-07350 8D

Permeability and Drainage Characteristics of Dredgings,
W77-07351 8D

SOIL PROPERTIES
Horizon Hydraulic Conductivities Determined In Situ for the Wilderness, Mexico and Menfro Soils and Used to Predict Soil Water Content,
W77-07103 2G

SOIL TESTS
Compressibility and Strength of Compacted Dredgings,
W77-07350 8D

Permeability and Drainage Characteristics of Dredgings,
W77-07351 8D

SOIL WATER
Horizon Hydraulic Conductivities Determined In Situ for the Wilderness, Mexico and Menfro Soils and Used to Predict Soil Water Content,
W77-07103 2G

SOIL WATER MOVEMENT
Solution of Equation for Two-Dimensional Infiltration Problems,
W77-07142 2G

Suction Head at Wet Front in Unsaturated-Flow Problems--A New Definition,
W77-07144 2G

Water Flux in Soil and Subsoil on a Steep Forested Slope,
W77-07147 2G

SOLAR RADIATION
Brace Research Institute, Annual Report, (1976),
W77-07242 3A

Evaporation of Wastewater from Mountain Cabins,
W77-07284 5E

SORGHUM
Effect of the Presence of Sodium Chloride in the Medium on Growth, Development and Distribution of Chlorine and Sodium in Sorghum Dochna F., (In French),
W77-07291 3C

SOUTH AFRICA
Estimating Above and Below Normal Rainfall Periods Over South Africa, 1972-2000,
W77-07170 2B

SOUTH AMERICA
Dynamics of Climatic Hazards in Northeast Brazil,
W77-07167 2B

Reconnaissance of Sediment Transport and Channel Morphology in the Lower Rio Bermejo Basin, Argentina--With a Section on Reconnaissance of the Lower Rio Pilcomayo Basin, Argentina and Paraguay,
W77-07490 2J

A Survey of the Biological Limnology of Lake Titicaca,
W77-07503 5C

SOUTH CAROLINA
Inorganic Contaminants in Rural Drinking Waters,
W77-07372 5A

SOUTH DAKOTA
Major Aquifers in Deuel and Hamlin Counties, South Dakota,
W77-07483 4B

SOUTHERN CALIFORNIA
Water Resources Data for California, Water Year 1975--Volume 1. Colorado River Basin, Southern Great Basin from Mexican Border to Mono Lake Basin, and Pacific Slope Basins from Tijuana River to Santa Maria River.
W77-07491 7C

SOVEREIGNTY
Some Suggestions for the Management of International River Basins,
W77-07250 6E

SPATIAL ANALYSIS TECHNIQUES
Towards System Models for Water Resource Management,
W77-07544 6A

SPATIAL DISTRIBUTION
Wassaw Island Erosion Study. Part 1: Sedimentary Framework of a Channel Margin Shoal of an Ebb Delta, Wassaw Sound, Georgia,
W77-07324 2L

Preliminary Investigations on Bivalves Bivalvia of the Dam Reservoir at Goczalkowice,
W77-07440 5C

Experimental Sediment Addition Studies on the Harris River, N.W.T., Canada: The Effect on Macroinvertebrate Drift,
W77-07455 5C

The Vertical Distribution of Plankton Rotifers in a Small Alpine Lake with a Sharp Oxygen Depletion (Lunzer Obersee),
W77-07456 5C

SPAWNING
Present and Historical Spawning Grounds and Nurseries of American Shad, Alosa sapidissima, in the Delaware River,
W77-07131 5C

Breeding Biology of a Non-Diadromous Galaxiid, Galaxias Vulgaris Stokell, in a New Zealand River,
W77-07389 5C

Oxygen Consumption, Ventilatory Frequency and Heart Rate of Lampreys (Lampetra Fluviatilis) During Their Spawning Run,
W77-07399 5C

Mathematical Models of Strontium-90 Behavior in 'Water-Fresh Water Fish Spawn' System for

LIBRARY U. OF I. URBANA-CHAMP.

SPAWNING

Particular Cases of Radioactive Contamination of Reservoirs, (In Russian),
W77-07539 5C

SPECIATION
Changes in Phytoplankton Species Composition Since 1894 in Two Lakes in East-Holstein, Germany,
W77-07501 5C

SPECIES COMPOSITION
Some Effects of Channelization on the Fishes and Invertebrates of Rush Creek, Modoc County, California,
W77-07109 5C

SPECIFIC YIELD
Specific Yield Determinations from a Consolidated Sandstone Aquifer,
W77-07153 2F

SPECTROPHOTOMETRY
Heavy Metals (Fe, Mn, Cd, Cr, Cu, Pb and Zn) in the Pelagic Zone of Lake Constance (Obersee and Untersee) and the Greifensee, (In German),
W77-07580 5A

A Comparison of Spectrophotometric Methods for the Determination of Phytoplankton Pigments, (In French),
W77-07581 5A

SPILLWAY DEFLECTORS
Spillway Redesign Abates Gas Supersaturation in Columbia River,
W77-07432 5G

SPILLWAYS
Design of Gravity Dams, Design Mnual for Concrete Gravity Dams,
W77-07151 8A

Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

SPOIL
Leaching Characteristics of Polluted Dredgings,
W77-07158 5B

SPOIL BANKS
Amdel Pipeline Inc V State of Texas (Statutory Requirement of Payment for Spoil Dredged from Bottom of Approaches to Corporate Loading Docks).
W77-07271 6E

SPRING
The Influence of Spring Circulation on Zooplankton Dynamics in the Plussee,
W77-07518 5C

ST. FRANCIS RIVER (ARK)
The Effects of High Vacuum on Fish,
W77-07421 5C

STABILITY
The Stability During Many Years of the Mid-Tidal Shore at Penrhyn Bay, North Wales, and a Note on the Peat Beds at Rhos-on-Sea,
W77-07367 2L

Instability in Tidal Flow Computational Schemes,
W77-07548 2L

STABILIZATION
Dune Stabilization with Panicum amarum Along the North Carolina Coast,
W77-07327 2L

STANDARDS
An Industrial View of Biological Monitoring,
W77-07126 5A

Nonpoint Source Effects on Water Quality,
W77-07173 5B

STANDING CROPS
A Study on Standing Crops in Phragmites Communis Communities and Their Environmental Factors, (In Korean),
W77-07335 5C

Algal Response to Nutrient Inputs in Some Iowa Lakes,
W77-07515 5C

STARFISH
Effects of Combination of Temperature and Hydrostatic Pressure on Asterias rubens,
W77-07308 5C

STATE GOVERNMENTS
Report of a Study of Control Agency Revenue Fees,
W77-07435 5G

STATISTICAL METHODS
Missouri River Power Curve Regression Equations,
W77-07152 2E

Similarities and Differences in the Chemical Composition of Waters from West, Central, and East Africa,
W77-07510 5A

STEADY-STATE CIRCULATION
Far Field Circulation Velocities in Shallow Lakes,
W77-07164 2H

STEAM
Assessment of Geothermal Resources of the United States--1975.
W77-07476 4B

STEELHEAD TROUT
Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

STOCHASTIC PROCESSES
Stochastic Properties of Daily Temperature in Rivers,
W77-07159 5B

Reliability-Constrained Dynamic Programing and Randomized Release Rules in Reservoir Management,
W77-07535 4A

STRATIFICATION
The Influence of Spring Circulation on Zooplankton Dynamics in the Plussee,
W77-07518 5C

STREAM FISHERIES
Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources,
W77-07192 5C

STREAMBEDS
Port Acres Sportman's Club V Mann (Public's Right to Use Navigable Waters Over Privately Owned Submerged Lands).
W77-07270 6E

STREAMFLOW
A Reconsideration and a Generalization of Lawrance and Fiering Two-Station Models,
W77-07157 2E

Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources,
W77-07192 5C

Streamflow Regionalization in British Columbia, No. 2, Regression of Mean Annual Flows on Physiographic Parameters,
W77-07434 2E

Reconnaissance of Sediment Transport and Channel Morphology in the Lower Rio Bermejo Basin, Argentina--With a Section on Reconnaissance of the Lower Rio Pilcomayo Basin, Argentina and Paraguay,
W77-07490 2J

Surface Water Supply of the United States, 1966-70--Part 15. Alaska.
W77-07493 7C

The Economic Basis of Resource Information Systems: The Case of Streamflow Data Network Design,
W77-07534 7A

STREAMS
Convective-Dispersion in Perennial Streams,
W77-07160 5B

Reaeration-Coefficient Measurements of 10 Small Streams in Wisconsin Using Radioactive Tracers--with a Section on the Energy-Dissipation Model.
W77-07496 5A

STRIP AQUIFERS
Type Curves for Analysis of Pump Tests in Leaky Strip Aquifers,
W77-07145 2F

STRIP MINE WASTES
The Federal Water Pollution Control Act Amendments of 1972 as Applied to the Surface Mine in West Virginia - Pollutant Discharge Permit Requirements,
W77-07240 5G

STRIPED BASS
Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

STRIPPED BASS
Hematology of Juvenile Striped Bass, Morone Saxatilis (Walbaum), Acclimated to Different Environmental Conditions,
W77-07400 5C

STRONIUM RADIOISOTOPES
Mathematical Models of Strontium-90 Behavior in 'Water-Fresh Water Fish Spawn' System for Particular Cases of Radioactive Contamination of Reservoirs, (In Russian),
W77-07539 5C

STRONTIUM-90
Mathematical Models of Strontium-90 Behavior in 'Water-Fresh Water Fish Spawn' System for Particular Cases of Radioactive Contamination of Reservoirs, (In Russian),
W77-07539 5C

SUB-THERMOCLINE
Sub-Thermocline Biomass Concentration Detected by Transmissometer in Lake Superior,
W77-07447 5C

SUBARCTIC
The Lentic and Lotic Freshwater Types of Marion Island (Sub-Antarctic): A Limnological Study,
W77-07514 5C

SUBMERGED LANDS
Florida Statutes, Chapter 253--The 1969 Amendments and Proposed Legislation,
W77-07258 6E

Port Acres Sportman's Club V Mann (Public's Right to Use Navigable Waters Over Privately Owned Submerged Lands).
W77-07270 6E

SUBMERGENCE
Subsidence: Settling Down Within the Laws of Accretion, Reliction, Erosion, and Submergence,
W77-07238 6E

SUBMERSIBLE PUMPS
Installation Tips on Large Submersibles,
W77-07289 8C

SUBSIDENCE
Subsidence: Settling Down Within the Laws of Accretion, Reliction, Erosion, and Submergence,
W77-07238 6E

SUBTROPIC
Preliminary Estimates of Production by a Calanoid Copepod in Subtropical Lake Sibaya,
W77-07500 5C

SUCCESSION
Succession Rates in Lake Phytoplankton Communities,
W77-07442 5C

Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

Population Changes in the Aquatic Fauna Inhabiting the Bladderwort, Utricularia Flexuosa Vahl., in a Tropical Swamp, Tasek Bera, Malaysia,
W77-07465 5C

SUCKERS
Some Effects of Channelization on the Fishes and Invertebrates of Rush Creek, Modoc County, California,
W77-07109 5C

Egg and Larval Survival of White Suckers (Catostomus Commersoni) at Low pH,
W77-07184 5C

SUCTION HEAD
Suction Head at Wet Front in Unsaturated-Flow Problems--A New Definition,
W77-07144 2G

SUIMON RIVER (JAPAN)
Outbreak of Chironomid Midge in a Polluted River and the Chemical Control of the Larvae, (In Japanese),
W77-07585 5G

SULFIDES
Mineralizing Microbial Activity in Lake Faro,
W77-07418 5C

SULFUR COMPOUNDS
Purifying Waste Liquor Containing Sulphide, Sulphite and Thiosulphate-Alkaline Oxidation Followed by Acid Oxidation, Using Oxygen.
W77-07226 5D

SUPERSATURATION
Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

A Nitrogen Gas (N2) Model for the Lower Columbia River, Final Report,
W77-07422 5B

Dissolved Gas Survey, Pacific Northwest Region.
W77-07423 5C

Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

Spillway Redesign Abates Gas Supersaturation in Columbia River,
W77-07432 5G

Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

SURBER SAMPLER
Surber Sampling in Deep Water for Bottom Organisms,
W77-07199 7B

SURFACE TENSION
Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

SURFACE WATERS
Water Resources Data for California, Water Year 1975--Volume 1. Colorado River Basin, Southern Great Basin from Mexican Border to Mono Lake Basin, and Pacific Slope Basins from Tijuana River to Santa Maria River.
W77-07491 7C

Water Resources Data for California, Water Year 1975--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W77-07492 7C

Surface Water Supply of the United States, 1966-70--Part 15. Alaska.
W77-07493 7C

Solutions to Green-Ampt Infiltration Equation,
W77-07553 4A

SURFACTANTS
Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms-II. Lethal Concentrations of Oil-Spill Emulsifier Components for Marine Phytoplankton, (In Japanese),
W77-07182 5C

Assay of Detergent Residues in Fresh Water, Sea Water and Waste Waters: Method of Extraction and Concentration of Surfactants by Adsorption on Liquid-Liquid Interface, (In French),
W77-07591 5A

SURVEYS
Beaufort Sea Plankton Studies,
W77-07414 6G

The Environmentally Concerned Citizen: Some Correlates,
W77-07438 6G

SUSPENDED LOAD
Experimental Sediment Addition Studies on the Harris River, N.W.T., Canada: The Effect on Macroinvertebrate Drift,
W77-07455 5C

SUSPENDED SOLIDS
Satellite Observations of Water Quality,
W77-07554 5A

SUSPENSION
Tripton Sedimentation in Eutrophic Lakes--Sample Correction for the Resuspended Matter,
W77-07463 5C

SWAMPS
Population Changes in the Aquatic Fauna Inhabiting the Bladderwort, Utricularia Flexuosa Vahl., in a Tropical Swamp, Tasek Bera, Malaysia,
W77-07465 5C

SWEDEN
Reduced Water Demand--Result of Swedish Anti-Pollution Program,
W77-07215 5D

Sources of Nitrogen as a Water Pollutant: Industrial Waste Water,
W77-07521 5B

Water Quality Criteria and Waste Water Treatment,
W77-07522 5D

Literature on Environmental Protection, Management and Hygiene in Sweden 1952-1971: Bibliography and Analysis, (In Swedish),
W77-07586 6G

SWIM BLADDERS
Experiments on the Resistance of Fish to Rapid Increase in Hydrostatic Pressure,
W77-07416 5C

SWIMBLADDER
Swim Bladder Gas Pressure of Cod in Relation to Hydrostatic Pressure,
W77-07417 5C

SWIMBLADDER GAS PRESSURE
Swim Bladder Gas Pressure of Cod in Relation to Hydrostatic Pressure,
W77-07417 5C

SWITZERLAND
Regional Study of the Upper Basin of the AAR from its Sources to Bern: Profile of Floods of a Given Return Period at any Point on the River (Etude Regionale du Bassin Superieur de L'Aar de ses Sources Jusqu'a Berne: Profile des

REPORT U. OF I. URBANA-CHAMPAIGN

SWITZERLAND

Crues de Periode Donnee le Long du Cours d'eau).
W77-07358 2E

Dynamics of O2 and CO2 Exchange, Photosynthesis, and Respiration in Rivers from Time-Delayed Correlations with Ideal Sunlight,
W77-07364 5C

SYNERGISM
Gains from Joint Operation of Multiple Reservoir Systems,
W77-07533 4A

SYNERGISTIC EFFECTS
Synergistic Effects of Phosphate and Manganese on Growth of Lake Superior Algae,
W77-07448 5C

SYSTEM MODELS
Towards System Models for Water Resource Management,
W77-07544 6A

SYSTEMS ANALYSIS
Evaluation of Flood Forecasting-Response Systems,
W77-07524 4A

TACONITE TAILINGS
Synergistic Effects of Phosphate and Manganese on Growth of Lake Superior Algae,
W77-07448 5C

TANNERY WASTES
Treating Effluent Containing Ionic Compounds Preferably Dyes--By Adding Salt Generator of Opposite Charge to Effluent Ion Then Ultra-Filtering.
W77-07223 5D

Two New Methods of Sludge Removal,
W77-07224 5D

A Mini-Pollution Tannery,
W77-07225 5D

TAPES DECUSSATUS
Accumulation and Distribution of Trace Metals and Radionuclides in Marine Organisms (Particularly Tapes Decussatus L.) in the Izmir Bay Area, Turkey,
W77-07395 5C

TASEK BERA SWAMP (MALAYSIA)
Population Changes in the Aquatic Fauna Inhabiting the Bladderwort, Utricularia Flexuosa Vahl., in a Tropical Swamp, Tasek Bera, Malaysia,
W77-07465 5C

TECHNOLOGY TRANSFER
Proceedings, Technology Transfer Seminar on High Quality Effluents,
W77-07330 5D

TELEMETRY
Downhole Measurements Through Modified Drill Pipe,
W77-07304 8G

Sub-Thermocline Biomass Concentration Detected by Transmissometer in Lake Superior,
W77-07447 5C

TEMEPHOS
Outbreak of Chironomid Midge in a Polluted River and the Chemical Control of the Larvae, (In Japanese),
W77-07585 5G

TEMPERATURE
Hydrographic Properties, MESA New York Bight Atlas Monograph 1,
W77-07328 2L

Interaction of Temperature and Salinity on Oxygen Consumption of the Estuarine Crab Panopeus Herbstii,
W77-07375 5C

The Influence of Temperature on Scope for Activity in Cutthroat Trout, Salmo Clarki,
W77-07380 5C

Attainment of the Final Thermal Preferendum in Brown Bullheads Acclimated to Different Temperatures,
W77-07381 5C

The Influence of Temperature and Time of Year on the Oxygen Uptake of the Sea Mussel Mytilus Edulis,
W77-07383 5C

The Effect of Salinity and Cyclic Temperature on Larval Development of the Mud-Crab Rhithropanopeus Harrisii (Brachyura: Xanthidae) Reared in the Laboratory,
W77-07384 5C

Influence of Light and Temperature on the Photosynthetic Rate of Marine Benthic Diatoms,
W77-07385 5C

Life History Patterns in the Coastal Shiner, Notropis Petersoni, Fowler,
W77-07386 5C

Studies on the Effect of Temperature on the Egg Laying of Three Species of Calanoid Copepods in the Laboratory (Acartia Tonsa, Temora Longicornis, and Pseudocalanus Elongatus),
W77-07391 5C

Comparative Ecophysiology of Gammarids (Crustacea: Amphipoda) From Marine, Brackish and Fresh-Water Habitats, Exposed to the Influence of Salinity-Temperature Combinations. I. Effect on Survival,
W77-07397 5C

Hematology of Juvenile Striped Bass, Morone Saxatilis (Walbaum), Acclimated to Different Environmental Conditions,
W77-07400 5C

Respiratory Responses of Gillichthys Mirabilis to changes in Temperature, Dissolved Oxygen and Salinity,
W77-07401 5C

Seasonal Changes in Hematology of Rainbow Trout, Salmo Gairdneri,
W77-07403 5C

Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

The Effect of Temperature on Size and Structure-II. The Body Musculature of Cyclops Agilis (Koch, Sars),
W77-07433 5C

Chemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07487 2K

TEMPORAL DISTRIBUTION
Modeling the Annual Thermal Evolution of Mid-Latitude Lakes,
W77-07462 2H

TENNESSEE
United States V Cutter Laboratories, Inc (Civil Liability of a Permittee for Whom no Industrial Effluent Limitations or Guidelines Exist).
W77-07274 6E

TENSIOMETERS
Automatic Monitoring of Soil Moisture Conditions in a Hillslope Spur and Hollow,
W77-07146 2G

TERTIARY TREATMENT
Response to Eutrophic Shagawa Lake, Minnesota, U.S.A., to Point-Source, Phosphorus Reduction,
W77-07519 5C

TESTING PROCEDURES
The Evaluation of Toxic Effects of Chemicals in Fresh Water by Using Frog Embryos and Larvae,
W77-07132 5C

Guidelines Establishing Test Procedures for the Analysis of Pollutants,
W77-07252 5A

TETRAETHYL LEAD CHLORIDE
Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

TEXAS
Subsidence: Settling Down Within the Laws of Accretion, Reliction, Erosion, and Submergence,
W77-07238 6E

Pecos River Compact.
W77-07262 6E

Port Acres Sportman's Club V Mann (Public's Right to Use Navigable Waters Over Privately Owned Submerged Lands).
W77-07270 6E

Amdel Pipeline Inc V State of Texas (Statutory Requirement of Payment for Spoil Dredged from Bottom of Approaches to Corporate Loading Docks).
W77-07271 6E

Salvops-Hopper Dredge 'A. Mackenzie',
W77-07343 8D

Summer Growth Depression in the Striped Mullet, Mugil Cephalus L.,
W77-07378 5C

TEXTILES
The Desalting and Recycling of Waste Waters from Textile Dyeing Operations Using Reverse Osmosis,
W77-07220 5D

Dyehouse Water Treatment with Catalytic Oxidation.
W77-07221 5D

Purification of Industrial Waste Water Containing Organic Impurities--By Contacting with Adsorbent Polymer Material in Solvated Gel State.
W77-07222 5D

TFM
Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

Residues of 3-trifluoromethyl-4-nitrophenol (TFM) Undetected in Lake Trout and Chinook Salmon from the Upper Great Lakes,
W77-07187 5A

THAMES ESTUARY
The Response of an Estuary to the Closure of a Mobile Barrier; Richmond Barrier on the Upper Thames Estuary,
W77-07366 2L

THAMES ESTUARY (ENG)
A Natural Pollution Experiment: The Effects of a Sewage Strike on the Fauna of the Thames Estuary,
W77-07124 5C

THEORETICAL ANALYSIS
A Nitrogen Gas (N2) Model for the Lower Columbia River, Final Report,
W77-07422 5B

The Economics of Natural Environments, Studies in the Valuation of Commodity and Amenity Resources.
W77-07437 6G

The Evaluation of Simple and Optimal Decision Rules with Misspecified Welfare Functions,
W77-07439 6B

THERMAL DISTRIBUTION
The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

THERMAL OXIDATION
Evaporation and Thermal Oxidation of Liquid Effluents--By Burning with Flame in Combustion Chamber.
W77-07227 5D

THERMAL POLLUTION
Cage Culture of Channel Catfish in a Heated Effluent from a Power Plant, Thomas Hill Reservoir,
W77-07101 5C

Aspects of Reservoir-Power Station Interactions: Some Effects of Heat on Physico-Chemistry, Aufwuchs Ecology and Plankton Metabolism,
W77-07102 5C

The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

Effects of Increased Water Temperature on Daphnia Pulex,
W77-07130 5C

Effects of Passage Through Power Plant Cooling Systems on Estuarine Copepods,
W77-07134 5C

Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

Thermal Pollution and Its Control,
W77-07245 5G

A Scientific and Legal Look at Thermal Pollution,
W77-07256 6E

Study on Respiratory Metabolism Modifications in Acartia clausi (Crustacea: Copepoda) Populations after Passage through the Cooling Circuit of a Power Plant,
W77-07305 5C

Gas Bubble Disease Mortality of Atlantic Menhaden at Pilgrim Nuclear Power Station, April, 1975,
W77-07429 5C

THERMAL POWER
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

Geothermal Systems and Power Development,
W77-07302 4B

Gas Bubble Disease Mortality of Atlantic Menhaden at Pilgrim Nuclear Power Station, April, 1975,
W77-07429 5C

Geothermal Resources, A New Look,
W77-07477 4B

THERMAL POWER PLANTS
Geothermal Energy: Needed, Effective Heat Transfer Equipment,
W77-07301 8G

THERMAL POWERPLANTS
Geothermal Power, The 'Sleeper' in the Energy Race,
W77-07296 3E

Electric Power Generation from Geothermal Hot Water Deposits,
W77-07300 8C

THERMAL PROPERTIES
Modeling the Annual Thermal Evolution of Mid-Latitude Lakes,
W77-07462 2H

THERMAL RADIATION
Evaporation of Wastewater from Mountain Cabins,
W77-07284 5E

THERMAL SPRINGS
Thermal and Isotopic Studies on the Crater Lakes of Monticchio (Lucania, Italy), (In Italian),
W77-07392 2H

Assessment of Geothermal Resources of the United States--1975.
W77-07476 4B

Convective Heat Flow from Hot Springs in the Long Valley Caldera, Mono County, California,
W77-07488 2K

Geochemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07489 2K

THERMAL STRATIFICATION
Meromixis in Ulmener Maar (Germany).
W77-07520 5C

THERMAL STRESS
Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

THERMAL WATER
Comparative Characteristics of the Parasite Fauna of Bream in Lakes Dusios, Obelijos, Salvantu and Galstas, Which Have Different Thermal Regimes, (In Russian),
W77-07312 2H

Chemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07487 2K

THERMOCLINE
Sub-Thermocline Biomass Concentration Detected by Transmissometer in Lake Superior,
W77-07447 5C

Upwelling in a Model of an Intermontane Lake,
W77-07469 5B

THERMODYNAMICS
Non-Equilibrium Thermodynamics of Groundwater Flow Systems: Symmetry Properties of Phenomenological Coefficients and Considerations of Hydrodynamic Dispersion,
W77-07143 2F

THESAURI
Subject Keyword List, (Estuarine and Coastal Marine Science),
W77-07564 2L

THOMAS HILL RESERVOIR (MO)
Cage Culture of Channel Catfish in a Heated Effluent from a Power Plant, Thomas Hill Reservoir,
W77-07101 5C

Aspects of Reservoir-Power Station Interactions: Some Effects of Heat on Physico-Chemistry, Aufwuchs Ecology and Plankton Metabolism,
W77-07102 5C

THOMPSON RIVER (BC)
Limitations of Single Water Samples in Representing Mean Water Quality 1. Thompson River at Shaw Spring, British Columbia,
W77-07563 5A

THREE-DIMENSIONAL MODEL
Far Field Circulation Velocities in Shallow Lakes,
W77-07164 2H

THREE FATHOM HARBOUR (NOVA SCOTIA)
Uptake and Retention of Kuwait Crude Oil and Its Effects on Oxygen Uptake by the Soft-Shell Clam, Mya Arenaria,
W77-07506 5C

THROMBOCYTES
The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

TIDAL EFFECTS
Pollution Susceptibility: An Environmental Parameter for Coastal Zone Management,
W77-07230 5G

TIDAL POWERPLANTS
Predicting Changes in Tidal Regime: The Open Boundary Problem,
W77-07370 8B

TIDAL WATERS
Instability in Tidal Flow Computational Schemes,
W77-07548 2L

FISKARI U. OF I. URBANA-CHAMP. PUBL.

TIDES
The Stability During Many Years of the Mid-Tidal Shore at Penrhyn Bay, North Wales, and a Note on the Peat Beds at Rhos-on-Sea,
W77-07367 2L

Predicting Changes in Tidal Regime: The Open Boundary Problem,
W77-07370 8B

TISSUE ANALYSIS
Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

TOLERANCE
Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

TOTAL ORGANIC CARBON
Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

TOXIC WASTE DISPOSAL
Toxic Waste Disposal,
W77-07209 5G

TOXICITY
Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

Experimental Substantiation of Maximum Permissible Propachlor (Ramrod) Concentrations in Water, (In Russian),
W77-07133 5A

The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

Egg and Larval Survival of White Suckers (Catostomus Commersoni) at Low pH,
W77-07184 5C

Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

Apparent Potentiation of the Cotton Defoliant DEF by Methyl Parathion in Mosquitofish,
W77-07204 5C

Fate of the Organophosphate Insecticide Parathion in the Freshwater Invertebrates,
W77-07285 5C

Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

Hygienic Standardization of Disodium Salts of Meta-and Para-Diisopropylbenzene in Water Bodies, (In Russian),
W77-07590 5C

TOXINS
Occurrence of Toxic Bivalves in Association with the Bloom of Gonyaulax sp. in Owase Bay,
W77-07119 5C

TRACE ELEMENTS
Accumulation and Distribution of Trace Metals and Radionuclides in Marine Organisms (Particularly Tapes Decussatus L.) in the Izmir Bay Area, Turkey,
W77-07395 5C

TRACERS
Reaeration-Coefficient Measurements of 10 Small Streams in Wisconsin Using Radioactive Tracers--with a Section on the Energy-Dissipation Model.
W77-07496 5A

Role of Oligochaetes in the Circulation of Water and Solutes Across the Mud-Water Interface,
W77-07508 5C

TRACK AUTORADIOGRAPHY
Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

TRAMPLING
Observations on a Peat Bog's Ability to Withstand Increasing Public Pressure,
W77-07139 5C

TRANSLOCATION
Enterovirus and Bacteriophage Inactivation in Subsurface Waters and Translocation in Soil,
W77-07283 5B

Role of Oligochaetes in the Circulation of Water and Solutes Across the Mud-Water Interface,
W77-07508 5C

TRANSMISSOMETERS
Sub-Thermocline Biomass Concentration Detected by Transmissometer in Lake Superior,
W77-07447 5C

TREATMENT
Review of Treatment Technology in the Fruit and Vegetable Processing Industry in Canada.
W77-07341 5D

TREATMENT FACILITIES
The Development of Regional Industrial Waste Processing Centres,
W77-07205 5D

Fifty Million Dollars Is a Lot of Fish,
W77-07219 5D

TRENCHES
Problems Associated with Construction of Submarine Pipelines,
W77-07349 8D

TRESPASS
Wood V Woodcock (Rights of Adjoining Landowners to Seepage Water from Joint Irrigation Ditch),
W77-07278 6E

TRICKLE IRRIGATION
Water Movement in Soil from Trickle Source,
W77-07550 2G

TRINITROTOLUENE (TNT)
How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

TRIPTON
Tripton Sedimentation in Eutrophic Lakes--Sample Correction for the Resuspended Matter,
W77-07463 5C

An Investigation of Colloidal Organic Particles Isolated from Different Populations of Bivalves,
W77-07498 5A

TRITIUM
A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

TROPHIC LEVEL
Spatial and Temporal Changes in the Primary Productivity of Lake Tahoe, California-Nevada Between 1959 and 1971,
W77-07443 5C

A Model of the Phosphorus Cycle and Phytoplankton Growth in Skaha Lake, British Columbia, Canada,
W77-07445 5C

Predicting the Impacts of Phosphorus Management Policies on the Eutrophication of Skaha Lake, British Columbia, Canada,
W77-07446 5C

Sediment Respiration in Six Italian Lakes in Different Trophic Conditions,
W77-07461 5C

An Organic Carbon Budget for an Oligotrophic Lake In New Hampshire, U.S.A.,
W77-07470 5C

TROPICAL REGIONS
The Effect of Soil Moisture on Circulation and Rainfall in a Tropical Model,
W77-07166 2

A Survey of the Physical and Chemical Limnology of Lake Titicaca,
W77-07460 5

Algal Productivity of Natural and Artificially Enriched Fresh Waters in Malaya,
W77-07471 5

A Survey of the Biological Limnology of Lake Titicaca,
W77-07503 5

Lake Izabal, Guatemala,
W77-07504 5

TROUT
Some Effects of Channelization on the Fishes and Invertebrates of Rush Creek, Modoc County, California,
W77-07109 5C

TUBIFEX
The Oligochaete Communities of a Lowland Stream and Their Value as Indicators of Organic Pollution,
W77-07307 5C

TURBIDITY PLUMES
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-07549 2H

TURBINE INTAKE GATEWELLS
Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

TURBINES
Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

TURKEY
Accumulation and Distribution of Trace Metals and Radionuclides in Marine Organisms (Particularly Tapes Decussatus L.) in the Izmir Bay Area, Turkey,
W77-07395 5C

TYPE CURVES
Type Curves for Analysis of Pump Tests in Leaky Strip Aquifers,
W77-07145 2F

ULMENER MAAR (GERMANY)
Meromixis in Ulmener Maar (Germany).
W77-07520 5C

ULTRAFILTRATION
Ultrafiltration Oil Reclamation Process,
W77-07212 5D

Treating Effluent Containing Ionic Compounds Preferably Dyes--By Adding Salt Generator of Opposite Charge to Effluent Ion Then Ultra-Filtering.
W77-07223 5D

UNDERWATER
Problems Associated with Construction of Submarine Pipelines,
W77-07349 8D

UNI-FLEX RIG COMPANY (ALBERTA CANADA)
New Rig Concept Uses Continuous Drill String.
W77-07298 8G

UNITED STATES
Assessment of Geothermal Resources of the United States--1975.
W77-07476 4B

Hydrology,
W77-07494 2A

Snow and Ice Hydrology in the United States--Current Status and Future Directions,
W77-07565 2C

UNSATURATED FLOW
Saturated and Unsaturated Flow to Parallel Drains,
W77-07552 4A

UPWELLING
Red Tide in the Upwelling Region of Baja California,
W77-07169 5C

Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

Upwelling in a Model of an Intermontane Lake,
W77-07469 5B

URANIUM PROSPECTING
Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

URANIUM RADIOISOTOPES
Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

URBAN AREAS
Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

URBANIZATION
Ecological Studies of the Brussels Urban Ecosystem: Contribution 8. First Survey of the Hydrobiology of the Woluwe Valley in Brussels, (In French),
W77-07292 5C

Spatial and Temporal Changes in the Primary Productivity of Lake Tahoe, California-Nevada Between 1959 and 1971,
W77-07443 5C

UREAS
Experimental Study of the Nitrogen Excretion of Bass (Dicentrarchus labrax) during Growth. I. Effects of Temperature and Weight on the Excretion of Ammonia and Urea,
W77-07313 5C

USSR (SEVERSKII DONETS RIVER VALLEY)
The Effect of the Use of Pesticides and Fertilizers in the Water Protection Zone with Sources of Artificial Replenishment of Underground Water Reserves, (In Russian),
W77-07107 5B

UTRICULARIA FLEXUOSA VAHL
Population Changes in the Aquatic Fauna Inhabiting the Bladderwort, Utricularia Flexuosa Vahl., in a Tropical Swamp, Tasek Bera, Malaysia,
W77-07465 5C

VACUUM SEWER SYSTEMS
Vacuum Sewer Systems and Their Possible Canadian Applications,
W77-07558 5D

VALUE
The Economics of Natural Environments, Studies in the Valuation of Commodity and Amenity Resources.
W77-07437 6G

Economic Value of Low Flow Data,
W77-07537 5D

VAN LAKE (MONT)
Symap Computer Projections of Summer Zooplankton Populations in Van Lake, Montana,
W77-07511 7C

VIRGINIA
The Differential Use of Chironomidae and Ceratopogonidae (Diptera) in the Monitoring of Various Aquatic Wastes,
W77-07282 5A

VIRUS
Studies on Virus Inactivation by Chlorine During Water Disinfection, (In German),
W77-07595 5F

VIRUSES
Use of Cation Polyelectrolytes for Water Purification from Viruses, (In Russian),
W77-07108 5F

Enterovirus and Bacteriophage Inactivation in Subsurface Waters and Translocation in Soil,
W77-07283 5B

Studies on Virus Inactivation by Chlorine During Water Disinfection, (In German),
W77-07595 5F

WARM WATER DISCHARGE
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

WARM-WATER FISH
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

WARNING SYSTEMS
Evaluation of Flood Forecasting-Response Systems,
W77-07524 4A

WASHINGTON
Subtidal and Intertidal Marine Fouling on Artificial Substrata in Northern Puget Sound, Washington,
W77-07201 5C

WASTE DISPOSAL
Toxic Waste Disposal,
W77-07209 5G

Deep Well Injection: Sweeping the Problem Under the Carpet,
W77-07295 5G

WASTE TREATMENT
An Industrial View of Biological Monitoring,
W77-07126 5A

WASTE WATER DISPOSAL
Evaporation of Wastewater from Mountain Cabins,
W77-07284 5E

WASTE WATER EVAPORATORS
Evaporation of Wastewater from Mountain Cabins,
W77-07284 5E

WASTE WATER (POLLUTION)
How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

Vacuum Sewer Systems and Their Possible Canadian Applications,
W77-07558 5D

WASTE WATER TRANSPORT
Vacuum Sewer Systems and Their Possible Canadian Applications,
W77-07558 5D

WASTE WATER TREATMENT
Use of Cation Polyelectrolytes for Water Purification from Viruses, (In Russian),
W77-07108 5F

Nitrate in Ground Water and Its Relation to Fertilization, (In German),
W77-07112 5B

Phenol-Selective, Highly Resistant Ro-Membranes Made from PVA for the Purification of Toxic Industrial Wastes,
W77-07206 5D

Large-Scale Reverse Osmosis Processing of Metal Finishing Rinse Waters,
W77-07207 5D

Calcium Carbonate in the Revomal of Iron and Lead from Dilute Waste Water,
W77-07208 5D

Toxic Waste Disposal,
W77-07209 5G

Waste Water Reclamation System Ups Productivity, Cuts Water Use,
W77-07210 5D

Electrolytic Treatment of Chromate and Cyanide Wastes with Packed Bipolar Cell, (In Japanese),
W77-07211 5D

Ultrafiltration Oil Reclamation Process,
W77-07212 5D

Techniques for Purifying Oily Waste Water,
W77-07213 5D

Inline Sensor Tightens Control on Sludge Consistency to Within 1.4-1.5% Solids,
W77-07214 5D

Reduced Water Demand--Result of Swedish Anti-Pollution Program,
W77-07215 5D

An Ozone Reactor for Color Removal from Pulp Bleachery Wastes,
W77-07216 5D

Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W77-07217 5D

Great Lakes Paper Launches First Closed-Cycle Kraft Pulp Mill.
W77-07218 5D

Fifty Million Dollars Is a Lot of Fish,
W77-07219 5D

Dyehouse Water Treatment with Catalytic Oxidation.
W77-07221 5D

Purification of Industrial Waste Water Containing Organic Impurities--By Contacting with Adsorbent Polymer Material in Solvated Gel State.
W77-07222 5D

Treating Effluent Containing Ionic Compounds Preferably Dyes--By Adding Salt Generator of Opposite Charge to Effluent Ion Then Ultra-Filtering.
W77-07223 5D

Two New Methods of Sludge Removal,
W77-07224 5D

A Mini-Pollution Tannery,
W77-07225 5D

Purifying Waste Liquor Containing Sulphide, Sulphite and Thiosulphate-Alkaline Oxidation Followed by Acid Oxidation, Using Oxygen.
W77-07226 5D

Evaporation and Thermal Oxidation of Liquid Effluents--By Burning with Flame in Combustion Chamber.
W77-07227 5D

How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

Economic Aspects of Pollution Abatement, Part 1,
W77-07260 6E

Ozonation in a Better Perspective,
W77-07293 5D

Proceedings of the Annual Conference, April 20-23, 1975, Toronto, Ontario,
W77-07329 5D

Proceedings, Technology Transfer Seminar on High Quality Effluents,
W77-07330 5D

Wastewater and Sludge Control in the Canadian Metal Finishing Industry, Segment Including Chemical, Electrolytic Treatment; Electrochemical Machining and Polishing; Cyanide Hardening,
W77-07333 5D

Review of Treatment Technology in the Fruit and Vegetable Processing Industry in Canada.
W77-07341 5D

Application of Vascular Aquatic Plants for Pollution Removal, Energy and Food Production in a Biological System,
W77-07474 5D

Network Approach to Optimal Wastewater Treatment System Design,
W77-07531 5D

A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

Proceedings, Water Pollution Abatement Technology in the Pulp and Paper Industry, (1975),
W77-07562 5D

WATER ALLOCATION (POLICY)
Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources,
W77-07192 5C

Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

WATER ANALYSIS
Guidelines Establishing Test Procedures for the Analysis of Pollutants,
W77-07252 5A

WATER CHEMISTRY
The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

Convective Heat Flow from Hot Springs in the Long Valley Caldera, Mono County, California,
W77-07488 2K

Annotated Bibliography on Hydrobiology and Hydrochemistry of the Kara Kum Canal 1955-74, (In Russian),
W77-07540 2I

WATER CIRCULATION
Far Field Circulation Velocities in Shallow Lakes,
W77-07164 2H

WATER CONSERVATION
Reclamation Research in the Seventies, Second Progress Report,
W77-07600 8A

WATER CONSUMPTION (EXCEPT CONSUMPTIVE USE)
Waste Water Reclamation System Ups Productivity, Cuts Water Use,
W77-07210 5D

WATER CONTRACTS
Schultz v Atkins (Claim for Easement Based on Contract for Water Rights Between Predecessors in Title).
W77-07268 6E

WATER DEMAND
Reduced Water Demand--Result of Swedish Anti-Pollution Program,
W77-07215 5D

WATER HYACINTH
Application of Vascular Aquatic Plants for Pollution Removal, Energy and Food Production in a Biological System,
W77-07474 5D

WATER LEVEL FLUCTUATIONS
Water-Level Records for the Northern High Plains of Colorado, 1973-77,
W77-07486 4B

WATER LEVELS
Ground-Water Levels in Massachusetts, 1936-74,
W77-07485 4B

WATER MANAGEMENT (APPLIED)
Seasonal Changes of Invertebrate Populations in the Polluted River Medlock,
W77-07121 5C

Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources,
W77-07192 5C

Management Model for Ground Water Development,
W77-07529 4B

WATER POLICY
P. L. 92-500 V Local Priorities,
W77-07229 5D

WATER POLLUTION
Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

Proceedings of the Annual Conference, April 20-23, 1975, Toronto, Ontario,
W77-07329 5D

Legal Decisions and Opinions in Pollution Cases,
W77-07436 5G

Reaeration-Coefficient Measurements of 10 Small Streams in Wisconsin Using Radioactive Tracers--with a Section on the Energy-Dissipation Model.
W77-07496 5A

WATER POLLUTION CONTROL
United States V Ashland Oil and Transportation Company (Use of the Word 'Navigable Waters' in the Federal Water Pollution Control Act Amendments of 1972 Held to Mean 'Waters of the United States').
W77-07273 6E

Proceedings, Technology Transfer Seminar on High Quality Effluents,
W77-07330 5D

Hydrology,
W77-07494 2A

Network Approach to Optimal Wastewater Treatment System Design,
W77-07531 5D

WATER POLLUTION CONTROL FEDERATION
Research and the Quest for Clean Water,
W77-07243 5G

WATER POLLUTION EFFECTS
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

Role of Mussels Mytilus edulis in Removal of Petroleum Products from Seawater (Under Experimental Conditions),
W77-07116 5C

Seasonal Changes of Invertebrate Populations in the Polluted River Medlock,
W77-07121 5C

A Natural Pollution Experiment: The Effects of a Sewage Strike on the Fauna of the Thames Estuary,
W77-07124 5C

Present and Historical Spawning Grounds and Nurseries of American Shad, Alosa sapidissima, in the Delaware River,
W77-07131 5C

The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

Egg and Larval Survival of White Suckers (Catostomus Commersoni) at Low pH,
W77-07184 5C

Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

United States V Ashland Oil and Transportation Company (Use of the Word 'Navigable Waters' in the Federal Water Pollution Control Act Amendments of 1972 Held to Mean 'Waters of the United States').
W77-07273 6E

Aquatic Organism Contamination by Mercury Residues in the Coatzacoalcos River Estuary, Mexico,
W77-07394 5C

WATER POLLUTION SOURCES
Application of Nitrogen-Isotope Studies to Hydrology and Hydrogeology--Analysis of the Peculiar Case of the Melarchez Basin (Seine-et-Marne, France) (Application de L'Etude Isotopique de L'Azote en Hydrologie et en Hydrogeologie--Analyse des Resultats Obtenus Sur un Exemple Precis: Le Bassin de Melarchez (Seine-et-Marne, France)),
W77-07154 5B

Leaching Characteristics of Polluted Dredgings,
W77-07158 5B

Convective-Dispersion in Perennial Streams,
W77-07160 5B

Nonpoint Source Effects on Water Quality,
W77-07173 5B

United States V Ashland Oil and Transportation Company (Use of the Word 'Navigable Waters' in the Federal Water Pollution Control Act Amendments of 1972 Held to Mean 'Waters of the United States').
W77-07273 6E

Long Island Beach Pollution: June 1976,
W77-07325 5B

Effects of Man's Activities on Groundwater Quality,
W77-07359 5B

Anthropogenically Reduced Groundwaters,
W77-07360 5B

Inorganic Contaminants in Rural Drinking Waters,
W77-07372 5A

Sources of Nitrogen as a Water Pollutant: Industrial Waste Water,
W77-07521 5B

Relation Between the Amounts of Fertilization and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: 1. On the Relation Between the Amount of Fertilizer Application and the Specific Pollution Loads of Nitrogen and Phosphorus in Main Streams Flowing into Lake Nishiura, (In Japanese),
W77-07568 5B

WATER PURIFICATION
Waste Water Reclamation System Ups Productivity, Cuts Water Use,
W77-07210 5D

Fifty Million Dollars Is a Lot of Fish,
W77-07219 5D

Purification of Industrial Waste Water Containing Organic Impurities--By Contacting with Adsorbent Polymer Material in Solvated Gel State.
W77-07222 5D

Influence of an Ozonisation Plant on the Bacterial Content in Water of a Demonstration Aquarium,
W77-07311 5C

WATER QUALITY
Comparison of Artificial and Natural Sea Water as Culture Media for Juvenile Lobsters,
W77-07118 5C

An Industrial View of Biological Monitoring,
W77-07126 5A

Quest for an Index of Community Structure Sensitive to Water Pollution,
W77-07136 5A

The Oligochaete Communities of a Lowland Stream and Their Value as Indicators of Organic Pollution,
W77-07307 5C

Fire Effects on Water Supply, Floods, and Sedimentation,
W77-07318 4C

Proceedings of the Annual Conference, April 20-23, 1975, Toronto, Ontario,
W77-07329 5D

Major Aquifers in Deuel and Hamlin Counties, South Dakota,
W77-07483 4B

Water Resources Data for California, Water Year 1975--Volume 1. Colorado River Basin, Southern Great Basin from Mexican Border to Mono Lake Basin, and Pacific Slope Basins from Tijuana River to Santa Maria River.
W77-07491 7C

Water Resources Data for California, Water Year 1975--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W77-07492 7C

Water Quality and Aquitard Permeability,
W77-07551 5G

Satellite Observations of Water Quality,
W77-07554 5A

WATER QUALITY CONTROL
Appropriation of Water--Permits, Certificates and Licenses--Survey.
W77-07265 6E

The Oligochaete Communities of a Lowland Stream and Their Value as Indicators of Organic Pollution,
W77-07307 5C

WATER QUALITY STANDARDS
Nonpoint Source Effects on Water Quality,
W77-07173 5B

NCWQ Recommends Changes in Water Pollution Act,
W77-07237 5G

Status Report on Abatement of Water Pollution from the Canadian Petroleum Refining Industry - 1975,
W77-07334 5G

Dissolved Gas Survey, Pacific Northwest Region.
W77-07423 5C

Water Quality Criteria and Waste Water Treatment,
W77-07522 5D

Report U. Of I. Urban-Champaign

WATER QUALITY STANDARDS

Bacteriological Quality of Poultry-Farms' Water in Minas Gerais State, Brazil: 1973, (In Portugese),
W77-07594 5F

WATER REQUIREMENTS

NCWQ Recommends Changes in Water Pollution Act,
W77-07237 5G

Protein Production by Russian Thistle: Effects of Water and Nitrogen on Protein Yields,
W77-07281 3F

WATER RESOURCE PLANNING ACT

Federal Riverbasin Planning in the Coastal Zone: The Long Island Sound Study,
W77-07232 2L

WATER RESOURCES

Bibliography and Index of North Dakota Water Resources 1878-1970,
W77-07140 10C

Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

Gains from Joint Operation of Multiple Reservoir Systems,
W77-07533 4A

Economic Value of Low Flow Data,
W77-07537 5D

WATER RESOURCES DEVELOPMENT

Evolution and Objectives of River Basin Commissions in the United States,
W77-07249 6E

Pecos River Compact.
W77-07262 6E

Appropriation of Water--Permits, Certificates and Licenses--Survey.
W77-07265 6E

Bunger v. Uncompahgre Valley Water Users Association (Conditional Water Permits).
W77-07267 6E

Hydrology,
W77-07494 2A

Public Participation in Water Resource Development,
W77-07526 6B

Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

Accounting for Non-Economic Goals in Benefit-Cost Analysis,
W77-07543 6B

Broadening the Approach to Evaluation in Resources Management Decision-Making,
W77-07545 6B

Imperatives of Water Resources Planning in the Developing Economy of India,
W77-07555 6A

WATER RESOURCES PLANNING ACT

Evolution and Objectives of River Basin Commissions in the United States,
W77-07249 6E

WATER REUSE

Large-Scale Reverse Osmosis Processing of Metal Finishing Rinse Waters,
W77-07207 5D

Waste Water Reclamation System Ups Productivity, Cuts Water Use,
W77-07210 5D

Great Lakes Paper Launches First Closed-Cycle Kraft Pulp Mill.
W77-07218 5D

Fifty Million Dollars Is a Lot of Fish,
W77-07219 5D

The Desalting and Recycling of Waste Waters from Textile Dyeing Operations Using Reverse Osmosis,
W77-07220 5D

Land Application of Digested Sludge Under Adverse Conditions.
W77-07337 5D

WATER SAMPLING

A Light-Weight and Cheap Depth Sampler,
W77-07155 5A

A Hand-Operated In Situ Water Sampler,
W77-07200 5A

Photosynthetic Rates in Lake Superior,
W77-07450 5C

Limitations of Single Water Samples in Representing Mean Water Quality 1. Thompson River at Shaw Spring, British Columbia,
W77-07563 5A

WATER SOLUBLE FRACTIONS

Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

WATER SOURCES

Artesian Wells and Storage Reservoirs, and Works Connected Therewith.
W77-07263 6E

Water Movement in Soil from Trickle Source,
W77-07550 2G

WATER SUPPLY

Reduced Water Demand--Result of Swedish Anti-Pollution Program,
W77-07215 5D

Artesian Wells and Storage Reservoirs, and Works Connected Therewith.
W77-07263 6E

Fire Effects on Water Supply, Floods, and Sedimentation,
W77-07318 4C

Hydrology,
W77-07494 2A

Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

Evaluating Alternative Levels of Water and Sanitation Service for Communities in the Northwest Territories,
W77-07557 6A

WATER TEMPERATURE

The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

Survival and Reproduction of Gammarus spp. (Amphipoda) Following Short-Term Exposure to Elevated Temperatures,
W77-07125 5C

Effects of Passage Through Power Plant Cooling Systems on Estuarine Copepods,
W77-07134 5C

Stochastic Properties of Daily Temperature in Rivers,
W77-07159 5B

Laboratory Apparatus for Providing Diel Temperature Regimes for Aquatic Animals,
W77-07188 5C

Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

Evaporation of Wastewater from Mountain Cabins,
W77-07284 5E

Effects of Combination of Temperature and Hydrostatic Pressure on Asterias rubens,
W77-07308 5C

Experimental Study of the Nitrogen Excretion of Bass (Dicentrarchus labrax) during Growth. I. Effects of Temperature and Weight on the Excretion of Ammonia and Urea,
W77-07313 5C

Modeling the Annual Thermal Evolution of Mid-Latitude Lakes,
W77-07462 2H

Ground-Water Levels in Massachusetts, 1936-74,
W77-07485 4B

Geochemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07489 2K

The Effect of Food Concentration and Temperature on Respiration and Excretion in Herbivorous Zooplankton,
W77-07502 5C

WATER TEMPERATURES

Effects of Increased Water Temperature on Daphnia Pulex,
W77-07130 5C

Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

WATER TREATMENT

Use of Cation Polyelectrolytes for Water Purification from Viruses, (In Russian),
W77-07108 5F

Ozonation in a Better Perspective,
W77-07293 5D

Proceedings of the Annual Conference, April 20-23, 1975, Toronto, Ontario,
W77-07329 5D

Bacteriological Quality of Poultry-Farms' Water in Minas Gerais State, Brazil: 1973, (In Portugese),
W77-07594 5F

WATER UTILIZATION
Reduced Water Demand--Result of Swedish Anti-Pollution Program,
W77-07215 5D

Appropriation of Water--Permits, Certificates and Licenses--Survey.
W77-07265 6E

WATER WELLS
Consumptive Use of Ground Water,
W77-07257 6E

A Study of Environment Sanitation on the Wells in Jungneung-Dong Area, Seoul, (In Korean),
W77-07475 5B

Water-Level Records for the Northern High Plains of Colorado, 1973-77,
W77-07486 4B

WATERSHED (BASINS)
Simulation of a Series of Daily Areal Mean Rainfalls for a Basin Using Rainfall Observations at a Reference Station Located Outside the Basin,
W77-07356 2B

WATERSHEDS (BASINS)
Application of Nitrogen-Isotope Studies to Hydrology and Hydrogeology--Analysis of the Peculiar Case of the Melarchez Basin (Seine-et-Marne, France) (Application de L'Etude Isotopique de L'Azote en Hydrologie et en Hydrogeologie--Analyse des Resultats Obtenus Sur un Exemple Precis: Le Bassin de Melarchez (Seine-et-Marne, France)),
W77-07154 5B

Utilization of the Results from Representative and Experimental Basins with a View to the Management of Water Resources,
W77-07355 4A

Regional Study of the Upper Basin of the AAR from its Sources to Bern: Profile of Floods of a Given Return Period at any Point on the River (Etude Regionale du Bassin Superieur de L'Aar de ses Sources Jusqu'a Berne: Profile des Crues de Periode Donnee le Long du Cours d'eau).
W77-07358 2E

Manning N and the Overland Flow Equation,
W77-07371 2E

Influence of the Drainage Basin on the Eutrophication of the a-Mesotrophic Lake Piaseczno and Diseutrophication of the Pond Lake Bikcze,
W77-07452 5C

Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

Test of Landsat-Based Urban Hydrologic Modeling,
W77-07528 6A

Systems Approach and Watershed Models,
W77-07556 2A

WAVELENGTH DEPENDENCY
Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

WEATHER MODIFICATION
Physical Problems of Weather Modification,
W77-07357 3B

Final Report on The Pyramid Lake Pilot Project, 1970-1975, Volume 1, Text of Report,
W77-07566 3B

Final Report on the Pyramid Lake Pilot Project, 1970-1975, Volume 2, Appendices,
W77-07567 3B

Reclamation Research in the Seventies, Second Progress Report,
W77-07600 8A

WEATHERING
Geologists Claim Health Can be Traced to Rocks,
W77-07290 5B

WEED CONTROL
Occurrence and Determination of a Herbicide Benthiocarb in Rivers and Agricultural Drainages,
W77-07361 5A

WEEDS
Protein Production by Russian Thistle: Effects of Water and Nitrogen on Protein Yields,
W77-07281 3F

WELFARE (ECONOMICS)
The Evaluation of Simple and Optimal Decision Rules with Misspecified Welfare Functions,
W77-07439 6B

WELL CASINGS
The Cable Tool Drilling Machine, Part IV,
W77-07287 8C

Cathodic Projection of Borehole Casing,
W77-07297 8G

WELL DEVELOPMENT
The Chief Driller's Report on JCCIP,
W77-07288 8C

WELL SCREENS
The Chief Driller's Report on JCCIP,
W77-07288 8C

WESER ESTUARY (GERMANY)
Studies on Fungal Propagules in the Weser Estuary (German Bight): I. Quantitative Data 1974, (In German),
W77-07583 5C

Data 1973/1974 Regarding Hydrography and Water Quality in the Weser Estuary, Germany, (In German),
W77-07584 5C

WEST VIRGINIA
The Federal Water Pollution Control Act Amendments of 1972 as Applied to the Surface Mine in West Virginia - Pollutant Discharge Permit Requirements,
W77-07240 5G

WET GEOTHERMAL SYSTEMS
Physical Modeling of Combined Forced and Natural Convection in Wet Geothermal Formations,
W77-07303 4B

WETLANDS
Rappl and Hoenig Company, Incorporated v. New York State Department of Environmental Conservation (Applicability of Fresh Water Wetlands Act to Artificially Created Wetlands).
W77-07269 6E

Nutrient Transformations in Louisiana Salt Marsh Soils,
W77-07319 5C

WHITE SHRIMP
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

WHITE SUCKERS
Egg and Larval Survival of White Suckers (Catostomus Commersoni) at Low pH,
W77-07184 5C

WILDERNESS AREAS
Scheduling Models for Wilderness Recreation.
W77-07541 6B

WILDLIFE
Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

WILDLIFE CONSERVATION
Scientific and Scenic Rivers Act: Commentary and Model Statute,
W77-07231 6G

WINDS
Transports in Lake Superior,
W77-07176 5B

Brace Research Institute, Annual Report, (1976),
W77-07242 3A

Wind and Current Patterns in an Arctic Coast Lagoon,
W77-07323 2L

WINTERGREEN LAKE (MICH)
Annual Contribution of Carbon, Nitrogen and Phosphorus by Migrant Canada Geese to a Hardwater Lake,
W77-07505 5C

WISCONSIN
Reaeration-Coefficient Measurements of 10 Small Streams in Wisconsin Using Radioactive Tracers--with a Section on the Energy-Dissipation Model.
W77-07496 5A

WOLUWE RIVER VALLEY (BELGIUM)
Ecological Studies of the Brussels Urban Ecosystem: Contribution 8. First Survey of the Hydrobiology of the Woluwe Valley in Brussels, (In French),
W77-07292 5C

WYOMING
Responses to Odors by Fingerling Cutthroat Trout from Yellowstone Lake,
W77-07111 5C

Techniques for Estimating Flow Characteristics of Wyoming Streams,
W77-07495 4A

YELLOWSTONE LAKE (WYO)
Responses to Odors by Fingerling Cutthroat Trout from Yellowstone Lake,
W77-07111 5C

YOUNGSAN RIVER ESTUARY (KOREA)
A Study on Standing Crops in Phragmites Communis Communities and Their Environmental Factors, (In Korean),
W77-07335 5C

Depart. U. of I. Urbana-Champaign

ZINC
The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

Variations in the Lead, Zinc and Calcium Content of Dendrobaena rubida (Oligochaeta) in a Base Metal Mining Area,
W77-07135 5C

Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

Environmental Dependence of Manganese and Zinc in the Scales of Atlantic Salmon, Salmo Salar (L) and Brown Trout, Salmo Trutta (L),
W77-07203 5C

Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

ZINC CHLORIDE
Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

ZOOPLANKTON
Evaluation of Two Methods for Calculating Freshwater Zooplankton Production, (In Russian),
W77-07228 7B

Planktonic Infusoria in Two Lakes of the Gorki Oblast, (In Russian),
W77-07234 5C

Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

The Effect of Collector Discharge Water from Rice Fields on the Zooplankton of Some Kuban Estuaries, (In Russian),
W77-07331 5C

Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

Zooplankton and Micronekton Studies in the Bering - Chukchi/Beaufort Seas,
W77-07412 6G

Effect of Zooplankton Grazing on Photosynthetic Activity and Composition of Phytoplankton,
W77-07453 5C

Preliminary Estimates of Production by a Calanoid Copepod in Subtropical Lake Sibaya,
W77-07500 5C

The Effect of Food Concentration and Temperature on Respiration and Excretion in Herbivorous Zooplankton,
W77-07502 5C

Grazing Effects on Nannoplankton in Gatun Lake, Panama,
W77-07507 5C

Strategies for Existence of Zooplankton Prey in Homogeneous Environments,
W77-07509 5C

Symap Computer Projections of Summer Zooplankton Populations in Van Lake, Montana,
W77-07511 7C

The Influence of Spring Circulation on Zooplankton Dynamics in the Plussee,
W77-07518 5C

First Information About N, P Nutrients and the Production of Lake Trasimeno, (In Italian),
W77-07593 5C

AUTHOR INDEX

ABDULLAH, M. I.
Environmental Dependence of Manganese and Zinc in the Scales of Atlantic Salmon, Salmo Salar (L) and Brown Trout, Salmo Trutta (L),
W77-07203 5C

A Hand-Operated In Situ Water Sampler,
W77-07200 5A

ADACHI, R.
Occurrence of Toxic Bivalves in Association with the Bloom of Gonyaulax sp. in Owase Bay,
W77-07119 5C

ADADE, B.
Nitrate in Ground Water and Its Relation to Fertilization, (In German),
W77-07112 5B

ADAMS, B. J.
Network Approach to Optimal Wastewater Treatment System Design,
W77-07531 5D

AGEEVA, T. A.
Planktonic Infusoria in Two Lakes of the Gorki Oblast, (In Russian),
W77-07234 5C

AGNEW, A. D. Q.
Observations on a Peat Bog's Ability to Withstand Increasing Public Pressure,
W77-07139 5C

AIRAN, D. S.
Circulation and Surge Modeling in Pamlico Sound, N.C.,
W77-07320 2L

AKIYAMA, T.
Occurrence and Determination of a Herbicide Benthiocarb in Rivers and Agricultural Drainages,
W77-07361 5A

AL-NIAMI, A. N. S.
Analysis of Flow Against Dispersion in Porous Media,
W77-07150 2F

ALDRIDGE, B. N.
Effects of the Catastrophic Flood of December 1966, North Rim Area, Eastern Grand Canyon, Arizona,
W77-07480 2E

ALEXANDER, V.
Phytoplankton Studies in the Bering Sea,
W77-07413 6G

ALFARO, J. F.
Water Movement in Soil from Trickle Source,
W77-07550 2G

ALLANSON, B. R.
Preliminary Estimates of Production by a Calanoid Copepod in Subtropical Lake Sibaya,
W77-07500 5C

ALLEN, J. L.
Residues of 3-trifluoromethyl-4-nitrophenol (TFM) Undetected in Lake Trout and Chinook Salmon from the Upper Great Lakes,
W77-07187 5A

ALTERMAN, R.
Power Plant Site Evaluation: The Case of the Sharon Plant in Israel,
W77-07546 6G

AMBRAZENE, Z. P.
Use of Quantitative Correlations Between Microorganisms for River Pollution Evaluation, (In Russian),
W77-07482 5B

AMEIN, M.
Circulation and Surge Modeling in Pamlico Sound, N.C.,
W77-07320 2L

AMEZAGA, E. DE
Spatial and Temporal Changes in the Primary Productivity of Lake Tahoe, California-Nevada Between 1959 and 1971,
W77-07443 5C

AMIARD, J.-C.
Preliminary Experiment of Cobalt 60 Pollution of a Marine Food Chain: Results of a Single Ingestion,
W77-07317 5C

AMIARD-TRIQUET, C.
Preliminary Experiment of Cobalt 60 Pollution of a Marine Food Chain: Results of a Single Ingestion,
W77-07317 5C

ANDERSON, D. W.
Dynamics of Storage of Organochlorine Pollutants in Herring Gulls,
W77-07127 5C

ANDERSON, G. C.
A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska,
W77-07411 6G

ANDERSON, H. W.
Fire Effects on Water Supply, Floods, and Sedimentation,
W77-07318 4C

ANDERSON, J. W.
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

ANDERSON, M. G.
Automatic Monitoring of Soil Moisture Conditions in a Hillslope Spur and Hollow,
W77-07146 2G

ANDERSON, W. D.
A Scientific and Legal Look at Thermal Pollution,
W77-07256 6E

ANDRONIKOVA, I. N.
Evaluation of Two Methods for Calculating Freshwater Zooplankton Production, (In Russian),
W77-07228 7B

ARASAKI, S.
Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

ARBUZOVA, N. A.
Use of Cation Polyelectrolytes for Water Purification from Viruses, (In Russian),
W77-07108 5F

ARTHUR, D. R.
A Natural Pollution Experiment: The Effects of a Sewage Strike on the Fauna of the Thames Estuary,
W77-07124 5C

ASTON, S. R.
Phosphorus and Carbon Distributions in a Polluted Coastal Environment,
W77-07368 5B

ATAEVA, E. S.
Annotated Bibliography on Hydrobiology and Hydrochemistry of the Kara Kum Canal 1955-74, (In Russian),
W77-07540 2I

ATLAS, R. M.
Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

ATTANASI, E. D.
The Economic Basis of Resource Information Systems: The Case of Streamflow Data Network Design,
W77-07534 7A

AUSTIN, A. L.
Electric Power Generation from Geothermal Hot Water Deposits,
W77-07300 8C

AVERILL, D. W.
Vacuum Sewer Systems and Their Possible Canadian Applications,
W77-07558 5D

BABANIN, V. F.
Study of the State of Water on the Surface of H+, NA+, MG2+ Saturated Kaolinite by the NMR Method, (In Russian),
W77-07241 2G

BACHMANN, R. W.
Algal Response to Nutrient Inputs in Some Iowa Lakes,
W77-07515 5C

BAEZ, A. P.
Aquatic Organism Contamination by Mercury Residues in the Coatzacoalcos River Estuary, Mexico,
W77-07394 5C

BAIN, R. C.
P. L. 92-500 V Local Priorities,
W77-07229 5D

BAL'ON, G.
Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

BANKS, J. W.
Environmental Dependence of Manganese and Zinc in the Scales of Atlantic Salmon, Salmo Salar (L) and Brown Trout, Salmo Trutta (L),
W77-07203 5C

BANKS, W. L.
A Mini-Pollution Tannery,
W77-07225 5D

BARBOSA, M.
Bacteriological Quality of Poultry-Farms' Water in Minas Gerais State, Brazil: 1973, (In Portugese),
W77-07594 5F

REPORT U. OF I. URBANA-CHAMPAIGN

BARBOUR, M. G.
Response of the Marine Angiosperm Phyllospadix Torreyi to Certain Environmental Variables: A Preliminary Study,
W77-07379 5C

BARLOW, R. M.
Application of Vascular Aquatic Plants for Pollution Removal, Energy and Food Production in a Biological System,
W77-07474 5D

BARRY, M.
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

BASCO, D. R.
Parameter Study of Variables Affecting the Performance of a Hydraulic Pipeline Dredge Model,
W77-07346 8D

BASTIEN, J. A. P.
Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

BATTERTON, J. C.
Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

BAUER, D.
Techniques for Purifying Oily Waste Water,
W77-07213 5D

BEAUCHAMP, M.
Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

BEAUPIED, H.
In Vitro Effect of Organic Nitrogen and Potassium Additions on Nitrogen Mineralization and on Exchanges Between the Mud and Water of a Pond, (In French),
W77-07575 5B

BEAVAN, A. P.
Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

BELL, J.
Subtidal and Intertidal Marine Fouling on Artificial Substrata in Northern Puget Sound, Washington,
W77-07201 5C

BELL, J. B.
A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

BENTLEY, W. W.
Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

BERAR, U.
Reducing Power Consumption in Irrigation Systems with the Aid of a Mathematical Model for Pipe Dimensioning,
W77-07547 3F

BERDUCOU, J.
Effect of the Presence of Sodium Chloride in the Medium on Growth, Development and Distribution of Chlorine and Sodium in Sorghum Dochna F., (In French),
W77-07291 3C

BERNASCONE, T. F.
A Light-Weight and Cheap Depth Sampler,
W77-07155 5A

BEYER, D. L.
Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

BINGHAM, S. W.
Diphenamid Removal from Water and Metabolism by Aquatic Plants,
W77-07193 5C

BLASCO, D.
Red Tide in the Upwelling Region of Baja California,
W77-07169 5C

BOLLING, H.
Inline Sensor Tightens Control on Sludge Consistency to Within 1.4-1.5% Solids,
W77-07214 5D

BOOTH, B.
A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska,
W77-07411 6G

BORMAN, R. G.
Water-Level Records for the Northern High Plains of Colorado, 1973-77,
W77-07486 4B

BORNEFF, J.
Nitrate in Ground Water and Its Relation to Fertilization, (In German),
W77-07112 5B

BORNO, C.
Calculation of Calcium Carbonate-Carbon Dioxide Equilibrium in Water and Mixtures of Water,
W77-07513 5A

BOUCK, G. R.
Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

BOWEN, A. J.
The Response of an Estuary to the Closure of a Mobile Barrier; Richmond Barrier on the Upper Thames Estuary,
W77-07366 2L

BOWMAN, M. J.
Hydrographic Properties, MESA New York Bight Atlas Monograph 1,
W77-07328 2L

BRADBURY, J. P.
Areal Distribution and Stratigraphy of Diatoms in the Sediments of Lake Sallie, Minnesota,
W77-07481 5C

BRADLEY, M. D.
Decision-Making for Environmental Resources Management,
W77-07542 6G

BRAGINSKII, L. P.
Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

BRANNON, J. M.
Nutrient Transformations in Louisiana Salt Marsh Soils,
W77-07319 5C

BRICE, R. M.
Response to Eutrophic Shagawa Lake, Minnesota, U.S.A., to Point-Source, Phosphorus Reduction,
W77-07519 5C

BRINSON, M. M.
Lake Izabal, Guatemala,
W77-07504 5C

BROECKER, W. S.
A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

BROOME, S. W.
Dune Stabilization with Panicum amarum Along the North Carolina Coast,
W77-07327 2L

BROWN, S. G.
Preliminary Maps Showing Ground-Water Resources in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W77-07478 7C

BROWN, W. D.
Comparison of Artificial and Natural Sea Water as Culture Media for Juvenile Lobsters,
W77-07118 5C

BRUCH, J. C. JR.
Solution of Equation for Two-Dimensional Infiltration Problems,
W77-07142 2G

BRUNI, V.
Mineralizing Microbial Activity in Lake Faro,
W77-07418 5C

BRUTON, J. E.
Satellite Observations of Water Quality,
W77-07554 5A

BUCKLEY, J. A.
Heinz Body Hemolytic Anemia in Coho Salmon (Oncorhynchus Kisutch) Exposed to Chlorinated Wastewater,
W77-07189 5C

BUFFA, L.
Wastewater and Sludge Control in the Canadian Metal Finishing Industry, Segment Including Chemical, Electrolytic Treatment; Electrochemical Machining and Polishing; Cyanide Hardening,
W77-07333 5D

BUKATA, R. P.
Satellite Observations of Water Quality,
W77-07554 5A

BULTOT, F.
Simulation of a Series of Daily Areal Mean Rainfalls for a Basin Using Rainfall Observations at a Reference Station Located Outside the Basin,
W77-07356 2B

BURMEISTER, E.
The Evaluation of Simple and Optimal Decision Rules with Misspecified Welfare Functions,
W77-07439 6B

BURNS, J. J.
The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

Trophic Relationships Among Ice Inhabiting Phocid Seals,
W77-07407 6G

BURRELL, D. C.
Wind and Current Patterns in an Arctic Coast Lagoon,
W77-07323 2L

BURT, T. P.
Automatic Monitoring of Soil Moisture Conditions in a Hillslope Spur and Hollow,
W77-07146 2G

BUSCEMI, P. A.
Symap Computer Projections of Summer Zooplankton Populations in Van Lake, Montana,
W77-07511 7C

BUTLER, J. N.
Water Quality and Chemical Models,
W77-07246 5C

CABLE, W. D.
Development of Eggs and Embryos of the Surf Clam, Spisula Solidissima, in Synthetic Seawater,
W77-07396 5C

CADWALLADER, P. L.
Breeding Biology of a Non-Diadromous Galaxiid, Galaxias Vulgaris Stokell, in a New Zealand River,
W77-07389 5C

CAIRNEY, T.
Interconnection of Surface and Underground Water Resources in Southeast Durham,
W77-07149 4B

A Light-Weight and Cheap Depth Sampler,
W77-07155 5A

CALKINS, D.
Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

CALKINS, D. G.
Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

CAMPBELL, E.
The Effect of Temperature on Size and Structure-II. The Body Musculature of Cyclops Agilis (Koch, Sars),
W77-07433 5C

CAREY, A. G. JR.
The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

CARLSON, G. P.
Fate of the Organophosphate Insecticide Parathion in the Freshwater Invertebrates,
W77-07285 5C

CARLSON, S.
Studies on Virus Inactivation by Chlorine During Water Disinfection, (In German),
W77-07595 5F

CARNAHAN, C. L.
Non-Equilibrium Thermodynamics of Groundwater Flow Systems: Symmetry Properties of Phenomenological Coefficients and Considerations of Hydrodynamic Dispersion,
W77-07143 2F

CAROTTI, A.
How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

CASILLAS, E.
The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

CECH, J. J. JR.
Summer Growth Depression in the Striped Mullet, Mugil Cephalus L.,
W77-07378 5C

CHANG, P.
Aspects of Zoobenthos Ecology of the Mackenzie Delta, N.W.T.,
W77-07499 5C

CHANG, S. D.
Effect of Silt and Salinity on the Mortality of Meretrix Lusoria (Roeding), (In Korean),
W77-07428 5C

CHARRON, J. E.
Hydrogeological Applications of Earth Resources Technology Satellite Landsat 1 Imagery,
W77-07339 7B

CHEN, T. H.
Cage Culture of Channel Catfish in a Heated Effluent from a Power Plant, Thomas Hill Reservoir,
W77-07101 5C

CHERNYSHOV, V. I.
Alteration in the Toxicity of Tissue Lipids with the Adaptation of Fishes to Osmotic Pressure Changes in the Environment,
W77-07120 5C

CHERRY, D. S.
Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

CHIEN, C-Y.
Stochastic Properties of Daily Temperature in Rivers,
W77-07159 5B

CHIN, P.
Effect of Silt and Salinity on the Mortality of Meretrix Lusoria (Roeding), (In Korean),
W77-07428 5C

CHITTENDEN, M. E. JR.
Present and Historical Spawning Grounds and Nurseries of American Shad, Alosa sapidissima, in the Delaware River,
W77-07131 5C

CHIU, M. T. L.
Seasonal Changes of Invertebrate Populations in the Polluted River Medlock,
W77-07121 5C

CHOW, V. T.
Design Criteria for Hydrologic Extremes,
W77-07165 8B

CHRISTIANSEN, M. E.
The Effect of Salinity and Cyclic Temperature on Larval Development of the Mud-Crab Rhithropanopeus Harrisii (Brachyura: Xanthidae) Reared in the Laboratory,
W77-07384 5C

CLANET, F.
Assay of Detergent Residues in Fresh Water, Sea Water and Waste Waters: Method of Extraction and Concentration of Surfactants by Adsorption on Liquid-Liquid Interface, (In French),
W77-07591 5A

CLARIDGE, P. N.
Oxygen Consumption, Ventilatory Frequency and Heart Rate of Lampreys (Lampetra Fluviatilis) During Their Spawning Run,
W77-07399 5C

CLARK, P.
Aspects of the Life History of Tresus Nuttallii in Elkhorn Slough,
W77-07388 2L

CLARKE, W. B.
Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

CLAUSEN, H. B.
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

COGGER, C. G.
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

COHON, J. L.
Gains from Joint Operation of Multiple Reservoir Systems,
W77-07533 4A

COLEMAN, A. K.
The Development of Regional Industrial Waste Processing Centres,
W77-07205 5D

COLIJN, F.
Influence of Light and Temperature on the Photosynthetic Rate of Marine Benthic Diatoms,
W77-07385 5C

COLLINS, G. B.
Effects of Dams on Pacific Salmon and Steelhead Trout,
W77-07426 5C

COLLINS, J. J.
Installation Tips on Large Submersibles,
W77-07289 8C

COMPTON, R. I.
Scientific and Scenic Rivers Act: Commentary and Model Statute,
W77-07231 6G

COOK, S. E. K.
Quest for an Index of Community Structure Sensitive to Water Pollution,
W77-07136 5A

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COOK, T. M.
Bacteriology of Chesapeake Bay Surface Waters,
W77-07382 5C

COOLEY, M. E.
Effects of the Catastrophic Flood of December 1966, North Rim Area, Eastern Grand Canyon, Arizona,
W77-07480 2E

COONEY, R. T.
Zooplankton and Micronekton Studies in the Bering - Chukchi/Beaufort Seas,
W77-07412 6G

CORDEIRO, C. A.
Bacteriological and Colimetric Examination of the Water Supplied to the Slaughterhouses Situated Near Salvador, Bahia, Brazil, (In Portugese),
W77-07587 5A

CORKETT, C. J.
Studies on the Effect of Temperature on the Egg Laying of Three Species of Calanoid Copepods in the Laboratory (Acartia Tonsa, Temora Longicornis, and Pseudocalanus Elongatus),
W77-07391 5C

COSTLOW, J. D. JR.
The Effect of Salinity and Cyclic Temperature on Larval Development of the Mud-Crab Rhithropanopeus Harrisii (Brachyura: Xanthidae) Reared in the Laboratory,
W77-07384 5C

COULTER, K.
Wastewater and Sludge Control in the Canadian Metal Finishing Industry, Segment Including Chemical, Electrolytic Treatment; Electrochemical Machining and Polishing; Cyanide Hardening,
W77-07333 5D

COURTOIS, L. A.
Hematology of Juvenile Striped Bass, Morone Saxatilis (Walbaum), Acclimated to Different Environmental Conditions,
W77-07400 5C

Respiratory Responses of Gillichthys Mirabilis to changes in Temperature, Dissolved Oxygen and Salinity,
W77-07401 5C

COWELL, B. C.
Life History Patterns in the Coastal Shiner, Notropis Petersoni, Fowler,
W77-07386 5C

CRADDOCK, D. R.
Effects of Increased Water Temperature on Daphnia Pulex,
W77-07130 5C

CRAIG, P. C.
Life History Notes for a Population of Slimy Sculpin (Cottus Cognatus) in an Alaskan Arctic Stream,
W77-07393 5C

CRAWFORD, C. C.
The Utilization of Dissolved Free Amino Acids by Estuarine Microorganisms,
W77-07117 5C

CRAWSHAW, L. I.
Attainment of the Final Thermal Preferendum in Brown Bullheads Acclimated to Different Temperatures,
W77-07381 5C

CREASON, S. C.
Waste Water Reclamation System Ups Productivity, Cuts Water Use,
W77-07210 5D

CROW, F. R.
Manning N and the Overland Flow Equation,
W77-07371 2E

D'AOUST, B. G.
Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

D'OMBRAIN, G. L.
Brace Research Institute, Annual Report, (1976),
W77-07242 3A

DAHLSTREM-EKBOHM, Y.
Literature on Environmental Protection, Management and Hygiene in Sweden 1952-1971: Bibliography and Analysis, (In Swedish),
W77-07586 6G

DAME, R. F.
Day Degree Growth Models for Intertidal Oysters,
W77-07376 2L

DANIL'CHENKO, O. P.
Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

DAVIS, C. L.
Economic Aspects of Pollution Abatement, Part 1,
W77-07260 6E

Legal Aspects of Changes Brought About by Buckeye's Pollution Abatement Program, Part II,
W77-07261 6E

DAVIS, D. R.
Evaluation of Flood Forecasting-Response Systems,
W77-07524 4A

DAVIS, G. E.
Laboratory Apparatus for Providing Diel Temperature Regimes for Aquatic Animals,
W77-07188 5C

DAVIS, J. D.
Apparent Potentiation of the Cotton Defoliant DEF by Methyl Parathion in Mosquitofish,
W77-07204 5C

DAVIS, L. E.
Subsidence: Settling Down Within the Laws of Accretion, Reliction, Erosion, and Submergence,
W77-07238 6E

DAVIS, M. B.
Post-Glacial History of Mirror Lake and Its Watershed In New Hampshire, U.S.A.: An Initial Report,
W77-07472 5C

DAVIS, S. J.
The Rate of Microbial Degradation of Oil in a Beach Gravel Column,
W77-07138 5B

DAVYDOV, O. N.
Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

DAWES, C. J.
Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

DE LA BANDA, I. G.
Bacteriologic Analysis in the Arosa, Vigo and Pontevedra Estuaries, (In Spanish),
W77-07589 5A

DE NULMAN, R.
Aquatic Organism Contamination by Mercury Residues in the Coatzacoalcos River Estuary, Mexico,
W77-07394 5C

DE SANTIAGO FIERRO, G.
Bacteriologic Analysis in the Arosa, Vigo and Pontevedra Estuaries, (In Spanish),
W77-07589 5A

DE VOOYS, C. G. N.
The Influence of Temperature and Time of Year on the Oxygen Uptake of the Sea Mussel Mytilus Edulis,
W77-07383 5C

DELAUNE, R. D.
Nutrient Transformations in Louisiana Salt Marsh Soils,
W77-07319 5C

DENISON, E. B.
Downhole Measurements Through Modified Drill Pipe,
W77-07304 8G

DENTON, J. E.
Seasonal Changes in Hematology of Rainbow Trout, Salmo Gairdneri,
W77-07403 5C

DETCHEVA, R. B.
The Ciliates of Two Bulgarian Tributaries of the Danube which are Polluted: The Rivers Vit and Ossam, (In French),
W77-07573 5B

DEVAUX, J.
Primary Production and Biomass of Algae Populations in an Oligotrophic Lake in the French Massif Central, (In French),
W77-07398 5C

DEW, C. B.
A Contribution to the Life History of the Cunner, Tautogolabrus Adspersus, in Fishers Island Sound, Connecticut,
W77-07377 5C

DICKSON, K. L. JR.
Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

DIEHL, S.
Transports in Lake Superior,
W77-07176 5B

DIGIOVANNI, M. V.
First Information About N, P Nutrients and the Production of Lake Trasimeno, (In Italian),
W77-07593 5C

DIMOCK, R. V. JR.
Interaction of Temperature and Salinity on Oxygen Consumption of the Estuarine Crab Panopeus Herbstii,
W77-07375 5C

DOLL, J. C.
Horizon Hydraulic Conductivities Determined In Situ for the Wilderness, Mexico and Menfro Soils and Used to Predict Soil Water Content,
W77-07103 2G

DONNELLY, D. P.
Digital Raingage Recorder,
W77-07172 2B

DONOVAN, D. J.
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

DORGELO, J.
Comparative Ecophysiology of Gammarids (Crustacea: Amphipoda) From Marine, Brackish and Fresh-Water Habitats, Exposed to the Influence of Salinity-Temperature Combinations. I. Effect on Survival,
W77-07397 5C

DOW, R. L.
The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

DOZIER, B. J.
The Structure of Phytoplankton Associations in Lake Tahoe (California-Nevada),
W77-07473 5C

DRYSDALE, F. R.
Response of the Marine Angiosperm Phyllospadix Torreyi to Certain Environmental Variables: A Preliminary Study,
W77-07379 5C

DUBOS, M.
Large-Scale Reverse Osmosis Processing of Metal Finishing Rinse Waters,
W77-07207 5D

DUNLAP, W. A.
Problems Associated with Construction of Submarine Pipelines,
W77-07349 8D

DUNWODY, E.
Florida Statutes, Chapter 253--The 1969 Amendments and Proposed Legislation,
W77-07258 6E

DUPRIEZ, G. L.
Simulation of a Series of Daily Areal Mean Rainfalls for a Basin Using Rainfall Observations at a Reference Station Located Outside the Basin,
W77-07356 2B

DWYER, W. P.
The Influence of Temperature on Scope for Activity in Cutthroat Trout, Salmo Clarki,
W77-07380 5C

DYER, T. G. J.
Estimating Above and Below Normal Rainfall Periods Over South Africa, 1972-2000,
W77-07170 2B

DYGAS, J. A.
Wind and Current Patterns in an Arctic Coast Lagoon,
W77-07323 2L

DYSART, B. C. III
Modeling Multiple-Use in Natural Areas: Part I -- The Basic Formulation,
W77-07530 6A

EATON, B.
The Chief Driller's Report on JCCIP,
W77-07288 8C

EIBEN, R.
Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

EL-NASHAR, A. M.
The Desalting and Recycling of Waste Waters from Textile Dyeing Operations Using Reverse Osmosis,
W77-07220 5D

ELDER, F. C.
Sub-Thermocline Biomass Concentration Detected by Transmissometer in Lake Superior,
W77-07447 5C

ELGAVISH, A.
The Role of Phosphate in Eutrophication. Stimulation of Plankton Growth and Residence Times of Inorganic Phosphate in Lake Kinneret Water,
W77-07517 5C

ELLIS, A. J.
Geothermal Systems and Power Development,
W77-07302 4B

ENGLISH, T. S.
Beaufort Sea Plankton Studies,
W77-07414 6G

EPIFANIO, C. E.
Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

ERLEBACH, W. E.
Limitations of Single Water Samples in Representing Mean Water Quality 1. Thompson River at Shaw Spring, British Columbia,
W77-07563 5A

ES'KOV, B. G.
Distribution Thickness and Certain Physical and Chemical Properties of Bottom Sediments in the Kiev Reservoir, (In Russian),
W77-07321 2J

EULER, R. C.
Effects of the Catastrophic Flood of December 1966, North Rim Area, Eastern Grand Canyon, Arizona,
W77-07480 2E

FABACHER, D. A.
Apparent Potentiation of the Cotton Defoliant DEF by Methyl Parathion in Mosquitofish,
W77-07204 5C

FABACHER, D. L.
Apparent Potentiation of the Cotton Defoliant DEF by Methyl Parathion in Mosquitofish,
W77-07204 5C

FALKENMARK, M.
Reduced Water Demand--Result of Swedish Anti-Pollution Program,
W77-07215 5D

FANG, S. C.
Effect of DDT on Photosynthesis of Selenstrum Capricornutum,
W77-07444 5C

FAY, F. H.
Morbidity and Mortality of Marine Mammals,
W77-07405 6G

The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

FICKEISEN, D. H.
Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

FILICE, F. P.
Uptake and Accumulation of the Nickel Ion by Mytilus edulis,
W77-07198 5C

FISHER, A. C.
The Economics of Natural Environments, Studies in the Valuation of Commodity and Amenity Resources.
W77-07437 6G

FISHER, D.
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

FITCH, W. N.
Test of Landsat-Based Urban Hydrologic Modeling,
W77-07528 6A

FLEMING, W. M.
A Model of the Phosphorus Cycle and Phytoplankton Growth in Skaha Lake, British Columbia, Canada,
W77-07445 5C

Predicting the Impacts of Phosphorus Management Policies on the Eutrophication of Skaha Lake, British Columbia, Canada,
W77-07446 5C

FONG, W. C.
Uptake and Retention of Kuwait Crude Oil and Its Effects on Oxygen Uptake by the Soft-Shell Clam, Mya Arenaria,
W77-07506 5C

FOULDS, D. M.
Frazil--The Invisible Strangler,
W77-07177 2C

FOWLER, J. L.
Protein Production by Russian Thistle: Effects of Water and Nitrogen on Protein Yields,
W77-07281 3F

FOYE, R. E.
Effects of Pressure on Survival of Six Species of Fish,
W77-07424 5C

FRASIER, S. C.
The Feasibility of a Water Importation Project for South Florida,
W77-07259 6E

FRAZIER, J. M.
The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

U.S. DEPT. OF I. URBANA-CHAMPAIGN

FREED, V. H.
Effect of DDT on Photosynthesis of Selenstrum Capricornutum,
W77-07444 5C

FRIEDRICH, A. R.
Uptake and Accumulation of the Nickel Ion by Mytilus edulis,
W77-07198 5C

FRONZA, G.
Reservoir Operation Under Conflicting Objectives,
W77-07536 4A

FROST, R. C.
A Light-Weight and Cheap Depth Sampler,
W77-07155 5A

FROST, S.
Seasonal Changes of Invertebrate Populations in the Polluted River Medlock,
W77-07121 5C

FUJINAWA, K.
Finite-Element Analysis of Groundwater Flow in Multiaquifer Systems, I. The Behavior of Hydrological Properties in an Aquitard While Being Pumped,
W77-07148 2F

FUJIYA, M.
The Influence of Underwater Explosion on Fish, (In Japanese),
W77-07316 8H

FUKUHARA, O.
The Influence of Underwater Explosion on Fish, (In Japanese),
W77-07316 8H

FUKUNAGA, I.
Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

FULLER, G. C.
Fate of the Organophosphate Insecticide Parathion in the Freshwater Invertebrates,
W77-07285 5C

FURTADO, J. I.
Population Changes in the Aquatic Fauna Inhabiting the Bladderwort, Utricularia Flexuosa Vahl., in a Tropical Swamp, Tasek Bera, Malaysia,
W77-07465 5C

GAECHTER, R.
Lake Restoration by Bottom Water Siphoning, (In German),
W77-07577 5G

GAHAN, L. W.
Modeling Multiple-Use in Natural Areas: Part I -- The Basic Formulation,
W77-07530 6A

GALLAGHER, M. L.
Comparison of Artificial and Natural Sea Water as Culture Media for Juvenile Lobsters,
W77-07118 5C

GALVEZ, L. C.
Aquatic Organism Contamination by Mercury Residues in the Coatzacoalcos River Estuary, Mexico,
W77-07394 5C

GAMBLE, D. J.
Evaluating Alternative Levels of Water and Sanitation Service for Communities in the Northwest Territories,
W77-07557 6A

GANDHI, S. S.
Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

GARCIA, M.
Effect of the Presence of Sodium Chloride in the Medium on Growth, Development and Distribution of Chlorine and Sodium in Sorghum Dochna F., (In French),
W77-07291 3C

GARRETT, C.
Predicting Changes in Tidal Regime: The Open Boundary Problem,
W77-07370 8B

GASITH, A.
Tripton Sedimentation in Eutrophic Lakes--Sample Correction for the Resuspended Matter,
W77-07463 5C

GAUDY, R.
Study on Respiratory Metabolism Modifications in Acartia clausi (Crustacea: Copepoda) Populations after Passage through the Cooling Circuit of a Power Plant,
W77-07305 5C

GAUM, C. H.
Water Resources Planning and Management Goals,
W77-07523 6B

GBUREK, W. J.
Predictability of Effects of a Severe Local Storm in Pennsylvania,
W77-07369 2B

GELDIAY, R.
Accumulation and Distribution of Trace Metals and Radionuclides in Marine Organisms (Particularly Tapes Decussatus L.) in the Izmir Bay Area, Turkey,
W77-07395 5C

GENOVESE, S.
Mineralizing Microbial Activity in Lake Faro,
W77-07418 5C

GETZEN, R. T.
Analog-Model Analysis of Regional Three-Dimensional Flow in the Ground-Water Reservoir of Long Island, New York,
W77-07479 2F

GIANOTTI, F. S.
First Information About N, P Nutrients and the Production of Lake Trasimeno, (In Italian),
W77-07593 5C

GIBBS, C. F.
The Rate of Microbial Degradation of Oil in a Beach Gravel Column,
W77-07138 5B

GIGER, M. W.
Compressibility and Strength of Compacted Dredgings,
W77-07350 8D

GINN, T. C.
Survival and Reproduction of Gammarus spp. (Amphipoda) Following Short-Term Exposure to Elevated Temperatures,
W77-07125 5C

GIOVANNONI, J. M.
Regional Study of the Upper Basin of the AAR from its Sources to Bern: Profile of Floods of a Given Return Period at any Point on the River (Etude Regionale du Bassin Superieur de L'Aar de ses Sources Jusqu'a Berne: Profile des Crues de Periode Donnee le Long du Cours d'eau).
W77-07358 2E

GLASS, G. E.
Synergistic Effects of Phosphate and Manganese on Growth of Lake Superior Algae,
W77-07448 5C

GLIWICZ, Z. M.
Effect of Zooplankton Grazing on Photosynthetic Activity and Composition of Phytoplankton,
W77-07453 5C

GOLDMAN, C. K.
Bacteriology of Chesapeake Bay Surface Waters,
W77-07382 5C

GOLDMAN, C. R.
Spatial and Temporal Changes in the Primary Productivity of Lake Tahoe, California-Nevada Between 1959 and 1971,
W77-07443 5C

Succession Rates in Lake Phytoplankton Communities,
W77-07442 5C

GOLIMBET, V. E.
Oil-Oxidizing Bacteria of the River Yenisei, (In Russian),
W77-07532 5C

GOODBAN, A.
Calcium Carbonate in the Revomal of Iron and Lead from Dilute Waste Water,
W77-07208 5D

GRAINGER, J. N. R.
The Effect of Temperature on Size and Structure-II. The Body Musculature of Cyclops Agilis (Koch, Sars),
W77-07433 5C

GRANT, R. S.
Reaeration-Coefficient Measurements of 10 Small Streams in Wisconsin Using Radioactive Tracers--with a Section on the Energy-Dissipation Model.
W77-07496 5A

GRAY, R.
Toxic Waste Disposal,
W77-07209 5G

GRAY, R. H.
Surber Sampling in Deep Water for Bottom Organisms,
W77-07199 7B

GREEN, F. A. JR.
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

GREEN, J. B.
Interactions of Cupric Ion with Humic Acid,
W77-07104 5B

GREENBERG, D.
Predicting Changes in Tidal Regime: The Open Boundary Problem,
W77-07370 8B

GREENHOUSE, G.
The Evaluation of Toxic Effects of Chemicals in Fresh Water by Using Frog Embryos and Larvae,
W77-07132 5C

GROBBELAAR, J. U.
The Lentic and Lotic Freshwater Types of Marion Island (Sub-Antarctic): A Limnological Study,
W77-07514 5C

GROSS, F.
The Oligochaete Communities of a Lowland Stream and Their Value as Indicators of Organic Pollution,
W77-07307 5C

GROVES, K. H.
Interaction of Temperature and Salinity on Oxygen Consumption of the Estuarine Crab Panopeus Herbstii,
W77-07375 5C

GUERIN-ANCEY, O.
Experimental Study of the Nitrogen Excretion of Bass (Dicentrarchus labrax) during Growth. I. Effects of Temperature and Weight on the Excretion of Ammonia and Urea,
W77-07313 5C

GUILLARD, R. R. L.
The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

GYTRE, T.
Swim Bladder Gas Pressure of Cod in Relation to Hydrostatic Pressure,
W77-07417 5C

HAAS, J. B.
Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

HACHUM, A. Y.
Water Movement in Soil from Trickle Source,
W77-07550 2G

HAESSELBARTH, U.
Studies on Virus Inactivation by Chlorine During Water Disinfection, (In German),
W77-07595 5F

HAGEMAN, J. H.
Protein Production by Russian Thistle: Effects of Water and Nitrogen on Protein Yields,
W77-07281 3F

HAIMES, Y. Y.
Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

HAKENJOS, C. B.
The Port of New Orleans and Its Dredging Program,
W77-07348 8D

HALE, L. C.
Techniques for Purifying Oily Waste Water,
W77-07213 5D

HALL, K. J.
Effect of Nutrient Enrichment on the Heterotrophic Uptake of Organic Solutes by Microorganisms,
W77-07466 5C

HALMANN, M.
The Role of Phosphate in Eutrophication. Stimulation of Plankton Growth and Residence Times of Inorganic Phosphate in Lake Kinneret Water,
W77-07517 5C

HAMAN, K. E.
Physical Problems of Weather Modification,
W77-07357 3B

HAMBLIN, P. F.
Upwelling in a Model of an Intermontane Lake,
W77-07469 5B

HAMILL, L.
Interconnection of Surface and Underground Water Resources in Southeast Durham,
W77-07149 4B

HAMMOND, A. L.
Geothermal Resources, A New Look,
W77-07477 4B

HAMPSON, B. L.
The Analysis of Ammonia in Polluted Sea Water,
W77-07362 5A

HANSEN, E.
Economic Value of Low Flow Data,
W77-07537 5D

HANSON, C. H.
Subtidal and Intertidal Marine Fouling on Artificial Substrata in Northern Puget Sound, Washington,
W77-07201 5C

HARDCASTLE, J. H.
Water Quality and Aquitard Permeability,
W77-07551 5G

HARR, R. D.
Water Flux in Soil and Subsoil on a Steep Forested Slope,
W77-07147 2G

HARRIS, G. P.
Satellite Observations of Water Quality,
W77-07554 5A

HART, R. C.
Preliminary Estimates of Production by a Calanoid Copepod in Subtropical Lake Sibaya,
W77-07500 5C

HASEGAWA, H.
The Larval Spirurid Nematodes of Fresh-Water Crustaceans: I. The Identification and the Examination of Their Pathogenicity,
W77-07458 5C

HASHIMOTO, Y.
Occurrence of Toxic Bivalves in Association with the Bloom of Gonyaulax sp. in Owase Bay,
W77-07119 5C

HASTENRATH, S.
Dynamics of Climatic Hazards in Northeast Brazil,
W77-07167 2B

HAUTALA, E.
Calcium Carbonate in the Revomal of Iron and Lead from Dilute Waste Water,
W77-07208 5D

HAYES, C.
Large-Scale Reverse Osmosis Processing of Metal Finishing Rinse Waters,
W77-07207 5D

HEDRICK, D. G.
Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

HEGI, H. R.
Heavy Metals (Fe, Mn, Cd, Cr, Cu, Pb and Zn) in the Pelagic Zone of Lake Constance (Obersee and Untersee) and the Greifensee, (In German),
W77-07580 5A

HEID, A. S.
House Committee Marks up HR 9560,
W77-07236 5G

HEINDL, L. A.
Hydrology,
W77-07494 2A

HEINKE, G. W.
Vacuum Sewer Systems and Their Possible Canadian Applications,
W77-07558 5D

HEINLE, D. R.
Effects of Passage Through Power Plant Cooling Systems on Estuarine Copepods,
W77-07134 5C

HELLER, L.
Dynamics of Climatic Hazards in Northeast Brazil,
W77-07167 2B

HELLY, J. JR.
The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

HELWICK, R.
Ultrafiltration Oil Reclamation Process,
W77-07212 5D

HENDRICK, R. L.
Predictability of Effects of a Severe Local Storm in Pennsylvania,
W77-07369 2B

HESE, N.
Phenol-Selective, Highly Resistant Ro-Membranes Made from PVA for the Purification of Toxic Industrial Wastes,
W77-07206 5D

HESS, J. W.
Nitrogen Contamination Sources in Shallow Ground Water, Las Vegas Area, Nevada,
W77-07141 5B

HEWITT, C. N.
Phosphorus and Carbon Distributions in a Polluted Coastal Environment,
W77-07368 5B

HICKEL, B.
Changes in Phytoplankton Species Composition Since 1894 in Two Lakes in East-Holstein, Germany,
W77-07501 5C

HICKEY, J. J.
Dynamics of Storage of Organochlorine Pollutants in Herring Gulls,
W77-07127 5C

HILL, C. T.
Thermal Pollution and Its Control,
W77-07245 5G

HILL, M.
Power Plant Site Evaluation: The Case of the Sharon Plant in Israel,
W77-07546 6G

HILLS, J. P.
Legal Decisions and Opinions in Pollution Cases,
W77-07436 5G

HIRSCH, N.
Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

HIRSCH, R. M.
Gains from Joint Operation of Multiple Reservoir Systems,
W77-07533 4A

HIRSCHFELD, F.
Geothermal Power, The 'Sleeper' in the Energy Race,
W77-07296 3E

HOBBIE, J. E.
The Utilization of Dissolved Free Amino Acids by Estuarine Microorganisms,
W77-07117 5C

HOFER-SIEGRIST, L.
Improved Method for the Determination of ATP in Lakewater, (In German),
W77-07578 5A

HOFMANN, W.
The Influence of Spring Circulation on Zooplankton Dynamics in the Plussee,
W77-07518 5C

HOGAN, J.
The Effects of High Vacuum on Fish,
W77-07421 5C

HOLLAN, E.
Meromixis in Ulmener Maar (Germany).
W77-07520 5C

HORNER, R. A.
Beaufort Sea Plankton Studies,
W77-07414 6G

HOUGH, R. A.
The Release of Dissolved Organic Carbon from Submersed Aquatic Macrophytes: Diel, Seasonal and Community Relationships,
W77-07516 5C

HUBBARD, K. G.
Parameterization of Depositional Ice Growth,
W77-07171 2B

HUFF, F. A.
Maximum 5-Minute and Hourly Rainfalls on Metromex Network, 1971-1975,
W77-07374 2B

HUMMON, W. D.
Survival of Mayfly Larvae Under Mine Acid Conditions,
W77-07128 5C

HUNT, B.
Calculation of the Leaky Aquifer Function,
W77-07156 2F

HUNTSMAN, S. A.
Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

HURST, J. W. JR.
The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

ICHIZEN, N.
Study on the Herbicidal Properties of Benthiocarb; Factors Affecting Herbicidal Activity and Its Behavior in Soil, (In Japanese),
W77-07387 5B

ILICHKINA, A. G.
Hygienic Standardization of Disodium Salts of Meta-and Para-Diisopropylbenzene in Water Bodies, (In Russian),
W77-07590 5C

IONESCU, V.
Reducing Power Consumption in Irrigation Systems with the Aid of a Mathematical Model for Pipe Dimensioning,
W77-07547 3F

IRELAND, M. P.
Variations in the Lead, Zinc and Calcium Content of Dendrobaena rubida (Oligochaeta) in a Base Metal Mining Area,
W77-07135 5C

IRLAND, L. C.
Federal Riverbasin Planning in the Coastal Zone: The Long Island Sound Study,
W77-07232 2L

ISHIZAKI, S.
An Investigation on the Disposal of Pig Excreta in Kasumigaura Area, (In Japanese),
W77-07571 5B

ITO, T.
Uptake of Dissolved Ammonium and Nitrate Ion by the Fry of Common Carp, Crucian Carp and Loach from Surrounding Water, (In Japanese),
W77-07314 5C

JACKSON, J.
The Evaluation of Simple and Optimal Decision Rules with Misspecified Welfare Functions,
W77-07439 6B

JACKSON, T. J.
Test of Landsat-Based Urban Hydrologic Modeling,
W77-07528 6A

Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

JAHN, L. A.
Responses to Odors by Fingerling Cutthroat Trout from Yellowstone Lake,
W77-07111 5C

JANSSEN, C. T. L.
Evaluating Alternative Levels of Water and Sanitation Service for Communities in the Northwest Territories,
W77-07557 6A

JENKINS, W. J.
A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

JENSEN, A. C.
Offshore Oil and Fishery Resources,
W77-07195 5C

JESKE, R.
Bacteriological Studies in the Cienaga Grande (Great Marsh) of Santa Maria, Columbia, (In Spanish),
W77-07512 5C

JIN, J. S.
Leaching Characteristics of Polluted Dredgings,
W77-07158 5B

Permeability and Drainage Characteristics of Dredgings,
W77-07351 8D

JIN, L. T.
Algal Productivity of Natural and Artificially Enriched Fresh Waters in Malaya,
W77-07471 5C

JOHNSEN, S. J.
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

JOHNSON, H. E.
Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

JOHNSON, W. C.
Annual Contribution of Carbon, Nitrogen and Phosphorus by Migrant Canada Geese to a Hardwater Lake,
W77-07505 5C

JONES, J. R.
Algal Response to Nutrient Inputs in Some Iowa Lakes,
W77-07515 5C

JONYS, C. K.
Acoustic Measurement of Sediment Transport,
W77-07338 2J

JORDAN, M.
An Organic Carbon Budget for an Oligotrophic Lake In New Hampshire, U.S.A.,
W77-07470 5C

JORDAN, T.
Transports in Lake Superior,
W77-07176 5B

JUDKINS, D.
An Ozone Reactor for Color Removal from Pulp Bleachery Wastes,
W77-07216 5D

JUNGE, C. O.
Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

KALFF, J.
Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

KAMP-NIELSEN, L.
Seasonal Variation in Sediment-Water Exchange of Nutrient Ions in Lake Esrom,
W77-07467 5C

KARLIN, A.
Reservoir Operation Under Conflicting Objectives,
W77-07536 4A

KARLINGER, M. R.
The Economic Basis of Resource Information Systems: The Case of Streamflow Data Network Design,
W77-07534 7A

KATAGIRI, A.
Electrolytic Treatment of Chromate and Cyanide Wastes with Packed Bipolar Cell, (In Japanese),
W77-07211 5D

KAWAI, S.
Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

KAZUJI, O.
Relation Between the Amounts of Fertilization and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: 1. On the Relation Between the Amount of Fertilizer Application and the Specific Pollution Loads of Nitrogen and Phosphorus in Main Streams Flowing into Lake Nishiura, (In Japanese),
W77-07568 5B

KELLEY, J. C.
Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

KEMMOTSU, M.
The Larval Spirurid Nematodes of Fresh-Water Crustaceans: I. The Identification and the Examination of Their Pathogenicity,
W77-07458 5C

KENDRICK, P. J.
Deep Well Injection: Sweeping the Problem Under the Carpet,
W77-07295 5G

KHALTURINA, G. V.
Planktonic Infusoria in Two Lakes of the Gorki Oblast, (In Russian),
W77-07234 5C

KIECHEL, W. JR.
Evolution and Objectives of River Basin Commissions in the United States,
W77-07249 6E

KIKKAWA, A.
Relation Between the Amounts of Fertilization and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: 1. On the Relation Between the Amount of Fertilizer Application and the Specific Pollution Loads of Nitrogen and Phosphorus in Main Streams Flowing into Lake Nishiura, (In Japanese),
W77-07568 5B

Relation Between the Amounts of Fertilizer and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: II. On the Relation Between Livestock Waste Per Unit Area of Basin and the Specific Load of Pollutants in Main Streams Flowing into Nishiura Lake Basin, (In Japanese),
W77-07569 5B

KILHAM, P.
Modeling the Annual Thermal Evolution of Mid-Latitude Lakes,
W77-07462 2H

KIM, C. S.
A Study on Standing Crops in Phragmites Communis Communities and Their Environmental Factors, (In Korean),
W77-07335 5C

KIM, H.
A Study of Environment Sanitation on the Wells in Jungneung-Dong Area, Seoul, (In Korean),
W77-07475 5B

KIM, K. G.
A Study of Environment Sanitation on the Wells in Jungneung-Dong Area, Seoul, (In Korean),
W77-07475 5B

KIM, Y. H.
A Study of Environment Sanitation on the Wells in Jungneung-Dong Area, Seoul, (In Korean),
W77-07475 5B

KIRYUKHINA, L. N.
Self-Purification in the Coastal Waters of the Black Sea, (In Russian),
W77-07592 5C

KITTEL, T.
A Survey of the Biological Limnology of Lake Titicaca,
W77-07503 5C

A Survey of the Physical and Chemical Limnology of Lake Titicaca,
W77-07460 5C

KNAUSENBERGER, WALTER I.
The Differential Use of Chironomidae and Ceratopogonidae (Diptera) in the Monitoring of Various Aquatic Wastes,
W77-07282 5A

KNOECHEL, R.
Algal Sedimentation: The Cause of a Diatom-Blue-Green Succession,
W77-07464 5C

KOERNER, R. M.
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

KOGAN, S. I.
Annotated Bibliography on Hydrobiology and Hydrochemistry of the Kara Kum Canal 1955-74, (In Russian),
W77-07540 2I

KOLO, D. E.
Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

KORN, S.
Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

KORONELLI, T. V.
Oil-Oxidizing Bacteria of the River Yenisei, (In Russian),
W77-07532 5C

KRAMER, R. H.
The Influence of Temperature on Scope for Activity in Cutthroat Trout, Salmo Clarki,
W77-07380 5C

KREMEN, S. S.
Large-Scale Reverse Osmosis Processing of Metal Finishing Rinse Waters,
W77-07207 5D

KRISHNASWAMY, G.
Systems Approach and Watershed Models,
W77-07556 2A

KRIZEK, R. J.
Compressibility and Strength of Compacted Dredgings,
W77-07350 8D

Leaching Characteristics of Polluted Dredgings,
W77-07158 5B

Permeability and Drainage Characteristics of Dredgings,
W77-07351 8D

KRUTILLA, J. V.
The Economics of Natural Environments, Studies in the Valuation of Commodity and Amenity Resources.
W77-07437 6G

KRZYZANEK, E.
Preliminary Investigations on Bivalves Bivalvia of the Dam Reservoir at Goczalkowice,
W77-07440 5C

KUCHERENKO, M. I.
Self-Purification in the Coastal Waters of the Black Sea, (In Russian),
W77-07592 5C

KUMAR, K. D.
The Effect of Food Concentration and Temperature on Respiration and Excretion in Herbivorous Zooplankton,
W77-07502 5C

KUME, J.
Major Aquifers in Deuel and Hamlin Counties, South Dakota,
W77-07483 4B

LACLAIRE, J. W.
Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

LADD, E. C.
An Industrial View of Biological Monitoring,
W77-07126 5A

LAIR, N.
Primary Production and Biomass of Algae Populations in an Oligotrophic Lake in the French Massif Central, (In French),
W77-07398 5C

LAIRD, A. D. K.
Physical Modeling of Combined Forced and Natural Convection in Wet Geothermal Formations,
W77-07303 4B

LAM, R. K.
A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska,
W77-07411 6G

LAMAYE, J. C.
Ecological Studies of the Brussels Urban Ecosystem: Contribution 8. First Survey of the Hydrobiology of the Woluwe Valley in Brussels, (In French),
W77-07292 5C

LAMMERS, W. T.
An Investigation of Colloidal Organic Particles Isolated from Different Populations of Bivalves,
W77-07498 5A

LAMPERT, W.
Experiments on the Resistance of Fish to Rapid Increase in Hydrostatic Pressure,
W77-07416 5C

LANDA, A.
A Survey of the Physical and Chemical Limnology of Lake Titicaca,
W77-07460 5C

LANDE, E.
Heavy Metal Pollution in Trondheimsfjorden, Norway, and the Recorded Effects on the Fauna and Flora,
W77-07194 5C

LANDERS, W. S.
Development of Eggs and Embryos of the Surf Clam, Spisula Solidissima, in Synthetic Seawater,
W77-07396 5C

LANDNER, L.
Sources of Nitrogen as a Water Pollutant: Industrial Waste Water,
W77-07521 5B

Water Quality Criteria and Waste Water Treatment,
W77-07522 5D

LAROW, E. J.
The Effect of Food Concentration and Temperature on Respiration and Excretion in Herbivorous Zooplankton,
W77-07502 5C

LARSEN, D. P.
Response to Eutrophic Shagawa Lake, Minnesota, U.S.A., to Point-Source, Phosphorus Reduction,
W77-07519 5C

LAUER, G. J.
Survival and Reproduction of Gammarus spp. (Amphipoda) Following Short-Term Exposure to Elevated Temperatures,
W77-07125 5C

LAURENT, L.
Aspects of the Life History of Tresus Nuttallii in Elkhorn Slough,
W77-07388 2L

LAWAND, T. A.
Brace Research Institute, Annual Report, (1976),
W77-07242 3A

LEATHEM, W.
The Distribution and Ecology of Common Marine and Estuarine Gastropods in the Delaware Bay Area,
W77-07185 5C

LEE, L. J.
Missouri River Power Curve Regression Equations,
W77-07152 2E

LEE, S. S.
Effect of DDT on Photosynthesis of Selenstrum Capricornutum,
W77-07444 5C

LEITH, R. M.
Streamflow Regionalization in British Columbia, No. 2, Regression of Mean Annual Flows on Physiographic Parameters,
W77-07434 2E

LENGQUIST, R.
Geothermal Power, The 'Sleeper' in the Energy Race,
W77-07296 3E

LETOLLE, R.
Application of Nitrogen-Isotope Studies to Hydrology and Hydrogeology--Analysis of the Peculiar Case of the Melarchez Basin (Seine-et-Marne, France) (Application de L'Etude Isotopique de L'Azote en Hydrologie et en Hydrogeologie--Analyse des Resultats Obtenus Sur un Exemple Precis: Le Bassin de Melarchez (Seine-et-Marne, France)),
W77-07154 5B

LEWIS, R. E.
Convective Heat Flow from Hot Springs in the Long Valley Caldera, Mono County, California,
W77-07488 2K

LI, R-M.
Solutions to Green-Ampt Infiltration Equation,
W77-07553 4A

LIGGETT, J. A.
Location of Free Surface in Porous Media,
W77-07162 2F

LIKENS, G. E.
An Organic Carbon Budget for an Oligotrophic Lake In New Hampshire, U.S.A.,
W77-07470 5C

Post-Glacial History of Mirror Lake and Its Watershed In New Hampshire, U.S.A.: An Initial Report,
W77-07472 5C

LIKHTAREV, I. A.
Mathematical Models of Strontium-90 Behavior in 'Water-Fresh Water Fish Spawn' System for Particular Cases of Radioactive Contamination of Reservoirs, (In Russian),
W77-07539 5C

LIM, R. P.
Population Changes in the Aquatic Fauna Inhabiting the Bladderwort, Utricularia Flexuosa Vahl., in a Tropical Swamp, Tasek Bera, Malaysia,
W77-07465 5C

LINDBERG, A.
Calculation of Calcium Carbonate-Carbon Dioxide Equilibrium in Water and Mixtures of Water,
W77-07513 5A

LISANTI, A. F.
Ultrafiltration Oil Reclamation Process,
W77-07212 5D

LIVINGSTON, D. L.
Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

LOWHAM, H. W.
Techniques for Estimating Flow Characteristics of Wyoming Streams,
W77-07495 4A

LOWRY, L. F.
Trophic Relationships Among Ice Inhabiting Phocid Seals,
W77-07407 6G

LUNDBERG, A. W.
Electric Power Generation from Geothermal Hot Water Deposits,
W77-07300 8C

MAANUM, W.
Transports in Lake Superior,
W77-07176 5B

MACHEMEHL, J. L.
Use of Aerial Remote Sensors to Monitor Dredging Projects,
W77-07344 8D

MACKENZIE, C. L. JR.
Use of Quicklime to Increase Oyster Seed Production,
W77-07122 5C

MAEDA, B. T.
The Structure of Phytoplankton Associations in Lake Tahoe (California-Nevada),
W77-07473 5C

MAEVSKY, A.
Ground-Water Levels in Massachusetts, 1936-74,
W77-07485 4B

MAGOMEDOV, S. K.
Alteration in the Toxicity of Tissue Lipids with the Adaptation of Fishes to Osmotic Pressure Changes in the Environment,
W77-07120 5C

MAHMOOD, K.
Mathematical Modeling of Sedimentation Transients in Sand-Bed Channels,
W77-07354 2J

MAJOR, T. J.
Water-Level Records for the Northern High Plains of Colorado, 1973-77,
W77-07486 4B

MAKI, A. W.
Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

MALINOVSKAYA, L. A.
Effect of Organic Acids on Experimental Manganese Isolation from Bottom Sediments, (In Russian),
W77-07597 5B

MALINOVSKII, V. I.
Study of the State of Water on the Surface of H+, NA+, MG2+ Saturated Kaolinite by the NMR Method, (In Russian),
W77-07241 2G

MALLORY, C. W.
Concepts for the Reclamation of Dredged Material,
W77-07352 8D

MALUEG, K. W.
Response to Eutrophic Shagawa Lake, Minnesota, U.S.A., to Point-Source, Phosphorus Reduction,
W77-07519 5C

MANNY, B. A.
Annual Contribution of Carbon, Nitrogen and Phosphorus by Migrant Canada Geese to a Hardwater Lake,
W77-07505 5C

MANTILACCI, L.
First Information About N, P Nutrients and the Production of Lake Trasimeno, (In Italian),
W77-07593 5C

MARCELLO, R. A. JR.
Gas Bubble Disease Mortality of Atlantic Menhaden at Pilgrim Nuclear Power Station, April, 1975,
W77-07429 5C

MARINER, R. H.
Geochemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07489 2K

MARINESCU, R.
Reducing Power Consumption in Irrigation Systems with the Aid of a Mathematical Model for Pipe Dimensioning,
W77-07547 3F

MARIOTTI, A.
Application of Nitrogen-Isotope Studies to Hydrology and Hydrogeology--Analysis of the Peculiar Case of the Melarchez Basin (Seine-et-Marne, France) (Application de L'Etude Isotopique de L'Azote en Hydrologie et en Hydrogeologie--Analyse des Resultats Obtenus Sur un Exemple Precis: Le Bassin de Melarchez (Seine-et-Marne, France)),
W77-07154 5B

MARKO, J. R.
Rectilinear Leads and Internal Motions in the Ice Pack of the Western Arctic Ocean,
W77-07373 2C

MARQUESS, L. W.
The Federal Water Pollution Control Act Amendments of 1972 as Applied to the Surface Mine in West Virginia - Pollutant Discharge Permit Requirements,
W77-07240 5G

MASHNEVA, N. I.
Mathematical Models of Strontium-90 Behavior in 'Water-Fresh Water Fish Spawn' System for Particular Cases of Radioactive Contamination of Reservoirs, (In Russian),
W77-07539 5C

MASSO, J. M.
Bacteriologic Analysis in the Arosa, Vigo and Pontevedra Estuaries, (In Spanish),
W77-07589 5A

MATALAS, N. C.
Apparent Regional Skew,
W77-07484 2E

MATTHESS, G.
Effects of Man's Activities on Groundwater Quality,
W77-07359 5B

MATVIENKO, I. N.
The Distribution of Residual Quantities of DDT in the Organs and Tissues of Fish of the Kiev Reservoir, (In Russian),
W77-07572 5B

MAURER, D.
The Distribution and Ecology of Common Marine and Estuarine Gastropods in the Delaware Bay Area,
W77-07185 5C

MAYO, D. W.
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

MCCOY, D. S.
Salvops-Hopper Dredge 'A. Mackenzie',
W77-07343 8D

MCDONALD, R. C.
Application of Vascular Aquatic Plants for Pollution Removal, Energy and Food Production in a Biological System,
W77-07474 5D

MCLELLON, W. M.
Nonpoint Source Effects on Water Quality,
W77-07173 5B

MECCIA, R. M.
Concepts for the Reclamation of Dredged Material,
W77-07352 8D

Dredged Material Disposal Effects and Alternatives,
W77-07345 8D

MEGARD, R. O.
Wind Control of Algae Growth in Eutrophic Lakes,
W77-07497 5G

MELNYK, P. B.
An Ozone Reactor for Color Removal from Pulp Bleachery Wastes,
W77-07216 5D

MERRITT, J.
Consumptive Use of Ground Water,
W77-07257 6E

MILES, D. L.
Environmental Dependence of Manganese and Zinc in the Scales of Atlantic Salmon, Salmo Salar (L) and Brown Trout, Salmo Trutta (L),
W77-07203 5C

MILLERIOUX, G.
A Comparison of Spectrophotometric Methods for the Determination of Phytoplankton Pigments, (In French),
W77-07581 5A

MIRONOV, O. G.
Self-Purification in the Coastal Waters of the Black Sea, (In Russian),
W77-07592 5C

MITCHELL, J. K.
Water Quality and Aquitard Permeability,
W77-07551 5G

MIYAZAKI, Y.
Electrolytic Treatment of Chromate and Cyanide Wastes with Packed Bipolar Cell, (In Japanese),
W77-07211 5D

MOISEEC, A. A.
Mathematical Models of Strontium-90 Behavior in 'Water-Fresh Water Fish Spawn' System for Particular Cases of Radioactive Contamination of Reservoirs, (In Russian),
W77-07539 5C

MONGELLI, F.
Thermal and Isotopic Studies on the Crater Lakes of Monticchio (Lucania, Italy), (In Italian),
W77-07392 2H

MONTGOMERY, J. C.
Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

MONTGOMERY, J. E.
Control of Agricultural Water Pollution: A Continuing Regulatory Dilema,
W77-07233 5G

MOON, R. E.
Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

MORARD, P.
Effect of the Presence of Sodium Chloride in the Medium on Growth, Development and Distribution of Chlorine and Sodium in Sorghum Dochna F., (In French),
W77-07291 3C

MOREIRA, E. C.
Bacteriological Quality of Poultry-Farms' Water in Minas Gerais State, Brazil: 1973, (In Portugese),
W77-07594 5F

MORIIZUMI, S.
Relation Between the Amounts of Fertilization and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: 1. On the Relation Between the Amount of Fertilizer Application and the Specific Pollution Loads of Nitrogen and Phosphorus in Main Streams Flowing into Lake Nishiura, (In Japanese),
W77-07568 5B

Relation Between the Amounts of Fertilizer and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: II. On the Relation Between Livestock Waste Per Unit Area of Basin and the Specific Load of Pollutants in Main Streams Flowing into Nishiura Lake Basin, (In Japanese),
W77-07569 5B

MOYLE, P. B.
Some Effects of Channelization on the Fishes and Invertebrates of Rush Creek, Modoc County, California,
W77-07109 5C

MUCKLESTON, K. W.
The Evolution of Approaches to Flood Damage Reduction,
W77-07248 6F

MURAOKA, M.
The Changes in Inorganic Nitrogen Concentration of Drinking Water from Wells Over a Two Year Period in Ani-Machi, Ibaraki Prefecture, (In Japanese),
W77-07570 5B

MURAYAMA, H.
PCB Contents in the Muscle of Marine Animals Collected in the Sea near Hakodate (In Japanese),
W77-07315 5C

MURTHY, K. V. R.
Qualitative and Quantitative Studies on the Meiofauna of a Tropical Fresh Water Stream Subject to Tidal Influence, (In Italian),
W77-07390 5C

NABIVANETS, B. I.
Effect of Organic Acids on Experimental Manganese Isolation from Bottom Sediments, (In Russian),
W77-07597 5B

NAGAI, K.
The Changes in Inorganic Nitrogen Concentration of Drinking Water from Wells Over a Two Year Period in Ani-Machi, Ibaraki Prefecture, (In Japanese),
W77-07570 5B

NAKHSHINA, E. P.
Effect of Organic Acids on Experimental Manganese Isolation from Bottom Sediments, (In Russian),
W77-07597 5B

NANJAPPA, G.
Suction Head at Wet Front in Unsaturated-Flow Problems--A New Definition,
W77-07144 2G

NAPIER, S. JR.
Survival of Mayfly Larvae Under Mine Acid Conditions,
W77-07128 5C

NEBEKER, A. V.
Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

NEGILSKI, D. S.
Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

NEITZEL, D. A.
Surber Sampling in Deep Water for Bottom Organisms,
W77-07199 7B

NELSON, D. M.
Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

NELSON, P.
Inorganic Contaminants in Rural Drinking Waters,
W77-07372 5A

NETZER, A.
An Ozone Reactor for Color Removal from Pulp Bleachery Wastes,
W77-07216 5D

NEUHOFF, H.-G.
Effects of Combination of Temperature and Hydrostatic Pressure on Asterias rubens,
W77-07308 5C

NEWMAN, B. A.
Management Model for Ground Water Development,
W77-07529 4B

NG, K. S.
Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W77-07217 5D

NOGUCHI, T.
Occurrence of Toxic Bivalves in Association with the Bloom of Gonyaulax sp. in Owase Bay,
W77-07119 5C

NOLAN, J. J. JR.
Property-Coastal Shores-Private Property Rights Upheld over Claimed Public Right to Recreational use of Beach-Implied Dedication, Easement by Prescription, Public Trust Through Custom and Grant, and Doctrine of Submergence not Applicable. Department of Natural Resources V. Mayor and Council of Ocean City, 274 Md. 1, 332 A.2d 630 (1975).
W77-07239 6E

NORDLIE, F. G.
Lake Izabal, Guatemala,
W77-07504 5C

NORTON, W. R.
A Nitrogen Gas (N2) Model for the Lower Columbia River, Final Report,
W77-07422 5B

NYBAKKEN, J.
Aspects of the Life History of Tresus Nuttallii in Elkhorn Slough,
W77-07388 2L

O'BRIEN, R. T.
Enterovirus and Bacteriophage Inactivation in Subsurface Waters and Translocation in Soil,
W77-07283 5B

O'BRYAN, G. K.
Aspects of Reservoir-Power Station Interactions: Some Effects of Heat on Physico-Chemistry, Aufwuchs Ecology and Plankton Metabolism,
W77-07102 5C

O'CONNOR, J. M.
The Responses of Some Estuarine Organisms to Suspended Solids,
W77-07353 8D

O'GRADY, K. T.
Environmental Dependence of Manganese and Zinc in the Scales of Atlantic Salmon, Salmo Salar (L) and Brown Trout, Salmo Trutta (L),
W77-07203 5C

O'NEIL, J. R.
Chemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07487 2K

ODA, K.
Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

OERTEL, G. F.
Wassaw Island Erosion Study. Part 1: Sedimentary Framework of a Channel Margin Shoal of an Ebb Delta, Wassaw Sound, Georgia,
W77-07324 2L

OGAWA, T.
The Influence of Underwater Explosion on Fish, (In Japanese),
W77-07316 8H

OGUSS, E.
Limitations of Single Water Samples in Representing Mean Water Quality 1. Thompson River at Shaw Spring, British Columbia,
W77-07563 5A

OIDA, M.
The Changes in Inorganic Nitrogen Concentration of Drinking Water from Wells Over a Two Year Period in Ani-Machi, Ibaraki Prefecture, (In Japanese),
W77-07570 5B

OLDEN, L.
Macrophytes and Phosphorus in Lake Andsjon, Central Sweden, (In Swedish),
W77-07582 5C

ORTIZ, N. V.
Hydraulic Jumps and Waves at Abrupt Drops,
W77-07163 8B

OSAKI, K.
Relation Between the Amounts of Fertilizer and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: II. On the Relation Between Livestock Waste Per Unit Area of Basin and the Specific Load of Pollutants in Main Streams Flowing into Nishiura Lake Basin, (In Japanese),
W77-07569 5B

OUTCALT, S.
Modeling the Annual Thermal Evolution of Mid-Latitude Lakes,
W77-07462 2H

OZISIK, M. N.
Far Field Circulation Velocities in Shallow Lakes,
W77-07164 2H

PAKHOV, G. M.
The Effect of the Use of Pesticides and Fertilizers in the Water Protection Zone with Sources of Artificial Replenishment of Underground Water Reserves, (In Russian),
W77-07107 5B

PANAGIOTAKOPOULOS, D.
Network Approach to Optimal Wastewater Treatment System Design,
W77-07531 5D

PANCHENKO, S. E.
The Effect of Collector Discharge Water from Rice Fields on the Zooplankton of Some Kuban Estuaries, (In Russian),
W77-07331 5C

PANICHI, C.
Thermal and Isotopic Studies on the Crater Lakes of Monticchio (Lucania, Italy), (In Italian),
W77-07392 2H

PANIKAR, J. T.
Suction Head at Wet Front in Unsaturated-Flow Problems--A New Definition,
W77-07144 2G

PARK, Y. J.
A Study of Environment Sanitation on the Wells in Jungneung-Dong Area, Seoul, (In Korean),
W77-07475 5B

PATERSON, W. S. B.
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

PATRICK, W. H. JR.
Nutrient Transformations in Louisiana Salt Marsh Soils,
W77-07319 5C

PATT, R. O.
Nitrogen Contamination Sources in Shallow Ground Water, Las Vegas Area, Nevada,
W77-07141 5B

PAUL, M. L.
Predictability of Effects of a Severe Local Storm in Pennsylvania,
W77-07369 2B

PAYERAS CIFRE, B.
Study of Bacterial Contamination in the Port Mahon Harbor: Effect of Ecological Conditions of the Harbor, (In Spanish),
W77-07588 5A

PEREVOZCHENKO, I. I.
Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

PETER, S.
Phenol-Selective, Highly Resistant Ro-Membranes Made from PVA for the Purification of Toxic Industrial Wastes,
W77-07206 5D

PETROCELLI, S. R.
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

PETROV, R. V.
The Effect of the Use of Pesticides and Fertilizers in the Water Protection Zone with Sources of Artificial Replenishment of Underground Water Reserves, (In Russian),
W77-07107 5B

PETROV, Y. M.
Role of Mussels Mytilus edulis in Removal of Petroleum Products from Seawater (Under Experimental Conditions),
W77-07116 5C

PETROVA, M. A.
Planktonic Infusoria in Two Lakes of the Gorki Oblast, (In Russian),
W77-07234 5C

PILLSBURY, R. D.
Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

PINE, R.
Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

PINLESS, S. J.
The Response of an Estuary to the Closure of a Mobile Barrier; Richmond Barrier on the Upper Thames Estuary,
W77-07366 2L

PITCHER, K.
Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

PITCHER, K. W.
Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

PLUHOWSKI, E. J.
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-07549 2H

POLISHCHUK, L. R.
The Distribution of Residual Quantities of DDT in the Organs and Tissues of Fish of the Kiev Reservoir, (In Russian),
W77-07572 5B

PONAT, A.
Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

PONCE, V. M.
Mathematical Modeling of Sedimentation Transients in Sand-Bed Channels,
W77-07354 2J

POSTON, H. A.
Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

POTTER, I. C.
Oxygen Consumption, Ventilatory Frequency and Heart Rate of Lampreys (Lampetra Fluviatilis) During Their Spawning Run,
W77-07399 5C

PRAKASH, A.
Convective-Dispersion in Perennial Streams,
W77-07160 5B

PRASAD, T.
Imperatives of Water Resources Planning in the Developing Economy of India,
W77-07555 6A

PRESLEY, B. J.
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

PRICE, M.
Specific Yield Determinations from a Consolidated Sandstone Aquifer,
W77-07153 2F

PRIEUR, D.
Study of Bacteria Associated with the Rearing of Larvae of Marine Bivalves, (In French),
W77-07599 5C

PROSKURINA, E. S.
The Effect of Collector Discharge Water from Rice Fields on the Zooplankton of Some Kuban Estuaries, (In Russian),
W77-07331 5C

PROVINI, A.
Sediment Respiration in Six Italian Lakes in Different Trophic Conditions,
W77-07461 5C

QUAN, E.
Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

RAGAN, R. M.
Test of Landsat-Based Urban Hydrologic Modeling,
W77-07528 6A

Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

RAI, H.
Pigment Cycle in a North German Lake,
W77-07459 5C

RAJARATNAM, N.
Free Flow Immediately Below Sluice Gates,
W77-07161 8B

Hydraulic Jumps and Waves at Abrupt Drops,
W77-07163 8B

RALSTON, E.
Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

RANDALL, J.
Calcium Carbonate in the Revomal of Iron and Lead from Dilute Waste Water,
W77-07208 5D

RAO, K. V.
Qualitative and Quantitative Studies on the Meiofauna of a Tropical Fresh Water Stream Subject to Tidal Influence, (In Italian),
W77-07390 5C

RAO, S. S.
Observations on Bacteriological Conditions in the Upper Great Lakes 1968-1974,
W77-07340 5A

RAPP, J. B.
Chemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07487 2K

RAUTSKIS, E. Y.
Comparative Characteristics of the Parasite Fauna of Bream in Lakes Dusios, Obelijos, Salvantu and Galstas, Which Have Different Thermal Regimes, (In Russian),
W77-07312 2H

RAYMOND, H. L.
Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

REE, W. O.
Manning N and the Overland Flow Equation,
W77-07371 2E

REFSGAARD, J. C.
Economic Value of Low Flow Data,
W77-07537 5D

RESICO, C. H. JR.
Life History Patterns in the Coastal Shiner, Notropis Petersoni, Fowler,
W77-07386 5C

REVELLE, C. S.
Gains from Joint Operation of Multiple Reservoir Systems,
W77-07533 4A

RHEINHEIMER, G.
Influence of an Ozonisation Plant on the Bacterial Content in Water of a Demonstration Aquarium,
W77-07311 5C

RICHARDSON, J. L.
Algal Productivity of Natural and Artificially Enriched Fresh Waters in Malaya,
W77-07471 5C

RICHERSON, P. J.
The Structure of Phytoplankton Associations in Lake Tahoe (California-Nevada),
W77-07473 5C

A Survey of the Biological Limnology of Lake Titicaca,
W77-07503 5C

A Survey of the Physical and Chemical Limnology of Lake Titicaca,
W77-07460 5C

RINALDI, S.
Reservoir Operation Under Conflicting Objectives,
W77-07536 4A

RITTER, J. R.
Reconnaissance of Sediment Transport and Channel Morphology in the Lower Rio Bermejo Basin, Argentina--With a Section on Reconnaissance of the Lower Rio Pilcomayo Basin, Argentina and Paraguay,
W77-07490 2J

ROBE, K.
Inline Sensor Tightens Control on Sludge Consistency to Within 1.4-1.5% Solids,
W77-07214 5D

RODERICK, G. L.
Leaching Characteristics of Polluted Dredgings,
W77-07158 5B

RODIER, J. A.
Utilization of the Results from Representative and Experimental Basins with a View to the Management of Water Resources,
W77-07355 4A

ROESNER, L. A.
A Nitrogen Gas (N2) Model for the Lower Columbia River, Final Report,
W77-07422 5B

ROGOWSKI, A. S.
Predictability of Effects of a Severe Local Storm in Pennsylvania,
W77-07369 2B

ROMESBURG, H. C.
Scheduling Models for Wilderness Recreation.
W77-07541 6B

ROSAS, I.
Aquatic Organism Contamination by Mercury Residues in the Coatzacoalcos River Estuary, Mexico,
W77-07394 5C

ROSEMARIN, A. S.
Comparison of Primary Productivity (14C) per Unit Biomass Between Phytoplankton and Periphyton in the Ottawa River Near Ottawa, Canada,
W77-07454 5C

ROSENBERG, D. M.
Experimental Sediment Addition Studies on the Harris River, N.W.T., Canada: The Effect on Macroinvertebrate Drift,
W77-07455 5C

Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

ROSS, S. A.
The Evaluation of Simple and Optimal Decision Rules with Misspecified Welfare Functions,
W77-07439 6B

ROSSMAN, L. A.
Reliability-Constrained Dynamic Programing and Randomized Release Rules in Reservoir Management,
W77-07535 4A

ROWNTREE, P. R.
The Effect of Soil Moisture on Circulation and Rainfall in a Tropical Model,
W77-07166 2B

RUCHTI, J.
Dynamics of O2 and CO2 Exchange, Photosynthesis, and Respiration in Rivers from Time-Delayed Correlations with Ideal Sunlight,
W77-07364 5C

RULIFSON, R.
Supersaturation of Total Dissolved Gases: A Review of Current Literature,
W77-07425 5C

RUSHTON, K. R.
Analysis of Flow Against Dispersion in Porous Media,
W77-07150 2F

RUTTNER-KOLISKO, A.
The Vertical Distribution of Plankton Rotifers in a Small Alpine Lake with a Sharp Oxygen Depletion (Lunzer Obersee),
W77-07456 5C

RYABCHENKO, V. A.
Use of Cation Polyelectrolytes for Water Purification from Viruses, (In Russian),
W77-07108 5F

SADYKOV, K.
Phytomicrobenthos of the Kurtli Reservoir, (In Russian),
W77-07596 5C

SAETHER, O. A.
Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

SAKAGUCHI, S.
The Influence of Underwater Explosion on Fish, (In Japanese),
W77-07316 8H

SALEM, A. M.
Permeability and Drainage Characteristics of Dredgings,
W77-07351 8D

SANDHU, S. S.
Inorganic Contaminants in Rural Drinking Waters,
W77-07372 5A

SANDNES, G.
Swim Bladder Gas Pressure of Cod in Relation to Hydrostatic Pressure,
W77-07417 5C

SAPKAREV, J. A.
Composition and Dynamics of the Bottom Animals in the Littoral Zone of Dojran Lake, Macedonia,
W77-07457 5C

SAPPO, G. B.
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

SARMA, A. L. N.
Qualitative and Quantitative Studies on the Meiofauna of a Tropical Fresh Water Stream Subject to Tidal Influence, (In Italian),
W77-07390 5C

SCHAUMANN, K.
Studies on Fungal Propagules in the Weser Estuary (German Bight): I. Quantitative Data 1974, (In German),
W77-07583 5C

SCHLESNER, H.
Influence of an Ozonisation Plant on the Bacterial Content in Water of a Demonstration Aquarium,
W77-07311 5C

SCHNEIDER, J. R.
Regional Study of the Upper Basin of the AAR from its Sources to Bern: Profile of Floods of a Given Return Period at any Point on the River (Etude Regionale du Bassin Superieur de L'Aar de ses Sources Jusqu'a Berne: Profile des Crues de Periode Donnee le Long du Cours d'eau).
W77-07358 2E

SCHNEIDER, M. J.
Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

SCHOFIELD, E.
Responses of the Lichens Peltigera aphthosa and Cetraria nivalis and the Alga Nostoc commune to Sulfur Dioxide, Natural Gas, and Crude Oil in Arctic Alaska,
W77-07197 5C

SCHRAMM, G.
Accounting for Non-Economic Goals in Benefit-Cost Analysis,
W77-07543 6B

SCHROCK, V. E.
Physical Modeling of Combined Forced and Natural Convection in Wet Geothermal Formations,
W77-07303 4B

SCHROEDER, W. W.
Physical Environment Atlas of Coastal Alabama,
W77-07322 2L

SCHULTS, D. W.
Response to Eutrophic Shagawa Lake, Minnesota, U.S.A., to Point-Source, Phosphorus Reduction,
W77-07519 5C

SCHURR, J. M.
Dynamics of O2 and CO2 Exchange, Photosynthesis, and Respiration in Rivers from Time-Delayed Correlations with Ideal Sunlight,
W77-07364 5C

SCHWILLE, F.
Anthropogenically Reduced Groundwaters,
W77-07360 5B

SCOTT, M.
Effects of Pressure on Survival of Six Species of Fish,
W77-07424 5C

SCOTT, M. W.
Bibliography and Index of North Dakota Water Resources 1878-1970,
W77-07140 10C

SEDGWICK, R.
A Natural Pollution Experiment: The Effects of a Sewage Strike on the Fauna of the Thames Estuary,
W77-07124 5C

SELTZ, J.
The Dune Book. How to Plant Grasses for Dune Stabilization,
W77-07326 2J

SENECA, E. D.
Dune Stabilization with Panicum amarum Along the North Carolina Coast,
W77-07327 2L

SEWELL, W. R. D.
Broadening the Approach to Evaluation in Resources Management Decision-Making,
W77-07545 6B

SHAPIRO, J.
Synergistic Effects of Phosphate and Manganese on Growth of Lake Superior Algae,
W77-07448 5C

SHAPIRO, L. H.
The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

SHAPIRO, Y. E.
Study of the State of Water on the Surface of H+, NA+, MG2+ Saturated Kaolinite by the NMR Method, (In Russian),
W77-07241 2G

SHARAF EL DIN, S. H.
Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

SHAVER, R. L.
Diphenamid Removal from Water and Metabolism by Aquatic Plants,
W77-07193 5C

SHERK, J. A.
The Responses of Some Estuarine Organisms to Suspended Solids,
W77-07353 8D

SHIN, K. J.
A Study of Environment Sanitation on the Wells in Jungneung-Dong Area, Seoul, (In Korean),
W77-07475 5B

SHIRAKI, T.
The Larval Spirurid Nematodes of Fresh-Water Crustaceans: I. The Identification and the Examination of Their Pathogenicity,
W77-07458 5C

SILBERMAN, E.
Public Participation in Water Resource Development,
W77-07526 6B

SILLS, J. B.
Residues of 3-trifluoromethyl-4-nitrophenol (TFM) Undetected in Lake Trout and Chinook Salmon from the Upper Great Lakes,
W77-07187 5A

SIMONS, D. B.
Solutions to Green-Ampt Infiltration Equation,
W77-07553 4A

SIMS, R.
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

SKAGGS, R. W.
Saturated and Unsaturated Flow to Parallel Drains,
W77-07552 4A

SKOCYPEC, R. J.
The 1973 IMCO Convention: Tightening the Controls on Operational Oil Pollution from Tankers,
W77-07244 5G

SKOGLUND, T.
Wind Control of Algae Growth in Eutrophic Lakes,
W77-07497 5G

SLACK, J. R.
Apparent Regional Skew,
W77-07484 2E

SLATER, F. M.
Observations on a Peat Bog's Ability to Withstand Increasing Public Pressure,
W77-07139 5C

SLOSS, J. M.
Solution of Equation for Two-Dimensional Infiltration Problems,
W77-07142 2G

SMIRNOVA, T. P.
Planktonic Infusoria in Two Lakes of the Gorki Oblast, (In Russian),
W77-07234 5C

SMITH, H. A. JR.
Spillway Redesign Abates Gas Supersaturation in Columbia River,
W77-07432 5G

SMITH, L. S.
Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

SNIEDOVICH, M.
Evaluation of Flood Forecasting-Response Systems,
W77-07524 4A

SNOW, N. B.
Aspects of Zoobenthos Ecology of the Mackenzie Delta, N.W.T.,
W77-07499 5C

SOHN, F. W.
Studies on Virus Inactivation by Chlorine During Water Disinfection, (In German),
W77-07595 5F

SOMA, S.
PCB Contents in the Muscle of Marine Animals Collected in the Sea near Hakodate (In Japanese),
W77-07315 5C

SONG, C. C. S.
Stochastic Properties of Daily Temperature in Rivers,
W77-07159 5B

SOREY, M. L.
Convective Heat Flow from Hot Springs in the Long Valley Caldera, Mono County, California,
W77-07488 2K

STAUFFER, J. R.
Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

STEFAN, H.
Wind Control of Algae Growth in Eutrophic Lakes,
W77-07497 5G

STEFAN, R.
Phenol-Selective, Highly Resistant Ro-Membranes Made from PVA for the Purification of Toxic Industrial Wastes,
W77-07206 5D

STEVENS, D. G.
Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

STEVENS, F.
Fifty Million Dollars Is a Lot of Fish,
W77-07219 5D

STEVENS, M. A.
Solutions to Green-Ampt Infiltration Equation,
W77-07553 4A

STEWART, K. M.
Meromixis in Ulmener Maar (Germany).
W77-07520 5C

STOCKNER, J. G.
Predicting the Impacts of Phosphorus Management Policies on the Eutrophication of Skaha Lake, British Columbia, Canada,
W77-07446 5C

STRATEVA, A.
Experimental Substantiation of Maximum Permissible Propachlor (Ramrod) Concentrations in Water, (In Russian),
W77-07133 5A

STROGANOV, N. S.
Evaluation of Toxicity to the Early Ontogeny of Fishes of Substances Discharged into a Body of Water,
W77-07191 5C

STRUHSAKER, J. W.
Effects of Benzene (A Toxic Component of Petroleum) on Spawning Pacific Herring, Clupea harengus pallasi,
W77-07137 5C

Uptake, Distribution, and Depuration of 14C-Benzene in Northern Anchovy, Engraulis mordax, and Striped Bass, Morone Saxatilis,
W77-07202 5C

SUKAL'SKAYA, S. Y.
Mathematical Models of Strontium-90 Behavior in 'Water-Fresh Water Fish Spawn' System for Particular Cases of Radioactive Contamination of Reservoirs, (In Russian),
W77-07539 5C

SUNDA, W.
The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

SUNG, B. O.
Effect of Silt and Salinity on the Mortality of Meretrix Lusoria (Roeding), (In Korean),
W77-07428 5C

SUZUKI, M.
Occurrence and Determination of a Herbicide Benthiocarb in Rivers and Agricultural Drainages,
W77-07361 5A

SWAMY, C. G.
Qualitative and Quantitative Studies on the Meiofauna of a Tropical Fresh Water Stream Subject to Tidal Influence, (In Italian),
W77-07390 5C

SYDOR, M.
Transports in Lake Superior,
W77-07176 5B

TABARU, Y.
Outbreak of Chironomid Midge in a Polluted River and the Chemical Control of the Larvae, (In Japanese),
W77-07585 5G

TAKAGI, M.
PCB Contents in the Muscle of Marine Animals Collected in the Sea near Hakodate (In Japanese),
W77-07315 5C

TAKASE, N.
Design Criteria for Hydrologic Extremes,
W77-07165 8B

TANG, Y-K.
Saturated and Unsaturated Flow to Parallel Drains,
W77-07552 4A

TARKHOVA, E. P.
Self-Purification in the Coastal Waters of the Black Sea, (In Russian),
W77-07592 5C

TEIXEIRA, E. N.
Bacteriological and Colimetric Examination of the Water Supplied to the Slaughterhouses Situated Near Salvador, Bahia, Brazil, (In Portugese),
W77-07587 5A

TEMOIN, P.
Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W77-07217 5D

TENNANT, A. B.
Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

TENNANT, D. L.
Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources,
W77-07192 5C

TENNANT, R. H.
A Hand-Operated In Situ Water Sampler,
W77-07200 5A

THEEDE, H.
Effects of Combination of Temperature and Hydrostatic Pressure on Asterias rubens,
W77-07308 5C

THOFELT, L.
Macrophytes and Phosphorus in Lake Andsjon, Central Sweden, (In Swedish),
W77-07582 5C

THOMAS, J. C.
How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

THOMAS, K. G.
Waste Water Reclamation System Ups Productivity, Cuts Water Use,
W77-07210 5D

THOMAS, M. P.
Seasonal Changes of Invertebrate Populations in the Polluted River Medlock,
W77-07121 5C

THOMSON, K. P. B.
Sub-Thermocline Biomass Concentration Detected by Transmissometer in Lake Superior,
W77-07447 5C

THOMSON, R. E.
Rectilinear Leads and Internal Motions in the Ice Pack of the Western Arctic Ocean,
W77-07373 2C

TIBERI, O.
First Information About N, P Nutrients and the Production of Lake Trasimeno, (In Italian),
W77-07593 5C

TOKUDA, H.
Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms-II. Lethal Concentrations of Oil-Spill Emulsifier Components for Marine Phytoplankton, (In Japanese),
W77-07182 5C

TONGIORGI, E.
Thermal and Isotopic Studies on the Crater Lakes of Monticchio (Lucania, Italy), (In Italian),
W77-07392 2H

TOP, Z.
Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

TORGERSEN, T.
A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

TOXOPEUS, R.
Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

TRAIN, R. E.
Looking Ahead (Federal Water Pollution Control Act of 1972).
W77-07235 6E

TROJNAR, J. R.
Egg and Larval Survival of White Suckers (Catostomus Commersoni) at Low pH,
W77-07184 5C

TSAPKO, V. V.
The Effect of the Use of Pesticides and Fertilizers in the Water Protection Zone with Sources of Artificial Replenishment of Underground Water Reserves, (In Russian),
W77-07107 5B

TSEEB, Y. Y.
A Bibliography of Soviet Literature on Freshwater Hydrobiology and Related Problems for 1975: Part 21, (In Russian),
W77-07402 5C

TUCKER, L. R.
The Environmentally Concerned Citizen: Some Correlates,
W77-07438 6G

TURNER, E. C. JR.
The Differential Use of Chironomidae and Ceratopogonidae (Diptera) in the Monitoring of Various Aquatic Wastes,
W77-07282 5A

TYSON, P. D.
Estimating Above and Below Normal Rainfall Periods Over South Africa, 1972-2000,
W77-07170 2B

UMEYAWA, S.
The Influence of Underwater Explosion on Fish, (In Japanese),
W77-07316 8H

UNO, G.
Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

UNZ, M.
Cathodic Projection of Borehole Casing,
W77-07297 8G

UTTON, A. E.
Some Suggestions for the Management of International River Basins,
W77-07250 6E

UYSAL, H.
Accumulation and Distribution of Trace Metals and Radionuclides in Marine Organisms (Particularly Tapes Decussatus L.) in the Izmir Bay Area, Turkey,
W77-07395 5C

UZZELL, J. C. JR.
Far Field Circulation Velocities in Shallow Lakes,
W77-07164 2H

VALADARES TAVARES, L.
A Reconsideration and a Generalization of Lawrance and Fiering Two-Station Models,
W77-07157 2E

VALLERO, P.
Two New Methods of Sludge Removal,
W77-07224 5D

VAN BUURT, G.
Influence of Light and Temperature on the Photosynthetic Rate of Marine Benthic Diatoms,
W77-07385 5C

VANBAALEN, C.
Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

VANDENBERG, A.
Type Curves for Analysis of Pump Tests in Leaky Strip Aquifers,
W77-07145 2F

VANDERPOST, J. M.
A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

VANDEWINT, J.
Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

VANYURIKHINA, L. N.
The Effect of the Use of Pesticides and Fertilizers in the Water Protection Zone with Sources of Artificial Replenishment of Underground Water Reserves, (In Russian),
W77-07107 5B

VAUGHT, K. D.
Water-Level Records for the Northern High Plains of Colorado, 1973-77,
W77-07486 4B

VEITSER, YU I.
Use of Cation Polyelectrolytes for Water Purification from Viruses, (In Russian),
W77-07108 5F

VENTZ, D.
Studies on the Typology of Baltic Lakes with Different States of Eutrophication, (In German),
W77-07576 5B

VERDUIN, J.
Photosynthetic Rates in Lake Superior,
W77-07450 5C

VIANA, F.
Bacteriological Quality of Poultry-Farms' Water in Minas Gerais State, Brazil: 1973, (In Portugese),
W77-07594 5F

VICK, H. R.
Maintenance Dredging in the New Orleans District, US Army Corps of Engineers,
W77-07347 8D

VILLECOURT, P.
Deposition of Mineral Nitrogen by Rain in the Lamto Savanna, (In French),
W77-07574 5B

VILLENEUVE, J. P.
Similarities and Differences in the Chemical Composition of Waters from West, Central, and East Africa,
W77-07510 5A

VILLER, J.-F.
Assay of Detergent Residues in Fresh Water, Sea Water and Waste Waters: Method of Extraction and Concentration of Surfactants by Adsorption on Liquid-Liquid Interface, (In French),
W77-07591 5A

VINDASIUS, D.
Public Participation Techniques and Methodologies: A resume,
W77-07332 6B

VISSER, S. A.
Similarities and Differences in the Chemical Composition of Waters from West, Central, and East Africa,
W77-07510 5A

VOGEL, J. L.
Maximum 5-Minute and Hourly Rainfalls on Metromex Network, 1971-1975,
W77-07374 2B

VORONIN, A. D.
Study of the State of Water on the Surface of H+, NA+, MG2+ Saturated Kaolinite by the NMR Method, (In Russian),
W77-07241 2G

VOYKO, Y. V.
Role of Mussels Mytilus edulis in Removal of Petroleum Products from Seawater (Under Experimental Conditions),
W77-07116 5C

WAGNER, G.
Models for Simulation of Eutrophication of Lakes for Lake Constance (Bodensee-Obersee): I. Data from Lake Constance used in Simulation Models, (In German),
W77-07579 5C

WAHLGREN, M. A.
Plutonium in the Laurentian Great Lakes: Comparison of Surface Waters,
W77-07449 5C

WAISS, A. JR.
Calcium Carbonate in the Revomal of Iron and Lead from Dilute Waste Water,
W77-07208 5D

WALKER, J.
The Effect of Soil Moisture on Circulation and Rainfall in a Tropical Model,
W77-07166 2B

WALLER, W. T.
Survival and Reproduction of Gammarus spp. (Amphipoda) Following Short-Term Exposure to Elevated Temperatures,
W77-07125 5C

WALLIS, J. R.
Apparent Regional Skew,
W77-07484 2E

WALSH, J. J.
Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

WANIELISTA, M. P.
Nonpoint Source Effects on Water Quality,
W77-07173 5B

WARD, J. C.
Evaporation of Wastewater from Mountain Cabins,
W77-07284 5E

WARD, P. S.
NCWQ Recommends Changes in Water Pollution Act,
W77-07237 5G

WARNKE, J. E.
Waste Water Reclamation System Ups Productivity, Cuts Water Use,
W77-07210 5D

WARREN, W. J.
Inorganic Contaminants in Rural Drinking Waters,
W77-07372 5A

WATSON, N. H. F.
Sub-Thermocline Biomass Concentration Detected by Transmissometer in Lake Superior,
W77-07447 5C

WATSON, R.
Consumptive Use of Ground Water,
W77-07257 6E

WEARE, T. J.
Instability in Tidal Flow Computational Schemes,
W77-07548 2L

WEBB, K. L.
The Utilization of Dissolved Free Amino Acids by Estuarine Microorganisms,
W77-07117 5C

WEBSTER, L.
Fifty Million Dollars Is a Lot of Fish,
W77-07219 5D

WEERS, E. T.
Grazing Effects on Nannoplankton in Gatun Lake, Panama,
W77-07507 5C

WEHLAGE, E. F.
Geothermal Energy: Needed, Effective Heat Transfer Equipment,
W77-07301 8G

WEIGEL, H.-P.
Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

WELLERSHAUS, S.
Data 1973/1974 Regarding Hydrography and Water Quality in the Weser Estuary, Germany, (In German),
W77-07584 5C

WELLS, J.
Life History Notes for a Population of Slimy Sculpin (Cottus Cognatus) in an Alaskan Arctic Stream,
W77-07393 5C

WETZEL, R. G.
Annual Contribution of Carbon, Nitrogen and Phosphorus by Migrant Canada Geese to a Hardwater Lake,
W77-07505 5C

Nitrogen, Phosphorus, Particulate and Colloidal Carbon Content of Sedimenting Seston of a Hard-Water Lake,
W77-07441 5C

The Release of Dissolved Organic Carbon from Submersed Aquatic Macrophytes: Diel, Seasonal and Community Relationships,
W77-07516 5C

WEYL, P. K.
Pollution Susceptibility: An Environmental Parameter for Coastal Zone Management,
W77-07230 5G

WHITE, W. S.
Nitrogen, Phosphorus, Particulate and Colloidal Carbon Content of Sedimenting Seston of a Hard-Water Lake,
W77-07441 5C

WHITLEDGE, T. E.
Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

WIDMER, C.
A Survey of the Physical and Chemical Limnology of Lake Titicaca,
W77-07460 5C

WIDNER, C.
A Survey of the Biological Limnology of Lake Titicaca,
W77-07503 5C

WIENS, A. P.
Experimental Sediment Addition Studies on the Harris River, N.W.T., Canada: The Effect on Macroinvertebrate Drift,
W77-07455 5C

Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

WIGLE, T. E.
Frazil--The Invisible Strangler,
W77-07177 2C

WILE, I.
Lake Restoration Through Mechanical Harvesting of Aquatic Vegetation,
W77-07451 5G

WILKINSON, J. W.
The Effect of Food Concentration and Temperature on Respiration and Excretion in Herbivorous Zooplankton,
W77-07502 5C

WILLARDSON, L. S.
Water Movement in Soil from Trickle Source,
W77-07550 2G

WILLEY, L. M.
Chemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07487 2K

Geochemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07489 2K

WILLIAMS, N. J.
Succession Rates in Lake Phytoplankton Communities,
W77-07442 5C

WILLIS, R.
Management Model for Ground Water Development,
W77-07529 4B

WILSON, A. G.
Towards System Models for Water Resource Management,
W77-07544 6A

WILSON, D. P.
The Stability During Many Years of the Mid-Tidal Shore at Penrhyn Bay, North Wales, and a Note on the Peat Beds at Rhos-on-Sea,
W77-07367 2L

WIMBERLY, F. L.
Manning N and the Overland Flow Equation,
W77-07371 2E

WINDSOR, J. S.
Pumped Storage Optimization in Generation Systems,
W77-07525 4A

WINKLEHAUS, C.
Ozonation in a Better Perspective,
W77-07293 5D

WINTER, T. C.
Areal Distribution and Stratigraphy of Diatoms in the Sediments of Lake Sallie, Minnesota,
W77-07481 5C

WINTERS, K.
Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

WOHLAND, H.
Models for Simulation of Eutrophication of Lakes for Lake Constance (Bodensee-Obersee): I. Data from Lake Constance used in Simulation Models, (In German),
W77-07579 5C

WOHLSCHLAG, D. E.
Summer Growth Depression in the Striped Mullet, Mugil Cephalus L.,
W77-07378 5C

WOJCIECHOWSKI, I.
Influence of the Drainage Basin on the Eutrophication of the a-Mesotrophic Lake Piaseczno and Diseutrophication of the Pond Lake Bikcze,
W77-07452 5C

WOLVERTON, B. C.
Application of Vascular Aquatic Plants for Pollution Removal, Energy and Food Production in a Biological System,
W77-07474 5D

WOOD, L. W.
Role of Oligochaetes in the Circulation of Water and Solutes Across the Mud-Water Interface,
W77-07508 5C

WOODHOUSE, W. W. JR.
Dune Stabilization with Panicum amarum Along the North Carolina Coast,
W77-07327 2L

WOOTON, R. J.
Variations in the Lead, Zinc and Calcium Content of Dendrobaena rubida (Oligochaeta) in a Base Metal Mining Area,
W77-07135 5C

WUNDERLICH, L. D.
Hydrographic Properties, MESA New York Bight Atlas Monograph 1,
W77-07328 2L

WURTSBAUGH, W. A.
Laboratory Apparatus for Providing Diel Temperature Regimes for Aquatic Animals,
W77-07188 5C

YAHAGI, H.
An Investigation on the Disposal of Pig Excreta in Kasumigaura Area, (In Japanese),
W77-07571 5B

YAMATO, Y.
Occurrence and Determination of a Herbicide Benthiocarb in Rivers and Agricultural Drainages,
W77-07361 5A

YEAGER, J. G.
Enterovirus and Bacteriophage Inactivation in Subsurface Waters and Translocation in Soil,
W77-07283 5B

YEVICH, P. P.
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part III: Histopathological Studies,
W77-07180 5C

YORK, D. W.
Modeling Multiple-Use in Natural Areas: Part I -- The Basic Formulation,
W77-07530 6A

YOSHIDA, T.
Relation Between the Amounts of Fertilizer and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: II. On the Relation Between Livestock Waste Per Unit Area of Basin and the Specific Load of Pollutants in Main Streams Flowing into Nishiura Lake Basin, (In Japanese),
W77-07569 5B

YOSHIKURA, T.
Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

YOSHIZAWA, S.
Electrolytic Treatment of Chromate and Cyanide Wastes with Packed Bipolar Cell, (In Japanese),
W77-07211 5D

YOUSEF, M. K.
Seasonal Changes in Hematology of Rainbow Trout, Salmo Gairdneri,
W77-07403 5C

YOUSEF, Y. A.
Nonpoint Source Effects on Water Quality,
W77-07173 5B

ZAPOL'SKII, I. A.
Distribution Thickness and Certain Physical and Chemical Properties of Bottom Sediments in the Kiev Reservoir, (In Russian),
W77-07321 2J

ZARET, T. M.
Grazing Effects on Nannoplankton in Gatun Lake, Panama,
W77-07507 5C

Strategies for Existence of Zooplankton Prey in Homogeneous Environments,
W77-07509 5C

ZEMKO, W. A.
Symap Computer Projections of Summer Zooplankton Populations in Van Lake, Montana,
W77-07511 7C

ZILLIOUX, F. J.
Studies on the Effect of Temperature on the Egg Laying of Three Species of Calanoid Copepods in the Laboratory (Acartia Tonsa, Temora Longicornis, and Pseudocalanus Elongatus),
W77-07391 5C

ZUREK, R.
The Utilization of the Green Alga Dictyosphaerium Pulchellum as Food for Certain Crustaceans of Fresh Water Plankton,
W77-07468 5C

ZYVOLOSKI, G.
Solution of Equation for Two-Dimensional Infiltration Problems,
W77-07142 2G

Duplicate G. Zyvoloski - Chemistry Group

ORGANIZATIONAL INDEX

ACADEMIA DE STUDII ECONOMICE, BUCHAREST (RUMANIA). DEPT. OF ECONOMIC CYBERNETICS.
Reducing Power Consumption in Irrigation Systems with the Aid of a Mathematical Model for Pipe Dimensioning,
W77-07547 3F

ACADEMY OF MEDICINE, SOFIA (BULGARIA). CENTER FOR HYGIENE.
Experimental Substantiation of Maximum Permissible Propachlor (Ramrod) Concentrations in Water, (In Russian),
W77-07133 5A

ACADEMY OF MUNICIPAL ECONOMY, MOSCOW (USSR). RESEARCH INST. OF PUBLIC WATER SUPPLY, WATER PURIFICATION.
Use of Cation Polyelectrolytes for Water Purification from Viruses, (In Russian),
W77-07108 5F

AEGEAN UNIV., BORNOVA (TURKEY). MARINE BIOLOGICAL LAB.; AND AEGEAN UNIV., BORNOVA (TURKEY). DEPT. OF GENERAL ZOOLOGY.
Accumulation and Distribution of Trace Metals and Radionuclides in Marine Organisms (Particularly Tapes Decussatus L.) in the Izmir Bay Area, Turkey,
W77-07395 5C

AGRICULTURAL RESEARCH SERVICE, STILLWATER, OKLA.
Manning N and the Overland Flow Equation,
W77-07371 2E

AGRICULTURAL RESEARCH SERVICE, UNIVERSITY PARK, PA. NORTHEAST WATERSHED RESEARCH CENTER.
Predictability of Effects of a Severe Local Storm in Pennsylvania,
W77-07369 2B

AKADEMIYA NAUK LITOVSKOI SSR, VILNIUS. INSTITUT ZOOLOGII I PARAZITOLOGII.
Comparative Characteristics of the Parasite Fauna of Bream in Lakes Dusios, Obelijos, Salvantu and Galstas, Which Have Different Thermal Regimes, (In Russian),
W77-07312 2H

AKADEMIYA NAUK TURKMENSKOI SSR, ASHKHABAD. INSTITUT BOTANIKI.
Phytomicrobenthos of the Kurtli Reservoir, (In Russian),
W77-07596 5C

AKADEMIYA NAUK URSR, KIEV. INSTYTUT HIDROBIOLOGII.
Distribution Thickness and Certain Physical and Chemical Properties of Bottom Sediments in the Kiev Reservoir, (In Russian),
W77-07321 2J

Effect of Organic Acids on Experimental Manganese Isolation from Bottom Sediments, (In Russian),
W77-07597 5B

AKADEMIYA NAUK URSR, KIEV. INSTYTUT ZOOLOGII.
Cumulation, Desorption and Mechanism of Action of Organochlorine Toxic Chemicals on Cestodes of Fishes, (In Russian),
W77-07598 5C

ALABAMA UNIV. SYSTEM, DAUPHINE ISLAND. MARINE SCIENCE PROGRAMS; AND MISSISSIPPI-ALABAMA SEA GRANT CONSORTIUM, OCEAN SPRINGS, MISS.
Physical Environment Atlas of Coastal Alabama,
W77-07322 2L

ALASKA DEPT. OF FISH AND GAME, ANCHORAGE.
Biology of the Harbor Seal, Phoca Vitulina Richardi, in the Gulf of Alaska,
W77-07406 6G

Population Assessment, Ecology and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska,
W77-07408 6G

ALASKA DEPT. OF FISH AND GAME, FAIRBANKS.
Trophic Relationships Among Ice Inhabiting Phocid Seals,
W77-07407 6G

The Relationships of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions,
W77-07409 6G

ALASKA UNIV., COLLEGE. INST. OF ARTIC BIOLOGY; AND ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
Morbidity and Mortality of Marine Mammals,
W77-07405 6G

ALASKA UNIV., CGLLEGE. INST. OF MARINE SCIENCE.
Wind and Current Patterns in an Arctic Coast Lagoon,
W77-07323 2L

Zooplankton and Micronekton Studies in the Bering - Chukchi/Beaufort Seas,
W77-07412 6G

ALASKA UUNIV., COLLEGE. INST. OF MARINE SCIENCE.
Phytoplankton Studies in the Bering Sea,
W77-07413 6G

ALBERTA UNIV., EDMONTON. DEPT. OF CIVIL ENGINEERING.
Free Flow Immediately Below Sluice Gates,
W77-07161 8B

Hydraulic Jumps and Waves at Abrupt Drops,
W77-07163 8B

ALEXANDRIA UNIV. (EGYPT). DEPT. OF OCEANOGRAPHY.
Effect of the Aswan High Dam on the Nile Flood and on the Estuarine and Coastal Circulation Pattern Along the Mediterranean Egyptian Coast,
W77-07363 2L

AMERICAN WATER WORKS ASSOCIATION, TORONTO (ONTARIO). ONTARIO SECTION.
Proceedings of the Annual Conference, April 20-23, 1975, Toronto, Ontario,
W77-07329 5D

AMSTERDAM UNIV., NETHERLANDS, DEPT. OF EXPERIMENTAL BIOLOGY.
Comparative Ecophysiology of Gammarids (Crustacea: Amphipoda) From Marine, Brackish and Fresh-Water Habitats, Exposed to the Influence of Salinity-Temperature Combinations. I. Effect on Survival,
W77-07397 5C

ANDHRA UNIV., WALTAIR (INDIA). DEPT. OF ZOOLOGY.
Qualitative and Quantitative Studies on the Meiofauna of a Tropical Fresh Water Stream Subject to Tidal Influence, (In Italian),
W77-07390 5C

AQUATIC ENVIRONMENTS LTD., CALGARY (ALBERTA).
Life History Notes for a Population of Slimy Sculpin (Cottus Cognatus) in an Alaskan Arctic Stream,
W77-07393 5C

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Decision-Making for Environmental Resources Management,
W77-07542 6G

ARKANSAS GAME AND FISH COMMISSION, LONOKE.
The Effects of High Vacuum on Fish,
W77-07421 5C

ARMY ENGINEER DISTRICT, GALVESTON, TEX.
Salvops-Hopper Dredge 'A. Mackenzie',
W77-07343 8D

ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
Maintenance Dredging in the New Orleans District, US Army Corps of Engineers,
W77-07347 8D

ARMY ENGINEER DISTRICT, PORTLAND, OREG., NORTH PACIFIC DIV.
Spillway Redesign Abates Gas Supersaturation in Columbia River,
W77-07432 5G

ARMY ENGINEERS WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Dredged Material Disposal Effects and Alternatives,
W77-07345 8D

ASSOCIATED ENGINEERING SERVICES LTD., EDMONTON (ALBERTA).
Evaluating Alternative Levels of Water and Sanitation Service for Communities in the Northwest Territories,
W77-07557 6A

AUSTRALIAN NATIONAL UNIV., CANBERRA. DEPT. OF ECONOMICS.
The Evaluation of Simple and Optimal Decision Rules with Misspecified Welfare Functions,
W77-07439 6B

AZOVSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT RYBNOGO KHOZYAISTVA, ROSTOV-NA-DONU (USSR).
The Effect of Collector Discharge Water from Rice Fields on the Zooplankton of Some Kuban Estuaries, (In Russian),
W77-07331 5C

B. C. RESEARCH LTD., VANCOUVER.
Design Considerations of Foam Separation Process for Detoxification of Kraft Effluents,
W77-07217 5D

BADEN-WUERTTEMBERG LANDESANSTALT FUER UNWELTSCHUTZ (WEST GERMANY). INST. OF SEENFORSCHUNGS FISCHEREIWESEN.
Models for Simulation of Eutrophication of Lakes for Lake Constance (Bodensee-Ober-

see): I. Data from Lake Constance used in Simulation Models, (In German),
W77-07579 5C

BAHIA UNIV., SALVADOR (BRAZIL). SCHOOL OF VETERINARY MEDICINE.
Bacteriological and Colimetric Examination of the Water Supplied to the Slaughterhouses Situated Near Salvador, Bahia, Brazil, (In Portugese),
W77-07587 5A

BARI UNIV. (ITALY). ISTITUTO DI GEODESIA E GEOFISICA.
Thermal and Isotopic Studies on the Crater Lakes of Monticchio (Lucania, Italy), (In Italian),
W77-07392 2H

BATH UNIV. (ENGLAND). SCHOOL OF BIOLOGICAL SCIENCES.
Oxygen Consumption, Ventilatory Frequency and Heart Rate of Lampreys (Lampetra Fluviatilis) During Their Spawning Run,
W77-07399 5C

BATTELLE-PACIFIC NORTHWEST LABS., RICHLAND, WASH. ECOSYSTEMS DEPT.
Surber Sampling in Deep Water for Bottom Organisms,
W77-07199 7B

Tolerance of Selected Fish Species to Atmospheric Gas Supersaturation,
W77-07431 5C

BECKMAN INSTRUMENTS, INC., PORTERVILLE, CALIF.
Waste Water Reclamation System Ups Productivity, Cuts Water Use,
W77-07210 5D

BEDFORD INST. OF OCEANOGRAPHY, DARTMOUTH (NOVA SCOTIA). MARINE ECOLOGY LAB.
Uptake and Retention of Kuwait Crude Oil and Its Effects on Oxygen Uptake by the Soft-Shell Clam, Mya Arenaria,
W77-07506 5C

BETZ LABS., INC., TREVOSE, PA.
Techniques for Purifying Oily Waste Water,
W77-07213 5D

BIGELOW LAB. FOR OCEAN SCIENCES, WEST BOOTHBAY HARBOR, MAINE.
Red Tide in the Upwelling Region of Baja California,
W77-07169 5C

BIHAR COLL. OF ENGINEERING, PATNA (INDIA).
Imperatives of Water Resources Planning in the Developing Economy of India,
W77-07555 6A

BIOLOGICAL STATION, BESSE-EN-CHANDESSE (FRANCE).
A Comparison of Spectrophotometric Methods for the Determination of Phytoplankton Pigments, (In French),
W77-07581 5A

BIOLOGISCHE ANSTALT HELGOLAND (WEST GERMANY).
Atomic Absorption Measurements of Lead, Cadmium, Copper, Iron, and Zinc in Seston of the Baltic Sea,
W77-07309 5A

BIRMINGHAM UNIV. (ENGLAND), DEPT. OF CIVIL ENGINEERING.
Analysis of Flow Against Dispersion in Porous Media,
W77-07150 2F

BORDEAUX-1 UNIV., TALENCE (FRANCE). COMPARATIVE ANATOMY LAB.; AND BORDEAUX-1 UNIV., TALENCE (FRANCE). DEPT. OF HYDROBIOLOGY.
The Oligochaete Communities of a Lowland Stream and Their Value as Indicators of Organic Pollution,
W77-07307 5C

BOWDOIN COLL., BRUNSWICK, MAINE. DEPT. OF CHEMISTRY.
The Ecological, Chemical and Histopathological Evaluation of an Oil Spill Site, Part II. Chemical Studies,
W77-07179 5C

BRISTOL UNIV., (ENGLAND). DEPT. OF GEOGRAPHY.
Automatic Monitoring of Soil Moisture Conditions in a Hillslope Spur and Hollow,
W77-07146 2G

BRITISH METEOROLOGICAL OFFICE, BRACKNELL (ENGLAND).
The Effect of Soil Moisture on Circulation and Rainfall in a Tropical Model,
W77-07166 2B

BROOKHAVEN NATIONAL LAB., UPTON, N.Y. OCEANOGRAPHIC SCIENCES DIV.
Further Transition States of the Baja California Upwelling Ecosystem,
W77-07365 5C

BROWN AND CALDWELL, SEATTLE, WASH.
P. L. 92-500 V Local Priorities,
W77-07229 5D

BRUSSELS UNIV. (BELGIUM). FACULTE DES SCIENCES.
Ecological Studies of the Brussels Urban Ecosystem: Contribution 8. First Survey of the Hydrobiology of the Woluwe Valley in Brussels, (In French),
W77-07292 5C

BUREAU OF COMMERCIAL FISHERIES, SEATTLE, WASH.
Collection of Juvenile Salmonids from Turbine Intake Gatewells of Major Dams in the Columbia River System,
W77-07419 5C

BUREAU OF RECLAMATION, BOISE, IDAHO. REGIONAL SOIL AND WATER LAB.
Dissolved Gas Survey, Pacific Northwest Region.
W77-07423 5C

BUREAU OF RECLAMATION, DENVER, COLO. ENGINEERING AND RESEARCH CENTER.
Design of Gravity Dams, Design Mnual for Concrete Gravity Dams,
W77-07151 8A

Reclamation Research in the Seventies, Second Progress Report,
W77-07600 8A

BUREAU OF SPORT FISHERIES AND WILDLIFE, CORTLAND, N. Y.
Effect of Method of Introducing Well Water on the Growth, Body Chemistry and Incidence of Eye Abnormalities of Juvenile Brown and Rainbow Trout,
W77-07430 5C

CALIFORNIA STATE DEPT. OF FISH AND GAME, RANCHO CORDOVA. WATER POLLUTION CONTROL LAB.
Hematology of Juvenile Striped Bass, Morone Saxatilis (Walbaum), Acclimated to Different Environmental Conditions,
W77-07400 5C

Respiratory Responses of Gillichthys Mirabilis to changes in Temperature, Dissolved Oxygen and Salinity,
W77-07401 5C

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Physical Modeling of Combined Forced and Natural Convection in Wet Geothermal Formations,
W77-07303 4B

CALIFORNIA UNIV., DAVIS. DEPT. OF BOTANY.
Response of the Marine Angiosperm Phyllospadix Torreyi to Certain Environmental Variables: A Preliminary Study,
W77-07379 5C

CALIFORNIA UNIV., DAVIS, DIV. OF WILDLIFE AND FISHERIES BIOLOGY.
Some Effects of Channelization on the Fishes and Invertebrates of Rush Creek, Modoc County, California,
W77-07109 5C

CALIFORNIA UNIV., DAVIS. INST. OF ECOLOGY.
Spatial and Temporal Changes in the Primary Productivity of Lake Tahoe, California-Nevada Between 1959 and 1971,
W77-07443 5C

CALIFORNIA UNIV., DAVIS. INST. OF MARINE RESOURCES.
Comparison of Artificial and Natural Sea Water as Culture Media for Juvenile Lobsters,
W77-07118 5C

CALIFORNIA UNIV., IRVINE. DEPT. OF ANATOMY; AND CALIFORNIA UNIV., IRVINE. DEPT. OF DEVELOPMENTAL AND CELL BIOLOGY.
The Evaluation of Toxic Effects of Chemicals in Fresh Water by Using Frog Embryos and Larvae,
W77-07132 5C

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Electric Power Generation from Geothermal Hot Water Deposits,
W77-07300 8C

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF MECHANICAL AND ENVIRONMENTAL ENGINEERING.
Solution of Equation for Two-Dimensional Infiltration Problems,
W77-07142 2G

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Acoustic Measurement of Sediment Transport,
W77-07338 2J

Observations on Bacteriological Conditions in the Upper Great Lakes 1968-1974,
W77-07340 5A

CANTERBURY UNIV., CHRISTCHURCH (NEW ZEALAND). DEPT. OF CIVIL ENGINEERING.
Calculation of the Leaky Aquifer Function,
W77-07156 2F

CANTERBURY UNIV., CHRISTCHURCH (NEW ZEALAND). DEPT. OF ZOOLOGY.
Breeding Biology of a Non-Diadromous Galaxiid, Galaxias Vulgaris Stokell, in a New Zealand River,
W77-07389 5C

CEA CENTRE D'ETUDES NUCLEAIRES DE CADARACHE, SAINT-PAUL-LES DURANCE (FRANCE). DEPARTEMENT DE PROTECTIONE; CEA CENTRE D'ETUDES NUCLEAIRES DE CADARACHE, SAINT-PAUL-LES DURANCE (FRANCE). SERVICE DE RECHERCHES TOXICOLOGIQUES ET ECOLOGIQUES; AND CEA CENTRE D'ETUDES NUCLEAIRES DE CADARACHE, SAINT-PAUL-LES DURANCE (FRANCE). LABORITORIE DE RADIOECOLOGIE CONTINENTAL.
Preliminary Experiment of Cobalt 60 Pollution of a Marine Food Chain: Results of a Single Ingestion,
W77-07317 5C

CENTRE D'OCEANOGRAPHIE, MARSEILLE (FRANCE). STATION MARINE D'ENDOUME.
Experimental Study of the Nitrogen Excretion of Bass (Dicentrarchus labrax) during Growth. I. Effects of Temperature and Weight on the Excretion of Ammonia and Urea,
W77-07313 5C

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, PARIS (FRANCE). LABORATOIRE DE GEOLOGIE DYNAMIQUE.
Application of Nitrogen-Isotope Studies to Hydrology and Hydrogeology--Analysis of the Peculiar Case of the Melarchez Basin (Seine-et-Marne, France) (Application de L'Etude Isotopique de L'Azote en Hydrologie et en Hydrogeologie--Analyse des Resultats Obtenus Sur un Exemple Precis: Le Bassin de Melarchez (Seine-et-Marne, France)),
W77-07154 5B

CENTRE UNIVERSITAIRE DE LUMINY, MARSEILLE (FRANCE). LABORATOIRE D'HYDROBIOLOGIE MARINE; AND CENTRE D'OCEANOGRAPHIE, MARSEILLE (FRANCE). STATION MARINE D'ENDOUME.
Study on Respiratory Metabolism Modifications in Acartia clausi (Crustacea: Copepoda) Populations after Passage through the Cooling Circuit of a Power Plant,
W77-07305 5C

CHESTER ENGINEERS, INC., CORAOPOLIS, PA.
Ultrafiltration Oil Reclamation Process,
W77-07212 5D

CHRISTIAN ORGANIZATION FOR RELIEF AND REHABILITATION, NEW YORK.
The Chief Driller's Report on JCCIP,
W77-07288 8C

CLYDE RIVER PURIFICATION BOARD, GLASGOW (SCOTLAND).
Toxic Waste Disposal,
W77-07209 5G

COAST GUARD, WASHINGTON, D.C.
Rules for the Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Bulk,
W77-07251 5G

Rules and Regulations for Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Domestic Trade,
W77-07254 5G

COBLENZ FEDERAL INST. OF HYDROLOGY (WEST GERMANY).
Anthropogenically Reduced Groundwaters,
W77-07360 5B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Solutions to Green-Ampt Infiltration Equation,
W77-07553 4A

COLORADO STATE UNIV., FORT COLLINS, ENGINEERING RESEARCH CENTER.
Mathematical Modeling of Sedimentation Transients in Sand-Bed Channels,
W77-07354 2J

COLORADO STATE UNIV., FORT COLLINS, SOLAR ENERGY APPLICATIONS LAB.
Evaporation of Wastewater from Mountain Cabins,
W77-07284 5E

CONNECTICUT UNIV., STORRS.
The Environmentally Concerned Citizen: Some Correlates,
W77-07438 6G

CORNELL UNIV., ITHACA, N.Y. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Location of Free Surface in Porous Media,
W77-07162 2F

CORNELL UNIV., ITHACA. N.Y. DEPT. OF NATURAL RESOURCES.
Egg and Larval Survival of White Suckers (Catostomus Commersoni) at Low pH,
W77-07184 5C

CORNELL UNIV., ITHACA, N. Y. SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Management Model for Ground Water Development,
W77-07529 4B

CORPS OF ENGINEERS, WASHINGTON, D.C. CENTRAL REPORTS MANAGEMENT BRANCH.
Water Resources Planning and Management Goals,
W77-07523 6B

CORVALLIS ENVIRONMENTAL RESEARCH LAB., OREG. WESTERN FISH TOXICOLOGY STATION.
Carbon Dioxide and Oxygen-Nitrogen Ratios as Factors Affecting Salmon Survival in Air-Super-Saturated Water,
W77-07415 5C

CROWN ZELLERBACH CORP., PORT TOWNSEND, WASH.
Inline Sensor Tightens Control on Sludge Consistency to Within 1.4-1.5% Solids,
W77-07214 5D

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). DEPT. OF BIOLOGY.
Studies on the Effect of Temperature on the Egg Laying of Three Species of Calanoid Copepods in the Laboratory (Acartia Tonsa, Temora Longicornis, and Pseudocalanus Elongatus),
W77-07391 5C

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). DEPT. OF OCEANOGRAPHY.
Predicting Changes in Tidal Regime: The Open Boundary Problem,
W77-07370 8B

DELAWARE UNIV., LEWES. MARINE STUDIES COMPLEX.
Shell Deformity Among Scallops (Argopecten Irradians Lamark) Cultured in a Recirculating Seawater System,
W77-07123 5C

The Distribution and Ecology of Common Marine and Estuarine Gastropods in the Delaware Bay Area,
W77-07185 5C

DEPARTMENT OF ENERGY, MINES AND RESOURCES, OTTAWA (ONTARIO). POLAR CONTINENTAL SHELF PROJECT.
An Oxygen-Isotope Climatic Record from the Devon Island Ice Cap, Arctic Canada,
W77-07175 2C

DEPARTMENT OF JUSTICE, WASHINGTON, D.C. LAND AND NATURAL RESOURCES DIV.
Evolution and Objectives of River Basin Commissions in the United States,
W77-07249 6E

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, AUCKLAND (NEW ZEALAND).
Geothermal Systems and Power Development,
W77-07302 4B

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). INLAND WATER DIRECTORATE.
Frazil--The Invisible Strangler,
W77-07177 2C

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). INLAND WATERS DIRECTORATE.
Type Curves for Analysis of Pump Tests in Leaky Strip Aquifers,
W77-07145 2F

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER PLANNING AND MANAGEMENT BRANCH.
Public Participation Techniques and Methodologies: A resume,
W77-07332 6B

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER QUALITY BRANCH.
Limitations of Single Water Samples in Representing Mean Water Quality 1. Thompson River at Shaw Spring, British Columbia,
W77-07563 5A

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH.
Hydrology Research Division, Annual Progress Reports and Short Research Notes 1975-76.
W77-07336 6E

Hydrogeological Applications of Earth Resources Technology Satellite Landsat 1 Imagery,
W77-07339 7B

DEPARTMENT OF THE ENVIRONMENT, VANCOUVER (BRITISH COLUMBIA). INLAND WATER DIRECTORATE (PACIFIC REGION); AND DEPARTMENT OF THE ENVIRONMENT,

VANCOUVER (BRITISH COLUMBIA). WATER RESOURCE BRANCH.
Streamflow Regionalization in British Columbia, No. 2, Regression of Mean Annual Flows on Physiographic Parameters,
W77-07434 2E

DEPARTMENT OF THE ENVIRONMENT, VICTORIA (BRITISH COLUMBIA). INST. OF OCEAN SCIENCES.
Rectilinear Leads and Internal Motions in the Ice Pack of the Western Arctic Ocean,
W77-07373 2C

ECOLE NATIONAL SUPERIEURE AGRONOMIQUE DE TOULOUSE (FRANCE). LABORATOIRE DE PHYSIOLOGIE VEGETALE APPLIQUEE'S.
Effect of the Presence of Sodium Chloride in the Medium on Growth, Development and Distribution of Chlorine and Sodium in Sorghum Dochna F., (In French),
W77-07291 3C

ECOLE NORMALE SUPERIEURE, PARIS (FRANCE). LABORATOIRE DE ZOOLOGIE.
Deposition of Mineral Nitrogen by Rain in the Lamto Savanna, (In French),
W77-07574 5B

ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (SWITZERLAND).
Regional Study of the Upper Basin of the AAR from its Sources to Bern: Profile of Floods of a Given Return Period at any Point on the River (Etude Regionale du Bassin Superieur de L'Aar de ses Sources Jusqu'a Berne: Profile des Crues de Periode Donnee le Long du Cours d'eau).
W77-07358 2E

EIDGENOESSISCHE ANSTALT FUER WASSERVERSORGUNG, ABWASSERREINIGUNG UND GEWAESSERSCHUTZ, ZURICH (SWITZERLAND).
Improved Method for the Determination of ATP in Lakewater, (In German),
W77-07578 5A

Heavy Metals (Fe, Mn, Cd, Cr, Cu, Pb and Zn) in the Pelagic Zone of Lake Constance (Obersee and Untersee) and the Greifensee, (In German),
W77-07580 5A

EIDGENOESSISCHE ANSTALT FUER WASSERVORSORGUNG, ABWASSERREINIGUNG UND GEWAESSERSCHUTZ, KASTIENBAUM (SWITZERLAND).
Lake Restoration by Bottom Water Siphoning, (In German),
W77-07577 5G

ENVIRONMENTAL PROTECTION AGENCY, KANSAS CITY, MO. REGION VII.
A Mini-Pollution Tannery,
W77-07225 5D

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
Looking Ahead (Federal Water Pollution Control Act of 1972).
W77-07235 6E

Guidelines Establishing Test Procedures for the Analysis of Pollutants,
W77-07252 5A

Proposed Toxic Pollutant Effluent Standard for Polychlorinated Biphenyls,
W77-07253 6E

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C. OFFICE OF PLANNING AND, MANAGEMENT.
Report of a Study of Control Agency Revenue Fees,
W77-07435 5G

ENVIRONMENTAL PROTECTION SERVICE, EDMONTON (ALBERTA). NORTHWEST REGION.
A Bacteriological Investigation of Meat Packing Plant Effluents in the Province of Alberta with Particular Emphasis on Salmonella,
W77-07560 5D

ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO).
Salmonella in Poultry Packing Plant Effluents,
W77-07561 5D

ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO). WATER POLLUTION CONTROL DIRECTORATE.
Wastewater and Sludge Control in the Canadian Metal Finishing Industry, Segment Including Chemical, Electrolytic Treatment; Electrochemical Machining and Polishing; Cyanide Hardening,
W77-07333 5D

Status Report on Abatement of Water Pollution from the Canadian Petroleum Refining Industry - 1975,
W77-07334 5G

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W77-07330 5D

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Phenol-Selective, Highly Resistant Ro-Membranes Made from PVA for the Purification of Toxic Industrial Wastes,
W77-07206 5D

FISH AND WILDLIFE SERVICE, BILLINGS, MONT.
Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources,
W77-07192 5C

FISH AND WILDLIFE SERVICE, WARM SPRINGS, GA. SOUTHEASTERN FISH CONTROL LAB.
Residues of 3-trifluoromethyl-4-nitrophenol (TFM) Undetected in Lake Trout and Chinook Salmon from the Upper Great Lakes,
W77-07187 5A

FISHERIES AND MARINE SERVICE, WINNIPEG (MANITOBA). FRESHWATER INST.
Responses to Crude Oil Contamination by Cricotopus (Cricotopus) bicinctus and C. (C.) mackenziensis (Diptera: Chironomidae) in the Fort Simpson Area, Northwest Territories,
W77-07113 5C

FLORIDA TECHNOLOGICAL UNIV., ORLANDO.
Nonpoint Source Effects on Water Quality,
W77-07173 5B

FLORIDA UNIV., GAINESVILLE. COLL. OF LAW.
A Scientific and Legal Look at Thermal Pollution,
W77-07256 6E

Consumptive Use of Ground Water,
W77-07257 6E

Florida Statutes, Chapter 253--The 1969 Amendments and Proposed Legislation,
W77-07258 6E

The Feasibility of a Water Importation Project for South Florida,
W77-07259 6E

Economic Aspects of Pollution Abatement, Part 1,
W77-07260 6E

Legal Aspects of Changes Brought About by Buckeye's Pollution Abatement Program, Part II,
W77-07261 6E

FMC CORP., PHILADELPHIA, PA.
An Industrial View of Biological Monitoring,
W77-07126 5A

FOREST SERVICE (USDA), CORVALLIS, OREG. PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION.
Water Flux in Soil and Subsoil on a Steep Forested Slope,
W77-07147 2G

FREIBURG UNIV. (WEST GERMANY). LIMNOLOGISCHES INSTITUT.
Experiments on the Resistance of Fish to Rapid Increase in Hydrostatic Pressure,
W77-07416 5C

GENERAL ELECTRIC CO., SCHENECTADY, N.Y.
Installation Tips on Large Submersibles,
W77-07289 8C

GENERAL MOTORS CORP., CLEVELAND, OHIO. FISHER BODY.
Capacity Expansion and Operational Planning for Regional Water-Resource Systems,
W77-07538 6B

GEOLOGICAL SURVEY, BOSTON, MASS. WATER RESOURCES DIV.
Ground-Water Levels in Massachusetts, 1936-74,
W77-07485 4B

GEOLOGICAL SURVEY, CHEYENNE, WYO. WATER RESOURCES DIV.
Techniques for Estimating Flow Characteristics of Wyoming Streams,
W77-07495 4A

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Effects of the Catastrophic Flood of December 1966, North Rim Area, Eastern Grand Canyon, Arizona,
W77-07480 2E

GEOLOGICAL SURVEY, EL PASO, TEX.; AND GEOLOGICAL SURVEY, ALBANY, N.Y. WATER RESOURCES DIV.
Assessment of Geothermal Resources of the United States--1975.
W77-07476 4B

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Reconnaissance of Sediment Transport and Channel Morphology in the Lower Rio Bermejo Basin, Argentina--With a Section on Reconnaissance of the Lower Rio Pilcomayo Basin, Argentina and Paraguay,
W77-07490 2J

GEOLOGICAL SURVEY, LAKEWOOD, COLO. WATER RESOURCES DIV.
Water-Level Records for the Northern High Plains of Colorado, 1973-77,
W77-07486 4B

GEOLOGICAL SURVEY, LAKEWOOD, COLO. WATER RESOURCES DIV.; AND GEOLOGICAL SURVEY, DENVER, COLO. GEOLOGIC DIV.
Areal Distribution and Stratigraphy of Diatoms in the Sediments of Lake Sallie, Minnesota,
W77-07481 5C

GEOLOGICAL SURVEY, MADISON, WIS. WATER RESOURCES DIV.
Reaeration-Coefficient Measurements of 10 Small Streams in Wisconsin Using Radioactive Tracers--with a Section on the Energy-Dissipation Model.
W77-07496 5A

GEOLOGICAL SURVEY, MENLO PARK, CALIF. WATER RESOURCES DIV.
Chemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07487 2K

Convective Heat Flow from Hot Springs in the Long Valley Caldera, Mono County, California,
W77-07488 2K

Geochemistry of Thermal Waters in Long Valley, Mono County, California,
W77-07489 2K

Water Resources Data for California, Water Year 1975--Volume 1. Colorado River Basin, Southern Great Basin from Mexican Border to Mono Lake Basin, and Pacific Slope Basins from Tijuana River to Santa Maria River.
W77-07491 7C

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W77-07492 7C

GEOLOGICAL SURVEY, MINEOLA, N.Y. WATER RESOURCES DIV.
Analog-Model Analysis of Regional Three-Dimensional Flow in the Ground-Water Reservoir of Long Island, New York,
W77-07479 2F

GEOLOGICAL SURVEY, RESTON, VA.
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-07549 2H

GEOLOGICAL SURVEY, RESTON, VA. GEOLOGIC DIV.
The Economic Basis of Resource Information Systems: The Case of Streamflow Data Network Design,
W77-07534 7A

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
Surface Water Supply of the United States, 1966-70--Part 15. Alaska.
W77-07493 7C

Hydrology,
W77-07494 2A

GEOLOGICAL SURVEY, TUCSON, ARIZ. WATER RESOURCES DIV.
Preliminary Maps Showing Ground-Water Resources in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W77-07478 7C

GEOLOGICAL SURVEY, VERMILLION, S. DAK. WATER RESOURCES DIV.
Major Aquifers in Deuel and Hamlin Counties, South Dakota,
W77-07483 4B

GORKII STATE UNIV. (USSR).
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W77-07234 5C

GOSUDARSTVENNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT OZERNOGO I RECHNOGO RYBNOGO KHOZYAISTVA, LENINGRAD (USSR).
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W77-07228 7B

GRONINGEN RIJKSUNIVERSITEIT (NETHERLANDS). DEPT. OF SYSTEMATIC BOTANY.
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W77-07385 5C

HARVARD UNIV., BOSTON, MASS. DIV. OF ENGINEERING AND APPLIED PHYSICS.
Water Quality and Chemical Models,
W77-07246 5C

HAYWARD BAKER CO., ODENTON, MD.
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W77-07158 5B

HITTMAN ASSOCIATES, INC., COLUMBIA, MD.
Concepts for the Reclamation of Dredged Material,
W77-07352 8D

HOKKAIDO UNIV., HAKODATE (JAPAN). LAB. OF FOOD HYGIENE.
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W77-07315 5C

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W77-07548 2L

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W77-07595 5F

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W77-07568 5B

Relation Between the Amounts of Fertilizer and Livestock Waste on Fields and the Pollution of Streams Flowing into Lake Kasumigaura: II. On the Relation Between Livestock Waste Per Unit Area of Basin and the Specific Load of Pollutants in Main Streams Flowing into Nishiura Lake Basin, (In Japanese),
W77-07569 5B

The Changes in Inorganic Nitrogen Concentration of Drinking Water from Wells Over a Two Year Period in Ani-Machi, Ibaraki Prefecture, (In Japanese),
W77-07570 5B

An Investigation on the Disposal of Pig Excreta in Kasumigaura Area, (In Japanese),
W77-07571 5B

IBM THOMAS J. WATSON RESEARCH CENTER, YORKTOWN HEIGHTS, N.Y.; AND GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
Apparent Regional Skew,
W77-07484 2E

IDAHO DEPT. OF ENVIRONMENTAL AND COMMUNITY SERVICES, BOISE.
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W77-07425 5C

IDAHO UNIV., MOSCOW. DEPT. OF CIVIL ENGINEERING.
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W77-07551 5G

ILLINOIS STATE WATER SURVEY, URBANA.
Maximum 5-Minute and Hourly Rainfalls on Metromex Network, 1971-1975,
W77-07374 2B

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF CIVIL ENGINEERING.
Design Criteria for Hydrologic Extremes,
W77-07165 8B

INDIAN INST. OF TECH., BOMBAY. DEPT. OF CIVIL ENGINEERING.
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W77-07144 2G

INSTITUT FUER MEERESFORSCHUNG, BREMERHAVEN (WEST GERMANY).
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W77-07583 5C

Data 1973/1974 Regarding Hydrography and Water Quality in the Weser Estuary, Germany, (In German),
W77-07584 5C

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W77-07356 2B

INSTITUTE FOR WATER AND AIR POLLUTION RESEARCH, STOCKHOLM (SWEDEN).
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W77-07521 5B

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W77-07522 5D

INSTITUTE OF GEOLOGICAL SCIENCES, LONDON (ENGLAND). DEPT. OF HYDROGEOLOGY.
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W77-07153 2F

INSTITUTE OF MARINE RESEARCH, BERGEN (NORWAY).
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W77-07417 5C

INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIRKENHEAD (ENGLAND).
The Response of an Estuary to the Closure of a Mobile Barrier; Richmond Barrier on the Upper Thames Estuary,
W77-07366 2L

INSTITUTE OF RADIATION HEALTH, LENINGRAD (USSR).
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W77-07539 5C

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W77-07588 5A

INSTYTUT PRZYRODNICZYCH PODSTAW, LUBLIN (POLAND). PRODUKEJI ROSLINNEJ AR.
Influence of the Drainage Basin on the Eutrophication of the a-Mesotrophic Lake Piaseczno and Diseutrophication of the Pond Lake Bikcze,
W77-07452 5C

INTERNATIONAL SOCIETY FOR GEOTHERMAL ENGINEERING, WHITTIER, CALIF.
Geothermal Energy: Needed, Effective Heat Transfer Equipment,
W77-07301 8G

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF BIOLOGY.
The Utilization of Dissolved Free Amino Acids by Estuarine Microorganisms,
W77-07117 5C

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF ENVIRONMENTAL MEDICINE.
The Dynamics of Metals in the American Oyster, Crassostrea virginica. II. Environmental Effects,
W77-07129 5C

JOHNS HOPKINS UNIV., BALTIMORE, MO. DEPT. OF GEOGRAPHY AND ENVIRONMENTAL ENGINEERING.
Gains from Joint Operation of Multiple Reservoir Systems,
W77-07533 4A

KAGOSHIMA UNIV. (JAPAN). DEPT. OF MEDICAL ZOOLOGY.
Outbreak of Chironomid Midge in a Polluted River and the Chemical Control of the Larvae, (In Japanese),
W77-07585 5G

KENTUCKY UNIV., LEXINGTON. DEPT. OF CIVIL ENGINEERING.
Value of Landsat in Urban Water Resources Planning,
W77-07527 6A

Test of Landsat-Based Urban Hydrologic Modeling,
W77-07528 6A

KIEL UNIV. (WEST GERMANY).
Influence of an Ozonisation Plant on the Bacterial Content in Water of a Demonstration Aquarium,
W77-07311 5C

KIEL UNIV. (WEST GERMANY). GEOLOGISCH-PALAEONTOLOGISCHES INSTITUT UND MUSEUM.
Effects of Man's Activities on Groundwater Quality,
W77-07359 5B

KIEL UNIV. (WEST GERMANY). INSTITUT FUER MEERESKUNDE.
Effects of Combination of Temperature and Hydrostatic Pressure on Asterias rubens,
W77-07308 5C

Investigations on the Influence of Crude Oil on Survival and Oxygen Consumption of Idotea baltica and Gammarus salinus,
W77-07310 5C

KIEV INST. OF NUTRITIONAL HYGIENE (USSR).
The Distribution of Residual Quantities of DDT in the Organs and Tissues of Fish of the Kiev Reservoir, (In Russian),
W77-07572 5B

KIEV RESEARCH INST. OF GENERAL COMMUNAL HYGIENE (USSR).
The Effect of the Use of Pesticides and Fertilizers in the Water Protection Zone with Sources of Artificial Replenishment of Underground Water Reserves, (In Russian),
W77-07107 5B

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A Natural Pollution Experiment: The Effects of a Sewage Strike on the Fauna of the Thames Estuary,
W77-07124 5C

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W77-07361 5A

KONGELIGE NORSKE VIDENSKABERS SELSKAB, TRONDHEIM. MUSEET.
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W77-07194 5C

KOREA UNIV., SEOUL. COLL. OF MEDICINE.
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W77-07475 5B

KYOTO UNIV. (JAPAN). DEPT. OF AGRICULTURAL ENGINEERING.
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W77-07148 2F

KYOTO UNIV. (JAPAN). DEPT. OF INDUSTRIAL CHEMISTRY.
Electrolytic Treatment of Chromate and Cyanide Wastes with Packed Bipolar Cell, (In Japanese),
W77-07211 5D

LAMONT-DOHERTY GEOLOGICAL OBSERVATORY, PALISADES, N.Y.
A New Method for Physical Limnology--Tritium-Helium-3 Ages--Results for Lake Erie, Huron, and Ontario,
W77-07168 2H

LANCASTER UNIV., BAILRIGG (ENGLAND). DEPT. OF ENVIRONMENTAL SCIENCES.
Phosphorus and Carbon Distributions in a Polluted Coastal Environment,
W77-07368 5B

LAWLER, MATUSKY AND SKELLY ENGINEERS, TAPPAN, N.Y.
The Responses of Some Estuarine Organisms to Suspended Solids,
W77-07353 8D

A Contribution to the Life History of the Cunner, Tautogolabrus Adspersus, in Fishers Island Sound, Connecticut,
W77-07377 5C

LEEDS UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
Towards System Models for Water Resource Management,
W77-07544 6A

LIVERPOOL UNIV. (ENGLAND). DEPT. OF OCEANOGRAPHY.
A Hand-Operated In Situ Water Sampler,
W77-07200 5A

Environmental Dependence of Manganese and Zinc in the Scales of Atlantic Salmon, Salmo Salar (L) and Brown Trout, Salmo Trutta (L),
W77-07203 5C

LOUISIANA STATE UNIV., BATON ROUGE. CENTER FOR WETLANDS RESOURCES.
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W77-07319 5C

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W77-07197 5C

LYON-1 UNIV., VILLEURBANNE (FRANCE). DEPARTEMENT DE BIOLOGIE VEGETALE; AND LYON-1 UNIV., VILLEURBANNE (FRANCE). LABORATOIRE DE BIOLOGIE ANIMAUX ET D'ECOLOGIE.
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W77-07575 5B

MACDONALD COLL. MONTREAL (QUEBEC). BRACE RESEARCH INST.
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MAGMA-THERMAL POWER PROJECT, SANTA ROSA, CALIF.
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W77-07296 3E

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Effects of Pressure on Survival of Six Species of Fish,
W77-07424 5C

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The Ecological Chemical and Histopathological Evaluation of an Oil Spill Site, Part I: Ecological Studies,
W77-07178 5C

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W77-07112 5B

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W77-07220 5D

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W77-07367 2L

MARYLAND UNIV., COLLEGE PARK. DEPT. OF MICROBIOLOGY.
Bacteriology of Chesapeake Bay Surface Waters,
W77-07382 5C

MARYLAND UNIV., SOLOMONS. CHESAPEAKE BIOLOGICAL LAB.
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W77-07134 5C

MCMASTER UNIV., HAMILTON (ONTARIO). DEPT. OF BIOLOGY.
Satellite Observations of Water Quality,
W77-07554 5A

MCMASTER UNIV., HAMILTON (ONTARIO). DEPT. OF PHYSICS.
Dissolved Helium in Lakes: Uranium Prospecting in the Precambrian Terrain of Central Labrador,
W77-07174 5A

MESSENGER, LYNCH, HILLS AND MILLER, BELTSVILLE, MD.
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W77-07436 5G

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Mineralizing Microbial Activity in Lake Faro,
W77-07418 5C

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF FISHERIES AND WILDLIFE.
Kinetics of Lampricide (TFM, 3-trifluoromethyl-4-nitrophenol) Residues in Model Stream Communities,
W77-07115 5C

MICHIGAN UNIV., ANN ARBOR. SCHOOL OF NATURAL RESOURCES.
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W77-07543 6B

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W77-07482 5B

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W77-07362 5A

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W77-07176 5B

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W77-07159 5B

Wind Control of Algae Growth in Eutrophic Lakes,
W77-07497 5G

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Public Participation in Water Resource Development,
W77-07526 6B

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Apparent Potentiation of the Cotton Defoliant DEF by Methyl Parathion in Mosquitofish,
W77-07204 5C

MISSOURI UNIV.-COLUMBIA. DEPT. OF AGRONOMY.
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W77-07103 2G

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W77-07104 5B

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W77-07101 5C

Aspects of Reservoir-Power Station Interactions: Some Effects of Heat on Physico-Chemistry, Aufwuchs Ecology and Plankton Metabolism,
W77-07102 5C

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W77-07152 2E

MOKPO TEACHERS' COLL. (SOUTH KOREA).
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W77-07335 5C

MOSCOW STATE UNIV. (USSR). DEPT. OF BIOPHYSICS.
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W77-07120 5C

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W77-07532 5C

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W77-07241 2G

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W77-07191 5C

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W77-07388 2L

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W77-07189 5C

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Pumped Storage Optimization in Generation Systems,
W77-07525 4A

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W77-07565 2C

NATIONAL MARINE FISHERIES SERVICE, HIGHLAND, N.J. SANDY HOOK LAB.
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W77-07122 5C

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W77-07396 5C

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W77-07426 5C

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W77-07130 5C

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W77-07137 5C

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W77-07202 5C

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W77-07325 5B

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W77-07180 5C

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W77-07231 6G

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W77-07403 5C

NEVADA UNIV., RENO. DESERT RESEARCH INST.
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W77-07143 2F

NEVADA UNIV. SYSTEM, RENO. LAB. OF ATMOSPHERIC PHYSICS.
Final Report on The Pyramid Lake Pilot Project, 1970-1975, Volume 1, Text of Report,
W77-07566 3B

Final Report on the Pyramid Lake Pilot Project, 1970-1975, Volume 2, Appendices,
W77-07567 3B

NEVADA UNIV. SYSTEM, RENO. WATER RESOURCES CENTER.
Nitrogen Contamination Sources in Shallow Ground Water, Las Vegas Area, Nevada,
W77-07141 5B

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF BIOLOGY.
Enterovirus and Bacteriophage Inactivation in Subsurface Waters and Translocation in Soil,
W77-07283 5B

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF CHEMISTRY.
Protein Production by Russian Thistle: Effects of Water and Nitrogen on Protein Yields,
W77-07281 3F

NEW MEXICO UNIV., ALBUQUERQUE. SCHOOL OF LAW.
Some Suggestions for the Management of International River Basins,
W77-07250 6E

NEW YORK SEA GRANT INST., ALBANY,
Hydrographic Properties, MESA New York Bight Atlas Monograph 1,
W77-07328 2L

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, DELMAR. DIV. OF MARINE AND COASTAL RESOURCES.
Offshore Oil and Fishery Resources,
W77-07195 5C

NEW YORK UNIV. MEDICAL CENTER, N.Y. INST. OF ENVIRONMENTAL MEDICINE.
Survival and Reproduction of Gammarus spp. (Amphipoda) Following Short-Term Exposure to Elevated Temperatures,
W77-07125 5C

NIIGATA UNIV. (JAPAN). DEPT. OF MEDICAL ZOOLOGY.
The Larval Spirurid Nematodes of Fresh-Water Crustaceans: I. The Identification and the Examination of Their Pathogenicity,
W77-07458 5C

NORTH CAROLINA STATE UNIV. AT RALEIGH. CENTER FOR MARINE AND COASTAL STUDIES.
The Dune Book. How to Plant Grasses for Dune Stabilization,
W77-07326 2J

Dune Stabilization with Panicum amarum Along the North Carolina Coast,
W77-07327 2L

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING.
Saturated and Unsaturated Flow to Parallel Drains,
W77-07552 4A

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF CIVIL ENGINEERING.
Circulation and Surge Modeling in Pamlico Sound, N.C.,
W77-07320 2L

Use of Aerial Remote Sensors to Monitor Dredging Projects,
W77-07344 8D

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF MECHANICAL AND AEROSPACE ENGINEERING.
Far Field Circulation Velocities in Shallow Lakes,
W77-07164 2H

NORTH DAKOTA UNIV., GRAND FORKS.
Bibliography and Index of North Dakota Water Resources 1878-1970,
W77-07140 10C

NORTHWESTERN UNIV., EVANSTON, ILL. DEPT. OF CIVIL ENGINEERING.
Compressibility and Strength of Compacted Dredgings,
W77-07350 8D

Permeability and Drainage Characteristics of Dredgings,
W77-07351 8D

OCCIDENTAL COLL., LOS ANGELES, CALIF. DEPT. OF BIOLOGY.
The Effect of Temperature and Thermal Distribution on Glycolysis in Two Rockfish Species (Sebastes),
W77-07110 5C

OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE OUTRE-MER, PARIS (FRANCE). HYDROLOGY SECTION.
Utilization of the Results from Representative and Experimental Basins with a View to the Management of Water Resources,
W77-07355 4A

OHIO UNIV., ATHENS. DEPT. OF ZOOLOGY AND MICROBIOLOGY.
Survival of Mayfly Larvae Under Mine Acid Conditions,
W77-07128 5C

OREGON FISH COMMISSION, PORTLAND.
Second Status Report on Anadromous Fish Runs of the Columbia River,
W77-07427 5C

OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL CHEMISTRY.
Effect of DDT on Photosynthesis of Selenstrum Capricornutum,
W77-07444 5C

OREGON STATE UNIV., CORVALLIS. DEPT. OF FISHERIES AND WILDLIFE.
Laboratory Apparatus for Providing Diel Temperature Regimes for Aquatic Animals,
W77-07188 5C

OREGON STATE UNIV., CORVALLIS. DEPT. OF GEOGRAPHY.
The Evolution of Approaches to Flood Damage Reduction,
W77-07248 6F

OREGON STATE UNIV., CORVALLIS. SCHOOL OF OCEANOGRAPHY.
The Distribution, Abundance, Diversity and Productivity of the Western Beaufort Sea Benthos,
W77-07410 6G

OSAKA CITY INST. OF PUBLIC HEALTH AND ENVIRONMENTAL SCIENCES, (JAPAN).
Rapid Determination of Total Organic Carbon and its Application to Water Research, (In Japanese),
W77-07183 5A

OXFORD POLYTECHNIC (ENGLAND). DEPT. OF BIOLOGY.
Quest for an Index of Community Structure Sensitive to Water Pollution,
W77-07136 5A

PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION, BERKELEY, CALIF.
Fire Effects on Water Supply, Floods, and Sedimentation,
W77-07318 4C

PERUGIA UNIV. (ITALY). ISTITUTO DI IDROBIOLOGIA E PESCICULTURA.
First Information About N, P Nutrients and the Production of Lake Trasimeno, (In Italian),
W77-07593 5C

PICATINNY ARSENAL, DOVER, N.J. MODERNIZATION AND SPECIAL TECHNOLOGY DIV.
How the Army Does A Bang-up Job of Treating Effluents,
W77-07247 5D

POLISH ACADEMY OF SCIENCE, PSZCYNA. LAB. OF WATER BIOLOGY.
Preliminary Investigations on Bivalves Bivalvia of the Dam Reservoir at Goczalkowice,
W77-07440 5C

POLISH ACADEMY OF SCIENCES, KRAKOW. ZAKLAD BIOLOGII WOD.
The Utilization of the Green Alga Dictyosphaerium Pulchellum as Food for Certain Crustaceans of Fresh Water Plankton,
W77-07468 5C

POLITECNICO DI MILANO (ITALY). INSTITUTO DI ELETTROTECNICA ED ELETTRONICA.
Reservoir Operation Under Conflicting Objectives,
W77-07536 4A

POLYARNYI NAUCHNO-ISSLEDOVATELSKII I PROEKTNYI INSTITUT MORSKOGO RYBNOGO KHOZYAISTVA I OKEANOGRAFII, MURMANSK (USSR).
Role of Mussels Mytilus edulis in Removal of Petroleum Products from Seawater (Under Experimental Conditions),
W77-07116 5C

PRINCETON UNIV., N.J. DEPT. OF CIVIL ENGINEERING.
Evaluation of Flood Forecasting-Response Systems,
W77-07524 4A

PROJECT PLANNING ASSOCIATES LTD., TORONTO (ONTARIO).
Vacuum Sewer Systems and Their Possible Canadian Applications,
W77-07558 5D

PUSAN NATIONAL UNIV. (REPUBLIC OF KOREA).
Effect of Silt and Salinity on the Mortality of Meretrix Lusoria (Roeding), (In Korean),
W77-07428 5C

RE-CHEM INTERNATIONAL LTD., SOUTHHAMPTON (ENGLAND).
The Development of Regional Industrial Waste Processing Centres,
W77-07205 5D

REGIONAL ENGINEERING COLL., ROURKELA (INDIA).
Systems Approach and Watershed Models,
W77-07556 2A

REGIONAL MUNICIPALITY OF NIAGARA, NIAGARA FALLS (ONTARIO). PUBLIC WORKS DEPT.
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W77-07337 5D

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W77-07437 6G

RHODE ISLAND UNIV., KINGSTON. DEPT. OF PHARMACOLOGY AND TOXICOLOGY.
Fate of the Organophosphate Insecticide Parathion in the Freshwater Invertebrates,
W77-07285 5C

RIJKSINSTITUUT VOOR VISSERIJONDERZOEK, TEXEL (NETHERLANDS). DEPT. OF SHELLFISH CULTURE.
The Influence of Temperature and Time of Year on the Oxygen Uptake of the Sea Mussel Mytilus Edulis,
W77-07383 5C

RYCKMAN, EDGERLEY, TOMLINSON AND ASSOCIATES, INC., ST. LOUIS, MO.
Modeling Multiple-Use in Natural Areas: Part I -- The Basic Formulation,
W77-07530 6A

SALFORD UNIV. (ENGLAND). DEPT. OF BIOLOGY.
Seasonal Changes of Invertebrate Populations in the Polluted River Medlock,
W77-07121 5C

SAN FRANCISCO UNIV., CALIF. DEPT. OF BIOLOGY.
Uptake and Accumulation of the Nickel Ion by Mytilus edulis,
W77-07198 5C

SANITARNO-GIGIENICHESKII MEDITSINSKII INSTITUT, LENINGRAD (USSR). DIV. OF PUBLIC HYGIENE.
Hygienic Standardization of Disodium Salts of Meta-and Para-Diisopropylbenzene in Water Bodies, (In Russian),
W77-07590 5C

SARGENT AND LUNDY, CHICAGO, ILL.
Convective-Dispersion in Perennial Streams,
W77-07160 5B

SHELL DEVELOPMENT CO., HOUSTON, TEX. BELLAIRE RESEARCH CENTER.
Downhole Measurements Through Modified Drill Pipe,
W77-07304 8G

SIENA COLL., LOUDONVILLE, N.Y. DEPT. OF PHYSICS.
Digital Raingage Recorder,
W77-07172 2B

SKIDAWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.; AND GEORGIA MARINE SCIENCE CENTER, SAVANNAH.
Wassaw Island Erosion Study. Part 1: Sedimentary Framework of a Channel Margin Shoal of an Ebb Delta, Wassaw Sound, Georgia,
W77-07324 2L

SOFIA UNIV. (BULGARIA). INST. OF ZOOLOGY.
The Ciliates of Two Bulgarian Tributaries of the Danube which are Polluted: The Rivers Vit and Ossam, (In French),
W77-07573 5B

SOUTH CAROLINA STATE COLL., ORANGEBURG. DEPT. OF CHEMISTRY.
Inorganic Contaminants in Rural Drinking Waters,
W77-07372 5A

SOUTH CAROLINA UNIV., COLUMBIA. SCHOOL OF LAW.
Control of Agricultural Water Pollution: A Continuing Regulatory Dilema,
W77-07233 5G

SOUTH CAROLINA UNIV., GEORGETOWN. BELLE W. BARUCH INST. FOR MARINE BIOLOGY AND COASTAL RESEARCH.
Day Degree Growth Models for Intertidal Oysters,
W77-07376 2L

STANLEY ASSOCIATES ENGINEERING LTD., EDMONTON (ALBERTA).
Review of Treatment Technology in the Fruit and Vegetable Processing Industry in Canada.
W77-07341 5D

STATE UNIV. OF NEW YORK AT STONY BROOK. MARINE SCIENCES RESEARCH CENTER.
Pollution Susceptibility: An Environmental Parameter for Coastal Zone Management,
W77-07230 5G

TECHNICAL UNIV. OF DENMARK, COPENHAGEN.
Economic Value of Low Flow Data,
W77-07537 5D

TECHNICAL UNIV. OF LISBON (PORTUGAL). DEPT. OF CIVIL ENGINEERING; AND LISBON UNIV. (PORTUGAL). CENTRE OF URBAN AND REGIONAL SYSTEMS.
A Reconsideration and a Generalization of Lawrance and Fiering Two-Station Models,
W77-07157 2E

TECHNION - ISRAEL INST. OF TECH., HAIFA. CENTER FOR URBAN AND REGIONAL STUDIES.
Power Plant Site Evaluation: The Case of the Sharon Plant in Israel,
W77-07546 6G

TECHNISCHE UNIVERSITAET, BRUNSWICK (WEST GERMANY). ZOOLOGISCHES INSTITUT.
Influence of Wetting Tension and Ions upon Settlement and Beginning of Metamorphosis in Bryozoan Larvae (Bowerbankia gracilis),
W77-07306 5C

TEESSIDE POLYTECHNIC, MIDDLESBOROUGH (ENGLAND).
A Light-Weight and Cheap Depth Sampler,
W77-07155 5A

TEESSIDE POLYTECHNIC, MIDDLESBOROUGH (ENGLAND). DEPT. OF CIVIL AND STRUCTURAL ENGINEERING.
Interconnection of Surface and Underground Water Resources in Southeast Durham,
W77-07149 4B

TEXAS A AND M UNIV., COLLEGE STATION. CENTER FOR DREDGING STUDIES.
Proceedings of the Seventh Dredging Seminar.
W77-07342 8D

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF BIOLOGY.
Effect of Mercury on the Survival, Respiration, and Growth of Postlarval White Shrimp, Penaeus setiferus,
W77-07114 5C

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF CIVIL ENGINEERING.
Parameter Study of Variables Affecting the Performance of a Hydraulic Pipeline Dredge Model,
W77-07346 8D

Problems Associated with Construction of Submarine Pipelines,
W77-07349 8D

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF WILDLIFE AND FISHERIES SCIENCES.
Present and Historical Spawning Grounds and Nurseries of American Shad, Alosa sapidissima, in the Delaware River,
W77-07131 5C

TEXAS UNIV. AT AUSTIN, PORT ARANSAS. MARINE SCIENCE INST.
Summer Growth Depression in the Striped Mullet, Mugil Cephalus L.,
W77-07378 5C

TEXAS UNIV., PORT ARANSAS. MARINE SCIENCE INST.
Phenalen-1-One: Occurrence in a Fuel Oil and Toxicity to Microalgae,
W77-07106 5C

TOKYO UNIV. (JAPAN). DEPT. OF FISHERIES.
Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms I. Lethal Concentrations of Oil-Spill Emulsifiers for Some Marine Phytoplankton, (In Japanese),
W77-07181 5C

Fundamental Studies on the Influence of Oil Pollution Upon Marine Organisms-II. Lethal Concentrations of Oil-Spill Emulsifier Components for Marine Phytoplankton, (In Japanese),
W77-07182 5C

TOKYO UNIV. (JAPAN). LAB. OF MARINE BIOCHEMISTRY.
Occurrence of Toxic Bivalves in Association with the Bloom of Gonyaulax sp. in Owase Bay,
W77-07119 5C

TORONTO UNIV. (ONTARIO).
Network Approach to Optimal Wastewater Treatment System Design,
W77-07531 5D

TOURS UNIV. (FRANCE). LABORATOIRE DE CHIMIE MINERALE ET D'HYDROLOGIE.
Assay of Detergent Residues in Fresh Water, Sea Water and Waste Waters: Method of Extraction and Concentration of Surfactants by Adsorption on Liquid-Liquid Interface, (In French),
W77-07591 5A

TRINITY COLL., DUBLIN (IRELAND). DEPT. OF ZOOLOGY.
The Effect of Temperature on Size and Structure-II. The Body Musculature of Cyclops Agilis (Koch, Sars),
W77-07433 5C

UNIVERSAL OIL PRODUCTS CO., SAN DIEGO, CALIF. FLUID SYSTEMS DIV.
Large-Scale Reverse Osmosis Processing of Metal Finishing Rinse Waters,
W77-07207 5D

UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, MEXICO CITY. INSTITUTO NACIONAL DE ENERGIA NUCLEAR.
Aquatic Organism Contamination by Mercury Residues in the Coatzacoalcos River Estuary, Mexico,
W77-07394 5C

UNIVERSIDADE FEDERAL DE MINAS GERAIS, BELO HORIZONTE (BRAZIL). SCHOOL OF VETERINARY MEDICINE.
Bacteriological Quality of Poultry-Farms' Water in Minas Gerais State, Brazil: 1973, (In Portugese),
W77-07594 5F

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Study of Bacteria Associated with the Rearing of Larvae of Marine Bivalves, (In French),
W77-07599 5C

UNIVERSITY COLL. OF NORTH WALES, BANGOR. MARINE SCIENCE LABS.
The Rate of Microbial Degradation of Oil in a Beach Gravel Column,
W77-07138 5B

UNIVERSITY COLL. OF WALES, ABERYSTWYTH. DEPT. OF ZOOLOGY.
Variations in the Lead, Zinc and Calcium Content of Dendrobaena rubida (Oligochaeta) in a Base Metal Mining Area,
W77-07135 5C

UNIVERSITY OF SOUTH FLORIDA, TAMPA. DEPT. OF BIOLOGY.
Life History Patterns in the Coastal Shiner, Notropis Petersoni, Fowler,
W77-07386 5C

Culture Studies on Eucheuma Nudum J. Agardh, A Carrageenan Producing Red Alga from Florida,
W77-07404 5C

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG (SOUTH AFRICA).
Estimating Above and Below Normal Rainfall Periods Over South Africa, 1972-2000,
W77-07170 2B

UNIVERSITY OF WALES INST. OF SCIENCE AND TECHNOLOGY, CARDIFF.
Observations on a Peat Bog's Ability to Withstand Increasing Public Pressure,
W77-07139 5C

UTAH COOPERATIVE FISHERY UNIT, LOGAN.
The Influence of Temperature on Scope for Activity in Cutthroat Trout, Salmo Clarki,
W77-07380 5C

UTAH STATE UNIV., LOGAN. DEPT. OF AGRICULTURE AND IRRIGATION ENGINEERING.
Water Movement in Soil from Trickle Source,
W77-07550 2G

UTAH STATE UNIV., LOGAN. DEPT. OF FOREST SCIENCE.
Scheduling Models for Wilderness Recreation.
W77-07541 6B

UTAH WATER RESEARCH LAB., LOGAN.
Parameterization of Depositional Ice Growth,
W77-07171 2B

UTSUNOMIYA UNIV. (JAPAN). COLL. OF AGRICULTURE.
Study on the Herbicidal Properties of Benthiocarb; Factors Affecting Herbicidal Activity and Its Behavior in Soil, (In Japanese),
W77-07387 5B

VALLERO, CESARE AND FIGLI, TURIN (ITALY).
Two New Methods of Sludge Removal,
W77-07224 5D

VICTORIA MINISTRY FOR CONSERVATION, MELBOURNE (AUSTRALIA). MARINE POLLUTION STUDIES GROUP.
Acute Toxicity of Zinc, Cadmium, and Chromium to the Marine Fishes, Yellow-Eye Mullet (Aldrichetta Forsteri C. and V.) and Small Mouthed Hardyhead (Atherinasoma Microstoma Whitley),
W77-07190 5C

VICTORIA UNIV. (BRITISH COLUMBIA). DEPT. OF GEOGRAPHY; AND VICTORIA UNIV. (BRITISH COLUMBIA). DEPT. OF ECONOMICS.
Broadening the Approach to Evaluation in Resources Management Decision-Making,
W77-07545 6B

VIRGINIA POLYTECHNIC INST. AND STATE UNIV. BLACKSBURG. DEPT. OF BIOLOGY.
Preferred, Avoided, and Lethal Temperatures of Fish During Rising Temperature Conditions,
W77-07186 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF ENTOMOLOGY.
The Differential Use of Chironomidae and Ceratopogonidae (Diptera) in the Monitoring of Various Aquatic Wastes,
W77-07282 5A

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF PLANT PATHOLOGY AND PHYSIOLOGY.
Diphenamid Removal from Water and Metabolism by Aquatic Plants,
W77-07193 5C

VSEROSSIISKII NAUCHNO-ISSLEDOVATELSKII INSTITUT PRUDOVOGO RYBNOGO KHOZYAISTVA, KONAKOVO (USSR). UPPER VOLGA DIV.
The Formation of a Local Population of Bream Abramis Brama Orientalis, In the Heated Water Zone of Konakovo Power Station,
W77-07105 5C

WAKE FOREST UNIV., WINSTON-SALEM, N. C. DEPT. OF BIOLOGY.
Interaction of Temperature and Salinity on Oxygen Consumption of the Estuarine Crab Panopeus Herbstii,
W77-07375 5C

WARSAW UNIV. (POLAND). FACULTY OF GEOPHYSICS.
Physical Problems of Weather Modification,
W77-07357 3B

WASHINGTON UNIV., SEATTLE.
A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska,
W77-07411 6G

WASHINGTON UNIV., SEATTLE. COLL. OF FISHERIES.
Subtidal and Intertidal Marine Fouling on Artificial Substrata in Northern Puget Sound, Washington,
W77-07201 5C

Dynamics of Gas Bubble Formation in Salmonids,
W77-07559 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF CHEMISTRY.
Dynamics of O2 and CO2 Exchange, Photosynthesis, and Respiration in Rivers from Time-Delayed Correlations with Ideal Sunlight,
W77-07364 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Beaufort Sea Plankton Studies,
W77-07414 6G

WASHINGTON UNIV., SEATTLE. FISHERIES RESEARCH INST.
The Response of Fish Blood Cells, Particularly Thrombocytes, to Decompression,
W77-07420 5C

WASHINGTON UNIV., ST. LOUIS, MO. DEPT. OF CHEMICAL ENGINEERING; AND WASHINGTON UNIV., ST. LOUIS, MO. PROGRAM IN TECHNOLOGY AND HUMAN AFFAIRS.
Thermal Pollution and Its Control,
W77-07245 5G

WATER POLLUTION CONTROL FEDERATION, WASHINGTON, D.C. BOARD OF CONTROL RESEARCH COMMITTEE.
Research and the Quest for Clean Water,
W77-07243 5G

WATER RESOURCES ENGINEERS, INC., WALNUT CREEK, CALIF.
A Nitrogen Gas (N2) Model for the Lower Columbia River, Final Report,
W77-07422 5B

WESTERN ILLINOIS UNIV., MACOMB. DEPT. OF BIOLOGICAL SCIENCES.
Responses to Odors by Fingerling Cutthroat Trout from Yellowstone Lake,
W77-07111 5C

WESTERN REGIONAL RESEARCH LAB., BERKELEY, CALIF.
Calcium Carbonate in the Revomal of Iron and Lead from Dilute Waste Water,
W77-07208 5D

WILLIAMS-MCWILLIAMS CO., INC., NEW ORLEANS, LA.
The Port of New Orleans and Its Dredging Program,
W77-07348 8D

WISCONSIN UNIV., MADISON. DEPT. OF METEOROLOGY.
Dynamics of Climatic Hazards in Northeast Brazil,
W77-07167 2B

WISCONSIN UNIV., MADISON. DEPT. OF WILDLIFE ECOLOGY.
Dynamics of Storage of Organochlorine Pollutants in Herring Gulls,
W77-07127 5C

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
The Relationship Between Cupric Ion Activity and the Toxicity of Copper to Phytoplankton,
W77-07196 5C

WORCESTER POLYTECHNIC INST., MASS. DEPT. CIVIL ENGINEERING.
Reliability-Constrained Dynamic Programing and Randomized Release Rules in Reservoir Management,
W77-07535 4A

YALE UNIV., NEW HAVEN, CONN. JOHN B. PIERCE FOUNDATION LAB.
Attainment of the Final Thermal Preferendum in Brown Bullheads Acclimated to Different Temperatures,
W77-07381 5C

YALE UNIV., NEW HAVEN, CONN. SCHOOL OF FORESTRY AND ENVIRONMENTAL STUDIES.
Federal Riverbasin Planning in the Coastal Zone: The Long Island Sound Study,
W77-07232 2L

YANKEE ATOMIC ELECTRIC CO., WESTBOROUGH, MASS. ENVIRONMENTAL ENGINEERING DEPT.
Gas Bubble Disease Mortality of Atlantic Menhaden at Pilgrim Nuclear Power Station, April, 1975,
W77-07429 5C

ZOOLOGISK MUSEUM, OSLO (NORWAY).
The Effect of Salinity and Cyclic Temperature on Larval Development of the Mud-Crab Rhithropanopeus Harrisii (Brachyura: Xanthidae) Reared in the Laboratory,
W77-07384 5C

ACCESSION NUMBER INDEX

W77-07101 5C
W77-07102 5C
W77-07103 2G
W77-07104 5B
W77-07105 5C
W77-07106 5C
W77-07107 5B
W77-07108 5F
W77-07109 5C
W77-07110 5C
W77-07111 5C
W77-07112 5B
W77-07113 5C
W77-07114 5C
W77-07115 5C
W77-07116 5C
W77-07117 5C
W77-07118 5C
W77-07119 5C
W77-07120 5C
W77-07121 5C
W77-07122 5C
W77-07123 5C
W77-07124 5C
W77-07125 5C
W77-07126 5A
W77-07127 5C
W77-07128 5C
W77-07129 5C
W77-07130 5C
W77-07131 5C
W77-07132 5C
W77-07133 5A
W77-07134 5C
W77-07135 5C
W77-07136 5A
W77-07137 5C
W77-07138 5B
W77-07139 5C
W77-07140 10C
W77-07141 5B
W77-07142 2G
W77-07143 2F
W77-07144 2G
W77-07145 2F
W77-07146 2G
W77-07147 2G
W77-07148 2F
W77-07149 4B
W77-07150 2F
W77-07151 8A
W77-07152 2E
W77-07153 2F
W77-07154 5B
W77-07155 5A
W77-07156 2F
W77-07157 2E
W77-07158 5B
W77-07159 5B
W77-07160 5B
W77-07161 8B
W77-07162 2F
W77-07163 8B
W77-07164 2H
W77-07165 8B
W77-07166 2B
W77-07167 2B
W77-07168 2H
W77-07169 5C
W77-07170 2B
W77-07171 2B
W77-07172 2B
W77-07173 5B
W77-07174 5A
W77-07175 2C
W77-07176 5B
W77-07177 2C
W77-07178 5C
W77-07179 5C
W77-07180 5C
W77-07181 5C
W77-07182 5C
W77-07183 5A
W77-07184 5C
W77-07185 5C
W77-07186 5C
W77-07187 5A
W77-07188 5C
W77-07189 5C
W77-07190 5C
W77-07191 5C
W77-07192 5C
W77-07193 5C
W77-07194 5C
W77-07195 5C
W77-07196 5C
W77-07197 5C
W77-07198 5C
W77-07199 7B
W77-07200 5A
W77-07201 5C
W77-07202 5C
W77-07203 5C
W77-07204 5C
W77-07205 5D
W77-07206 5D
W77-07207 5D
W77-07208 5D
W77-07209 5G
W77-07210 5D
W77-07211 5D
W77-07212 5D
W77-07213 5D
W77-07214 5D
W77-07215 5D
W77-07216 5D
W77-07217 5D
W77-07218 5D
W77-07219 5D
W77-07220 5D
W77-07221 5D
W77-07222 5D
W77-07223 5D
W77-07224 5D
W77-07225 5D
W77-07226 5D
W77-07227 5D
W77-07228 7B
W77-07229 5D
W77-07230 5G
W77-07231 6G
W77-07232 2L
W77-07233 5G
W77-07234 5C
W77-07235 6E
W77-07236 5G
W77-07237 5G
W77-07238 6E
W77-07239 6E
W77-07240 5G
W77-07241 2G
W77-07242 3A
W77-07243 5G
W77-07244 5G
W77-07245 5G
W77-07246 5C
W77-07247 5D
W77-07248 6F
W77-07249 6E
W77-07250 6E
W77-07251 5G
W77-07252 5A
W77-07253 6E
W77-07254 5G
W77-07255 6E
W77-07256 6E
W77-07257 6E
W77-07258 6E
W77-07259 6E
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W77-07262 6E
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W77-07274 6E
W77-07275 6E
W77-07276 6E
W77-07277 6E
W77-07278 6E
W77-07279 6E
W77-07280 6E
W77-07281 3F
W77-07282 5A
W77-07283 5B
W77-07284 5E
W77-07285 5C
W77-07286 8C
W77-07287 8C
W77-07288 8C
W77-07289 8C
W77-07290 5B
W77-07291 3C
W77-07292 5C
W77-07293 5D
W77-07294 8B
W77-07295 5G
W77-07296 3E
W77-07297 8G
W77-07298 8G
W77-07299 8G
W77-07300 8C
W77-07301 8G
W77-07302 4B
W77-07303 4B
W77-07304 8G
W77-07305 5C
W77-07306 5C
W77-07307 5C
W77-07308 5C
W77-07309 5A
W77-07310 5C
W77-07311 5C
W77-07312 2H
W77-07313 5C
W77-07314 5C
W77-07315 5C
W77-07316 8H
W77-07317 5C
W77-07318 4C
W77-07319 5C
W77-07320 2L
W77-07321 2J
W77-07322 2L
W77-07323 2L
W77-07324 2L
W77-07325 5B
W77-07326 2J
W77-07327 2L
W77-07328 2L
W77-07329 5D
W77-07330 5D
W77-07331 5C
W77-07332 6B
W77-07333 5D
W77-07334 5G
W77-07335 5C
W77-07336 6E
W77-07337 5D
W77-07338 2J
W77-07339 7B
W77-07340 5A
W77-07341 5D
W77-07342 8D
W77-07343 8D
W77-07344 8D
W77-07345 8D
W77-07346 8D
W77-07347 8D
W77-07348 8D
W77-07349 8D
W77-07350 8D
W77-07351 8D
W77-07352 8D
W77-07353 8D
W77-07354 2J
W77-07355 4A
W77-07356 2B
W77-07357 3B
W77-07358 2E
W77-07359 5B
W77-07360 5B
W77-07361 5A
W77-07362 5A
W77-07363 2L
W77-07364 5C
W77-07365 5C
W77-07366 2L
W77-07367 2L
W77-07368 5B
W77-07369 2B
W77-07370 8B
W77-07371 2E
W77-07372 5A
W77-07373 2C
W77-07374 2B
W77-07375 5C
W77-07376 2L
W77-07377 5C
W77-07378 5C
W77-07379 5C
W77-07380 5C
W77-07381 5C
W77-07382 5C
W77-07383 5C
W77-07384 5C
W77-07385 5C
W77-07386 5C
W77-07387 5B
W77-07388 2L
W77-07389 5C
W77-07390 5C
W77-07391 5C
W77-07392 2H
W77-07393 5C
W77-07394 5C
W77-07395 5C
W77-07396 5C
W77-07397 5C
W77-07398 5C
W77-07399 5C
W77-07400 5C
W77-07401 5C
W77-07402 5C
W77-07403 5C
W77-07404 5C
W77-07405 6G
W77-07406 6G
W77-07407 6G
W77-07408 6G
W77-07409 6G
W77-07410 6G
W77-07411 6G
W77-07412 6G

W77-07413

W77-07413 6G
W77-07414 6G
W77-07415 5C
W77-07416 5C
W77-07417 5C
W77-07418 5C
W77-07419 5C
W77-07420 5C
W77-07421 5C
W77-07422 5B
W77-07423 5C
W77-07424 5C
W77-07425 5C
W77-07426 5C
W77-07427 5C
W77-07428 5C
W77-07429 5C
W77-07430 5C
W77-07431 5C
W77-07432 5G
W77-07433 5C
W77-07434 2E
W77-07435 5G
W77-07436 5G
W77-07437 6G
W77-07438 6G
W77-07439 6B
W77-07440 5C
W77-07441 5C
W77-07442 5C
W77-07443 5C
W77-07444 5C
W77-07445 5C
W77-07446 5C
W77-07447 5C
W77-07448 5C
W77-07449 5C
W77-07450 5C
W77-07451 5G
W77-07452 5C
W77-07453 5C
W77-07454 5C
W77-07455 5C
W77-07456 5C
W77-07457 5C
W77-07458 5C
W77-07459 5C
W77-07460 5C
W77-07461 5C
W77-07462 2H
W77-07463 5C
W77-07464 5C
W77-07465 5C
W77-07466 5C
W77-07467 5C
W77-07468 5C
W77-07469 5B
W77-07470 5C
W77-07471 5C
W77-07472 5C
W77-07473 5C
W77-07474 5D
W77-07475 5B
W77-07476 4B
W77-07477 4B
W77-07478 7C
W77-07479 2F
W77-07480 2E
W77-07481 5C
W77-07482 5B
W77-07483 4B
W77-07484 2E
W77-07485 4B
W77-07486 4B
W77-07487 2K
W77-07488 2K
W77-07489 2K
W77-07490 2J
W77-07491 7C
W77-07492 7C
W77-07493 7C
W77-07494 2A
W77-07495 4A
W77-07496 5A
W77-07497 5G
W77-07498 5A
W77-07499 5C
W77-07500 5C
W77-07501 5C
W77-07502 5C
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W77-07504 5C
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W77-07506 5C
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W77-07508 5C
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W77-07510 5A
W77-07511 7C
W77-07512 5C
W77-07513 5A
W77-07514 5C
W77-07515 5C
W77-07516 5C
W77-07517 5C
W77-07518 5C
W77-07519 5C
W77-07520 5C
W77-07521 5B
W77-07522 5D
W77-07523 6B
W77-07524 4A
W77-07525 4A
W77-07526 6B
W77-07527 6A
W77-07528 6A
W77-07529 4B
W77-07530 6A
W77-07531 5D
W77-07532 5C
W77-07533 4A
W77-07534 7A
W77-07535 4A
W77-07536 4A
W77-07537 5D
W77-07538 6B
W77-07539 5C
W77-07540 2I
W77-07541 6B
W77-07542 6G
W77-07543 6B
W77-07544 6A
W77-07545 6B
W77-07546 6G
W77-07547 3F
W77-07548 2L
W77-07549 2H
W77-07550 2G
W77-07551 5G
W77-07552 4A
W77-07553 4A
W77-07554 5A
W77-07555 6A
W77-07556 2A
W77-07557 6A
W77-07558 5D
W77-07559 5C
W77-07560 5D
W77-07561 5D
W77-07562 5D
W77-07563 5A
W77-07564 2L
W77-07565 2C
W77-07566 3B
W77-07567 3B
W77-07568 5B
W77-07569 5B
W77-07570 5B
W77-07571 5B
W77-07572 5B
W77-07573 5B
W77-07574 5B
W77-07575 5B
W77-07576 5B
W77-07577 5G
W77-07578 5A
W77-07579 5C
W77-07580 5A
W77-07581 5A
W77-07582 5C
W77-07583 5C
W77-07584 5C
W77-07585 5G
W77-07586 6G
W77-07587 5A
W77-07588 5A
W77-07589 5A
W77-07590 5C
W77-07591 5A
W77-07592 5C
W77-07593 5C
W77-07594 5F
W77-07595 5F
W77-07596 5C
W77-07597 5B
W77-07598 5C
W77-07599 5C
W77-07600 8A

ABSTRACT SOURCES

OURCE	ACCESSION NUMBER	TOTAL
. CENTERS OF COMPETENCE		
Cornell University, Policy Models for Water Resources Systems	W77-07523--07531 07533--07538 07541--07558	33
ERDA Oak Ridge National Laboratory, Nuclear Radiation and Safety	W77-07375--07386 07388--07389 07391 07393--07397 07399--07401 07403--07404 07433	26
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W77-07205--07227	23
Illinois State Water Survey, Hydrology	W77-07142--07177 07342--07374 07564--07565	71
National Water Well Association, Water Well Construction Technology	W77-07286--07290 07293--07304 07477	18
University of Florida, Eastern U. S. Water Law	W77-07229--07233 07235--07240 07242--07280	50
University of Wisconsin, Eutrophication	W77-07440--07457 07459--07474 07497--07511 07513--07521	58
University of Wisconsin, Water Resources Economics	W77-07435--07439	5
. STATE WATER RESOURCES RESEARCH INSTITUTES	W77-07101--07104 07140--07141 07281--07285	11

USDA, S.E.S., Oxford, Miss.

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER		
BioSciences Information Service	W77-07107--07108 07112, 07117 07133, 07228 07234, 07241 07291--07292 07312, 07321 07331, 07335 07387, 07390 07392, 07398 07402, 07418 07428, 07458 07475, 07482 07512, 07532 07539--07540 07568--07599	6
Bureau of Reclamation	W77-07566--07567 07600	
Environmental Information Services, Inc. (Gas Bubble Disease)	W77-07415--07417 07419--07427 07429--07432 07559	1
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W77-07105--07106 07109--07111 07113--07116 07118--07132 07134--07139 07178--07204 07305--07311 07313--07317	6
Environment Canada (WATDOC)	W77-07329--07330 07332--07334 07336--07341 07434 07560--07563	
Forest Service (USDA)	W77-07318	

ABSTRACT SOURCES

URCE	ACCESSION NUMBER	TOTAL
OTHER (CONTINUED)		
National Oceanic and Atmospheric Administration	W77-07319--07320 07322--07328	9
Ocean Engineering Information Service (Outer Continental Shelf)	W77-07405--07414	10
U. S. Geological Survey	W77-07476 07478--07481 07483--07496	19

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

DEPOSITORY

VOLUME 10, NUMBER 16
AUGUST 15, 1977

W77-07601 -- W77-08100

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent nographs, journal articles, reports, and other publication mats. The contents of these documents cover the water-ated aspects of the life, physical, and social sciences as ll as related engineering and legal aspects of the charac-istics, conservation, control, use, or management of water. ch abstract includes a full bibliographical citation and a set descriptors or identifiers which are listed in the **Water sources Thesaurus.** Each abstract entry is classified into fields and 60 groups similar to the water resources re-arch categories established by the Committee on Water sources Research of the Federal Council for Science and chnology.

RSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE OPIES OF DOCUMENTS ABSTRACTED IN THIS JOUR-AL. Sufficient bibliographic information is given to enable aders to order the desired documents from local libraries other sources.

lected Water Resources Abstracts is designed to serve e scientific and technical information needs of scientists, gineers, and managers as one of several planned services the Water Resources Scientific Information Center RSIC). The Center was established by the Secretary of the erior and has been designated by the Federal Council for ience and Technology to serve the water resources com-unity by improving the communication of water-related search results. The Center is pursuing this objective by co-dinating and supplementing the existing scientific and tech-cal information activities associated with active research d investigation program in water resources.

provide WRSIC with input, selected organizations with tive water resources research programs are supported as enters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

HYDROLOGIC OPTICS. VOLUME I. INTRODUCTION,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
R. W. Preisendorfer.
1976, 251 p.

Descriptors: *Optical properties, *Light intensity, *Water properties, *Physical properties, Hydrologic properties, Light quality, Photometry, Food chains, Model studies, Light penetration, Numerical analysis.
Identifiers: *Hydrologic optics, *Radiometry, *Underwater visibility.

The first chapter in Volume I in a series of six volumes may serve as a self-contained 'short course' on hydrologic optics. Particular attention is directed toward the three simple models for light fields in natural waters. These models constitute the minimal theoretical tools for the field of hydrologic optics. Attention is also directed to the section dealing with practical nomographs for predicting the range of visibility available to underwater swimmers in various natural hydrosols such as harbors, lakes and seas. Also of general interest are the many samples of magnitudes of light fields and optical constants found in natural waters. Chapter 2 is concerned with the scientific language of radiative transfer: geometrical radiometry and provides the radiometric concepts and formulations needed in the applications of the interaction principle to hydrologic optics. (See also W77-07957 thru W77-07961) (NOAA)
W77-07956

HYDROLOGIC OPTICS, VOLUME II. FOUNDATIONS,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
R. W. Preisendorfer.
1976, 410 p.

Descriptors: *Optical properties, *Light, *Reflectance, *Water properties, *Physical properties, Radiation, Irradiation, *Hydrologic properties, Numerical analysis.
Identifiers: *Hydrologic optics, Photoelectric effects, Irradiance, Scalar irradiance, *Transmittance, Radiometry, *Radiant flux.

This second volume of a set of six volumes of the text on hydrologic optics deals with foundations: radiometric and photometric concepts and the interaction principle. Detailed treatment is given on: radiant flux; the meaning and fundamental geometric properties of radiant flux; irradiance and radiant emittance; radiance; an invariance property of radiance; scalar irradiance, radiant energy, and related concepts; vector irradiance; radiant intensity; polarized radiance; transition from radiometry to photometry; generalized photometries; the interaction principle; reflectance and transmittance operators for surfaces; applications to plane surfaces; applications to curved surfaces; reflectance and transmittance operators for plane-parallel media; applications to plane-parallel media; interaction operators for general spaces; applications to general spaces; derivation of the beam transmittance function; derivation of the volume attentuation function; derivation of path radiance and path function; derivation of apparent-radiance equation; derivation of volume scattering function; equation of transfer for radiance; integral structure of the interaction operators and summary of the interaction method. (See also W77-07956) (NOAA)
W77-07957

HYDROLOGIC OPTICS. VOLUME III. SOLUTIONS,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
R. W. Preisendorfer.
1976, 253 p.

Descriptors: *Light, *Water properties, *Physical properties, *Optical properties, *Equations, *Diffusion, Aquatic environment, *Radiation, *Energy transfer, Aqueous solutions, Numerical analysis.
Identifiers: *Hydrologic optics, Light fields, *Radiance, Polarized radiance, Radiometry, *Equation of transfer, Radiant energy fields, Spherical harmonics, *Radiant energy.

This third volume of a set of six volumes of a text on hydrologic optics deals with the theory of light fields and solutions of the equation of transfer. Detailed treatment is given on the subjects of: radiance in transparent media; radiance in absorbing media; Koschmieder's equation for radiance; the classical canonical equation; the general canonical equation for radiance; canonical representation of polarized radiance; abstract versions of canonical equations; the n-ary radiometric concepts; equation of transfer for n-ary radiance, diffuse radiance, and path function; canonical equations for n-ary radiance; the natural solution for radiance; truncated natural solutions for radiance; optical ringing problem; transport equation for residual, directly observable, and n-ary radiant energy; solutions for the n-ary radiant energy equations; properties of time depended n-ary radiant energy fields; dimensionless forms of n-ary radiant energy fields; global approximations of general radiance fields; light storage phenomena; bases of the spherical harmonic method; abstract spherical harmonic method; classical spherical harmonic method; three approaches to diffusion theory and solutions of the classical and exact diffusion equations. (See also W77-07956) (NOAA)
W77-07958

HYDROLOGIC OPTICS. VOLUME IV. IMBEDDINGS,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
R. W. Preisendorfer.
1976, 215 p.

Descriptors: Optical properties, *Light, *Water properties, *Physical properties, Numerical analysis, Equations, Hydrologic properties.
Identifiers: *Hydrologic optics, *Invariant imbedding, *Imbeddings, Light fields, Differential equations, Optical media, Integral transform techniques.

The 4th volume of a set of six volumes of the text on hydrologic optics provides detailed treatment on invariant imbedding techniques for light fields. Subjects presented are: differential equations governing the steady state R and T operators; differetial equations governing the time dependent R and T operators; algebraic and analytic properties of the R and T operators; algebraic properties of the invariant imbedding operators; analytic properties of the invariant imbedding operators; special solution procedures for R(a,b) and T(a,b) in plane-parallel media; method of modules for deep homogeneous media; method of semigroups for deep homogeneous media; method of groups for deep homogeneous media; method of groups for general optical media; homogeneity, isotropy and related properties of optical media; functional relations for media with internal sources; and invariant imbedding and integral transform techniques. (See also W77-07956) (NOAA)
W77-07959

HYDROLOGIC OPTICS. VOLUME V. PROPERTIES,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
R. W. Preisendorfer.
1976, 305 p.

Descriptors: *Light, *Physical properties, *Water properties, *Optical properties, Aquatic environment, Diffusion, Sea water, Equations, Stratification, Hydrologic properties, *Irradiation, Properties, Equations.
Identifiers: *Hydrologic optics, *Light fields, Radiance, Polarized radiance, Radiometry, Equation of transfer, Radiant energy fields, *Irradiance fields, Radiative transport equation.

In the 5th volume in a set of six volumes of the text on hydrologic optics major emphasis is on the optical properties of the sea that govern the penetration of natural light into its depths. The stratified light field, so prevalent in oceanography and limnology is studied and the special and interesting behavior of the light field and its attendant apparent optical properties at both small and great depths in the sea are explored in detail. Subjects treated in this volume are: models for irradiance fields; general theory of optical properties; optical properties at extreme depths; and the universal radiative transport equation. (See also W77-07956) (NOAA)
W77-07960

HYDROLOGIC OPTICS. VOLUME VI. SURFACES,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Pacific Marine Environmental Lab.
R. W. Preisendorfer.
1976, 401 p, 84 fig, 8 tab, 327 ref.

Descriptors: *Optical properties, *Air-water interfaces, *Surfaces, *Hydrologic properties.
Identifiers: *Radiance, *Hydrologic optics, Sky radiance, Contrast transmittance.

The central problem addressed in this volume is the prediction of the reflected radiance distribution from a random sea surface, and the transmitted radiance distribution entering the body of the sea below the random surface. The main results are presented in equations. These equations describe the predicted radiance in terms of the wind-generated statistical parameters of the sea radiance distribution. With possible future oceanographic and meteorologic applications of this theory in mind, the author appended a hierarchy of approximate versions of the exact theory ranging from the exact time-averaged radiance theory down to the simple model of contrast transmittance of a random sea surface. (See also W77-07956) (NOAA)
W77-07961

TEMPERATURE REGIME IN LAKE SUPERIOR AT SILVER BAY, MINNESOTA,
R. A. Ragotzkie, and H. J. Niebauer.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 144-418, 1975. 4 fig., 5 ref.

Descriptors: *Lake Superior, *Water temperature, *On-site data collections, *Minnesota, Thermal stratification, Mixing, Upwelling, Internal waves, Lakes, Great Lakes.
Identifiers: *Silver Bay(Minn), Thermistors.

A chain of thermistors was installed on the shoreward side of a deep trough parallel and close to the shore of Lake Superior about one kilometer off Silver Bay, Minnesota, where the depth of the lake exceeds 275 meters. Thermistors were located at nine depths: 4.5, 9, 15, 30, 46, 61, 91, 122 and 152 meters. Electrical signals from the thermistors

were transmitted by cable to a laboratory on the shore, where they were recorded at 2 1/2- minute intervals on an analog strip chart recorder and digitally on a magnetic disc. Data as recorded from July 2, 1971-April 9, 1973, with occasional breaks. Analysis of the data shows that Lake Superior undergoes both summer and winter thermal stratification and mixes vertically twice each year. Summer stratification does not start to develop until late July. The temperature cycle lags the solar radiation cycle by about three months. The maximum surface temperature, 12-14C, and maximum thermal stratification of the Minnesota coast occur in September and minimum temperature, 0C from the surface to 91 meters, occurs in April. Episodes of upwelling are clearly evident from the thermal record during both summer and winter stratification. Internal waves with the inertial and seiche periods for Lake Superior occur frequently and may extend to a depth of 91 meters. (Harris-Wisconsin)
W77-07970

1B. Aqueous Solutions and Suspensions

HYDROLOGIC OPTICS. VOLUME III. SOLUTIONS,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
For primary bibliographic entry see Field 1A.
W77-07958

HYDROLOGIC OPTICS. VOLUME V. PROPERTIES,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
For primary bibliographic entry see Field 1A.
W77-07960

2. WATER CYCLE

THE REPRESENTATION OF A SHORT PERIOD OF EXPERIMENTAL CATCHMENT DATA BY A LINEAR STOCHASTIC DIFFERENCE EQUATION,
Institute of Hydrology, Wallingford (England).
R. T. Clarke.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 3-15, 1974. 3 fig, 5 tab, 13 ref.

Descriptors: *Mathematical models, *Demonstration watersheds, *Streamflow forecasting, *Synthetic hydrology, Stochastic processes, Analytical techniques, Runoff, Forecasting, Statistical models, Analysis, Hydrology, Foreign research, Statistical methods.
Identifiers: *United Kingdom.

Stochastic models for short-term hydrological forecasting have several drawbacks, but they also have one advantage: namely, that it is simple to give confidence limits for forecasts derived from them. Recently developed models based on stochastic difference equations have been widely used for forecasting in other fields, and one such model was identified and fitted to a short period of record (3 month) from a densely instrumented experimental catchment. This model gave 3-h-ahead forecasts with small errors, but more work is required before valid confidence limits can be stated for forecasts of longer range. The value of stochastic models is assured only if confidence statements for forecasts are useful, since conceptual models (whose parameters are more capable of physical interpretation) do not readily yield confidence limits for forecasts. It was suggested that a stochastic model also may play a role complementary to that of a conceptual model in that it can be fitted to the conceptual model's residuals, where these are shown to be non-random and, therefore, contain information which cannot be readily extracted by simply modifying the conceptual model. (See also W77-06708) (Humphreys-ISWS)
W77-07646

2A. General

GENERATION OF MULTIVARIATE SYNTHETIC FLOWS,
Geological Survey, Reston, Va. Water Resources Div.
N. C. Matalas.
In: Proceedings of a Workshop, Institute Di Idraulics and IBM, Pisa, Italy, p 27-37, December 1974. 6 tab.

Descriptors: *Model studies, *Synthetic hydrology, *Streamflow, *Markov processes, Stochastic processes, Statistical models, Simulation analysis, Equations, Water resources development, Planning.
Identifiers: Operational hydrology.

Models for generating multi-site, single season synthetic flows are described. Because estimates of the value of parameters that characterize streamflow are biased and because historic flow sequences tend not to be concurrent and of equal length, problems are encountered in generating synthetic flows. To overcome these problems, the synthetic flow genertors must be appropriately modified to assure statistical resemblance between the historic and synthetic flows. The nature of the modification is discussed. (Woodard-USGS)
W77-07610

GLOSSARY OF WATER RESOURCE TERMS,
Open Lands Project, Chicago, Ill.
For primary bibliographic entry see Field 10C.
W77-07613

SOME APPLICATIONS OF STOCHASTIC FLOW GENERATION,
Birmingham Univ. (England).
M. J. Hamlin, and N. T. Kottegoda.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 16-25, 1974. 6 fig, 3 tab, 11 ref.

Descriptors: *Mathematical models, *Synthetic hydrology, *Streamflow, *Statistical models, Hydrological data, River flow, Stochastic processes, Markov processes, Watersheds(Basins), Statistical methods, Analytical techniques, Simulation analysis, Data processing, Foreign countries, Foreign research, Hydrology.
Identifiers: *United Kingdom.

This paper examined four linear data generating techniques which may be applied to British rivers. Extensions and modifications were considered, and the method which provides the best fit to the data was sought. The work included the statistical examination of the historical series and tests on the synthesized data. Initially, the month was chosen as an economical time unit for computer based methods. In order to meet further practical needs, time series were also formed using a five day unit. The marginal probability distributions of these series belong to a different population because of the increased skewness and additional parameters are required for definition. A study of the seasonal variation of serial correlation suggests that catchment persistence is nearly the same throughout the year. A method of smoothing the seasonal standard deviations of rivers with low summer flows was given. It was shown that synthesized data, formulated and tested by statistical methods, can enhance the information found in the historical records. It is thought that in forecasting probable future behavior patterns in river flows, the application of logical data generation techniques should serve a useful purpose. However, with varying catchment and climatic characteristics and the possible shortcomings in the data, care is necessary in the choice of a model and the interpretation of the results. (See also W77-06708) (Humphreys-ISWS)
W77-07647

STOCHASTIC ANALYSIS OF VELOCITY FLUCTUATIONS IN A NATURAL STREAM CHANNEL,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-07648

INVESTIGATIONS ON THE STRUCTURE OF FREQUENCY DISTRIBUTIONS OF FLOODS,
Technische Universitaet, Dresden (East Germany).
For primary bibliographic entry see Field 2E.
W77-07649

BAYESIAN ESTIMATION OF FREQUENCY OF HYDROLOGICAL EVENTS,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2E.
W77-07650

STOCHASTIC STRUCTURE OF A PROCESS OF AVERAGE MONTHLY FLOWS,
Technical Univ. of Warsaw (Poland).
For primary bibliographic entry see Field 2E.
W77-07651

METHODS FOR THE MATHEMATICAL DESCRIPTION OF THE STRUCTURE OF RIVER RUNOFF VARIATIONS,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2E.
W77-07652

SPECTRAL ANALYSIS OF THE STRUCTURE OF HYDROLOGICAL SERIES,
For primary bibliographic entry see Field 2E.
W77-07653

SPATIAL AND TIME ANALYSIS AND ESTIMATION OF RIVER FLOW,
Moscow State Univ. (USSR). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W77-07654

ELEMENTS OF RUNOFF PERIODICITY IN TASKS OF MODELLING,
Gruzinskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Tiflis (USSR).
For primary bibliographic entry see Field 2E.
W77-07655

CYCLICAL STRUCTURE OF THE HYDROLOGICAL SERIES AND THE NATURE OF INDIVIDUAL COMPONENTS,
Siberian Energy Inst., Irkutsk (USSR).
For primary bibliographic entry see Field 2E.
W77-07656

PROBLEMS ENCOUNTERED IN SYNTHETIC RIVER FLOW GENERATION PROCEDURES,
Water Resources Board, Reading (England).
R. J. G. Bloomer, and J. R. Sexton.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July

1971: International Association of Hydrological Sciences Publication No 100, p 91-100, 1974. 1 fig, 8 tab, 8 ref.

Descriptors: *Streamflow, *Model studies, *Synthetic hydrology, *Simulation analysis, Mathematical models, Stochastic processes, Analytical techniques, Hydrology, Rivers, Frequency, Distribution patterns, Low flow, Monthly, Persistence, Time series analysis, Foreign research.
Identifiers: *United Kingdom.

Details are given of some problems which have been encountered during the development of a set of river flow data generation procedures. The adopted methods followed the principles of time series analysis, and both monthly and daily flows were studied. Three aspects were mentioned in the paper: Firstly, the use of an objective rescaled range analysis as an index of long-term persistence was outlined, and some imperfections in the technique were apparent from results obtained using real data. The second topic concerned the fitting techniques used to select a frequency distribution for the residuals obtained from an autoregressive analysis. It was shown that maximum likelihood estimators will give parameter values which differ from those obtained by the method of moments. Thirdly, tests for independence of residuals after a daily analysis were studied, and the value of the run test in rejecting certain series of residuals was shown. The importance of testing synthetic flows, with particular reference to their long-term cumulative low flow sequences, was also stressed. To be of value for reservoir yield estimation, synthetic river flow data sequences should pass value for reservoir yield estimation, synthetic river flow data sequences should pass the following tests: (a) Both daily (where appropriate) and monthly statistics should be comparable with their historic counterparts. Particular care is required in checks of serial correlation coefficients. (b) The Hurst exponent H values (or some other index of long term persistence) for the synthetic and historical flows should be similar. (c) The cumulative low flow sequences should be correctly reproduced. (See also W77-06708) (Humphreys-ISWS)
W77-07657

ON DETERMINISTIC COMPONENTS IN NATURAL STREAMFLOW,
Akademiya Nauk SSSR, Moscow. Scientific Research Inst. of Electroenergetics.
For primary bibliographic entry see Field 2E.
W77-07658

NEW FORMS OF CORRELATION RELATIONSHIPS BETWEEN POSITIVE QUANTITIES APPLIED IN HYDROLOGY,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
I. O. Sarmanov.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 104-109, 1974. 7 ref.

Descriptors: *Correlation analysis, *Hydrologic systems, *Mathematical studies, *Statistical methods, Mathematical models, Hydrology, Hydrologic aspects, Stochastic processes, Equations, Theoretical analysis, Analytical techniques, Foreign research.
Identifiers: *USSR, Gamma correlation, Symmetric gamma correlation, Non-symmetric gamma correlation.

The theory of correlation between positive stochastic variables was used to construct mathematical models of hydrological processes. This paper described the theory of symmetric and non-symmetric gamma correlation and of random gamma processes. New forms of uniform correlation leading to gamma correlation also were described. (See also W77-06708) (Humphreys-ISWS)
W77-07659

SIMULATION OF DAILY RAINFALL SERIES USING MARKOV CHAIN MODELS,
Institute for Water Resources, Belgrade (Yugoslavia).
S. Jovanovic, A. R. Dakkak, M. Cabric, and M. Brajkoric.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 110-120, 1974. 7 fig, 5 tab, 5 ref.

Descriptors: *Markov processes, *Stochastic processes, Europe, Simulation analysis, Model studies, Rainfall, Gaging stations, Monte Carlo method, Wet seasons, Dry seasons, Statistical methods, Seasonal, Foreign countries, Foreign research.
Identifiers: *Zapadna Morava River Basin(Yugoslavia), *Daily rainfall, *Yugoslavia, Rainfall series, Markov chain models, Statistical analysis.

A model was developed to synthesize the seasonal daily rainfall in the season March-June at 22 rain-gauging stations located over the vast watershed of the Zapadna Morava River basin. Using the Monte Carlo techinque, a Markov chain model was utilized for the simulation of wet and dry spell sequences, and a first-order Markov chain model was used for daily rainfall depth series generation. Statistical analysis was performed to test whether the historical and synthetic data belonged to the same population. (See also W77-06708) (Roberts-ISWS)
W77-07660

THE GENERATION OF SYNTHETIC MONTHLY RUNOFF RECORDS FOR UNGAUGED BRITISH CATCHMENTS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
B. M. J. Barton.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 121-133, 1974. 5 fig, 2 tab, 19 ref.

Descriptors: *Synthetic hydrology, *Gaging stations, *Monthly, *Runoff, Soil types, Topography, Stochastic processes, Transpiration, Precipitation(Atmospheric), Geology, Precipitation gages, Potential flow, Foreign countries, Foreign research.
Identifiers: *British catchments, *Synthetic runoff record, Stochastic runoff, Potential transpiration, Two-stage catchment model, Prototype catchment, Ungaged river catchments.

A technique was developed which permits a synthetic record of stochastic monthly runoff to be generated for any British catchment, gaged or ungaged. The technique involves the generation and routing of synthetic monthly records of catchment precipitation and potential transpiration through a simple two-stage catchment model to yield the corresponding monthly synthetic runoff record. The parameters which define the model were obtained in each case from a correlation with the topography, geology, and soil type of the prototype catchment under investigation. (See also W77-06808) (Robert-ISWS)
W77-07661

MULTIDIMENSIONAL STATISTIC MODELLING OF HYDROLOGICAL PROCESSES ON THE BASIS OF STRUCTURAL ANALYSIS OF THE EMPIRICAL HYDROGRAPHS OF RUNOFF,
Siberian Energy Inst., Irkutsk (USSR).
G. A. Grinevich, A. G. Grinevich, and A. F. Solovjova.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 134-139, 1974. 11 ref.

Descriptors: *Statistical methods, *Runoff, *Model studies, Hydrographs, Hydrograph analysis, Stochastic processes, Time series analysis, Statistical models, Probability, Data collections, Geophysics, Time lag.
Identifiers: *Statistical analysis, *Empirical hydrographs, Probabilistic estimates, Hydrological processes, Geophysical processes, Cosmic processes.

Methods of Statistical analysis by decomposition of empirical hydrographs of runoff were described. By means of the proposed methods, properties of the component stochastic processes of runoff changes in different timeintervals were exposed. Methods of compositional statistic modelling of possible combinations of the propertiesof principal component processes were developed, which gives a possibility of obtaining probabilistic estimates of rarely observed situations. (See also W77-06708), (Roberts-ISWS)
W77-07662

STOCHASTIC DIFFERENCE EQUATION MODELLING OF HYDROLOGICAL PROCESSES,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-07663

STRUCTURAL RELATION BETWEEN PARAMETRIC AND STOCHASTIC HYDROLOGY MODELS,
Pittsburgh Univ., Pa.
R. G. Quimpo.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 151-157, 1974. 2 fig, 15 ref. NSF GK-20388.

Descriptors: *Model studies, *Parametric hydrology, *Streamflow, *Hydrographs, Unit hydrographs, Synthetic hydrology, Statistical methods, Mathematical models, Analytical techniques, Analysis, Correlation analysis, Hydrology, Rainfall-runoff relationships, Stochastic processes, Markov processes.

To reconcile techniques of parametric and stochastic hydrology, the structural relation between unit hydrograph and hydrological time series models was investigated. Using autocorrelation analysis, the parameters of the instantaneous unit hydrograph were related to the autoregressive coefficients of a stochastic model for streamflow. The autocorrelation function of the Dooge-Nash model (with parameters n and K) was obtained in terms of a modified Bessel function of the second kind with order n -1/2, whose argument is the inverse of the storage coefficient K. Generalized curves werepresented which allow graphical estimation of hydrograph parameters from the autocorrelation characteristics of the hydrograph. The use of the technique was illustrated in an example. The mathematical development demonstrated the structure of the linkage between linear models of stochastic and parametric hydrology. The key to this linkage is in the kernel function of the storage model for the system. Given parameters of the instantaneous unit hydrograph, one is able to determine the parameters of the corresponding autoregressive model for the time series representing system response. (See also W77-06708) (Humphreys-ISWS).
W77-07664

SIGNIFICANCE TESTS OF PERIODICITY IN HYDROLOGICAL TIME SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
In: Mathematical Models in Hydrology, Volume 1; Proceedings in the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 158-168, 1974. 11 fig, 1 ref.

Descriptors: *Parametric hydrology, *Model studies, *Statistical methods, *Hydrology, Frequency, Analytical techniques, Analysis, Time series analysis, Variability, Statistics, Correlation analysis, Precipitation(Atmospheric), Rainfall, Runoff, Mathematical models, Probability, Stochastic processes, Mathematical studies.

The main parameters of hydrological discrete time series, with the time interval a fraction of a year, are periodic. Detection of significant harmonics in these parameters is required when their identification and removal lead to a stationary (and presumably also ergodic) independent or dependent stochastic component of a prescribed order of stationarity. When a hydrological variable, or its logarithm, can be justifiably expressed as a sum of a periodic parameter and a stochastic stationary component, the classical Fisher's test of detecting significant harmonics is applicable. Because these simple sums are not always found in hydrological time series, an empirical approximate method was presented for performing tests. Examples of three precipitation and two runoff discrete time series were given, with the cumulative percentage of explained variance by the sum of any first m harmonics out of omega/2 possible harmonics. Periodicity is always present in the mean and standard deviation of both precipitation and runoff series, no periodicity in the serial correlation coefficients in precipitation, and in runoff series when rainfall predominately contributes to runoff, but show periodicity in these coefficients when the runoff is fed by both rainfall and snowmelt. (See also W77-06708) (Humphreys-ISWS)
W77-07665

A SIMPLE STOCHASTIC MODELLING OF HURST'S LAW,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-07666

IN HYDROLOGY H IS A HOUSEHOLD WORD,
IBM Thomas J. Watson Research Center, Yorktown Heights, N. Y.
J. R. Wallis, and N. C. Matalas.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 196-203, 1974. 7 fig, 8 ref.

Descriptors: *Flow, *Synthetic hydrology, *Model studies, Mathematical models, Persistence, Correlation analysis, Streamflow, River flow, Runoff, Time series analysis, Equations, Markov processes, Statistical methods, Statistics, Hydrology, Precipitation(Atmospheric).
Identifiers: Serial dependence.

Empirical correlograms subjectively reflect long-term persistence, yet objective tests for serial dependence fail to do so because of biases in the estimates of the test statistics as well as the inherent low power of the tests. To generate synthetic flows, resemblance between historical and synthetic sequences requires the use of values for statistical characteristics that are different from those extracted from the historical sequences. (See also W77-06708) (Sims-ISWS)
W77-07667

FREQUENCY ANALYSIS OF WATER BALANCE COMPONENTS IN RELATION TO CLIMATIC FACTORS,
Ebasco Services, Inc., New York.
B. S. Browzin.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 204-211, 1974. 3 fig, 5 tab, 6 ref.

Descriptors: *Watersheds(Basins), *Precipitation(Atmospheric), *Runoff, *Great Lakes, *St. Lawrence River, Evaporation, Storage, Climatology, Climates, Water balance, Data processing, Analytical techniques, Rainfall, Snowfall, Water resources, Annual, Seasonal, Variability, Meteorology, Hydrology.
Identifiers: *St. Louis River.

The variation of both annual and seasonal values of precipitation, runoff, evaporation, deficit, and catchment storage in four selected basins from different climatic conditions was studied. The variation of monthly flow is large, and in certain months it is excessively large. The variation of monthly flow is influenced by the variation of precipitation as seen in this study, but the variation is also influenced by other causes, especially by variation of temperatures. The monthly flow variation is larger than the variation of monthly precipitation. In the basin of the St. Louis River, which is located in a pronounced continental climate, the variation in flow is considerably different as compared with the three other rivers located in transient and oceanic climate. The ratio C/F of warm to cold season precipitation is an index which marks the hydrological conditions conveniently to segregate river basins according to climate. This index is 2.52 for St. Louis, and 1.55 to 0.99 for the three other river basins. The variation in monthly water volume accumulations, in general, is large but erratic. (See also W77-06708) (Sims-ISWS)
W77-07668

MATHEMATICAL MODELS RESULTING FROM STATISTICAL ANALYSIS OF THE MEAN MONTHLY FLOW,
Ebasco Services, Inc. New York.
For primary bibliographic entry see Field 2E.
W77-07669

FLOOD FREQUENCY STUDIES OF RIVERS IN THE FEDERAL REPUBLIC OF GERMANY,
Technische Universitaet, Brunswick (West Germany). Leichtweiss Inst. for Water Research.
For primary bibliographic entry see Field 2E.
W77-07670

STOCHASTIC ANALYSIS OF SHORT-TIME RAINFALLS,
Technical Univ. of Budapest (Hungary).
For primary bibliographic entry see Field 2B.
W77-07671

A STATISTICAL FILTRATION MODEL FOR THE INSEEPAGE OF MELT WATER INTO FROZEN GROUND,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2G.
W77-07672

DETERMINATION OF THE DEGREE OF PROTECTION OFFERED BY FLOOD CONTROL SYSTEMS ON THE BASIS OF DISTRIBUTION FUNCTIONS,
Water Resources Centre, Budapest (Hungary).
For primary bibliographic entry see Field 8B.
W77-07673

STATISTICAL ANALYSIS APPLIED TO THE STUDY OF THE COMPONENTS OF A FLOOD WAVE,
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2E.
W77-07674

A MULTIVARIATE MATHEMATICAL MODEL OF MONTHLY RIVER FLOW,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering.
For primary bibliographic entry see Field 2E.
W77-07675

FINDING REGULARITIES IN LONG-TERM STREAMFLOW FLUCTUATIONS BY ANALYSIS OF HYDROLOGICAL ENSEMBLES,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2E.
W77-07676

OPTIMAL SPATIAL INTERPOLATION AND ITS ERRORS IN THE CASE OF VARIOUS DISTANCES BETWEEN OBSERVATION POINTS OR WATERSHED CENTRES,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4D.
W77-07677

OBJECTIVE ANALYSIS OF SNOW COVER FIELDS,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2C.
W77-07678

USE OF CROSS-CORRELATION TECHNIQUES FOR DETERMINING THE RELATIONSHIP BETWEEN GROUNDWATER LEVELS AND SOURCES IN THE NILE DELTA AREA,
For primary bibliographic entry see Field 2F.
W77-07679

TIME AND FREQUENCY-DOMAIN IDENTIFICATION OF A CASUAL BIVARIATE STOCHASTIC PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2E.
W77-07680

APPLICATION OF STOCHASTIC HYDROLOGICAL MODELS IN THE DESIGN OF LAKE LEVEL CONTROL,
Technical Univ. of Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W77-07681

SOME ARITHMETICAL RELATIONS OF A MATRIX FOR A CALCULUS OF RESERVOIRS, (QUELQUES RELATIONS ARITHMETIQUES DE MATRICE DANS LE CALCUL DES RESERVOIRS),
Direction des Eaux, Baja (Hungary).
For primary bibliographic entry see Field 4A.
W77-07682

EMPTINESS OF A FINITE DAM--TIME DEPENDENT THEORY,
Indian Inst. of Tech., Madras. Dept. of Mathematics.
For primary bibliographic entry see Field 8B.
W77-07683

MULTIPLE MARKOV PROCESSES IN HYDROLOGY AND THEIR IMPORTANCE FOR STOCHASTIC ANALYSIS OF WATER ACCUMULATION PROBLEMS,
Technical Univ. of Prague (Czechoslovakia).
For primary bibliographic entry see Field 4A.
W77-07684

MATHEMATICAL MODELS OF RUNOFF FOR THE COMPUTATION OF STORAGE RESERVOIRS,
Tbilisskii Gosudarstvennyi Universitet (USSR). Dept. of Hydrology.
For primary bibliographic entry see Field 4A.
W77-07685

MODEL OF A LAKE RESERVOIR,
Wasserwirtschaftsdirektion, Halle, (East Germany).
For primary bibliographic entry see Field 4A.
W77-07687

SOME PROBLEMS OF STOCHASTIC STORAGE WITH CORRELATED INFLOW,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-07689

TIDAL AND CURRENT PREDICTION FOR THE AMAZON'S NORTH CHANNEL USING A HYDRODYNAMICAL-NUMERICAL MODEL,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W77-07743

REPRESENTATIVE AND EXPERIMENTAL BASINS - WHERE NEXT,
Hydrocomp, Inc., Palo Alto, Calif.
R. K. Linsley.
Hydrological Sciences Bulletin, Vol. 21, No. 4, p 517-529, December 1976. 13 fig, 13 ref.

Descriptors: *Basins, *Watersheds(Basins), *Overland flow, *Simulation analysis, Urbanization, Channels, Subsurface runoff, Water quality, Model studies, Bench marks.
Identifiers: *Stanford watershed model, Deforestation, Experimental basins.

Discussed are some of the problems of basin studies, such as the relative sizes of different basins, overland flow, and interflow between different basins. Simulation of basins was considered, particularly the use of the Stanford Watershed Model and how it can be applied to investigate changes due to urbanization and deforestation. The future role of representative and experimental basins was discussed. (Bhowmik-ISWS)
W77-07781

PENN STATE URBAN RUNOFF MODEL--USER'S MANUAL,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W77-07797

STUDY OF THE RIO GRANDE, BOLIVIA HIGHLIGHTS SOME BASIC QUESTIONS ABOUT SIMULATION,
Hydrocomp, Inc., Palo Alto, Calif.
R. C. Johanson.
Simulation Network Newsletter, Vol. 8, No. 8, p 1-8, December, 1976. 7 fig, 3 ref.

Descriptors: *Model studies, *Hydrologic data, Rivers, Precipitation(Atmospheric), Rainfall intensity, Computer models, Evaluation, Flow, Data collections, *Simulation analysis.
Identifiers: Hydrocomp Simulation Programming(HSP), *Rio Grande River(Bolivia).

A simulation study of the Rio Grande River, Bolivia, was performed which highlighted questions on the validity of simulation studies where data was incomplete. It was pointed out that there was no hourly continuous precipitation data available for use with Hydrocomp Simulation Programming (HSP). Opinion was presented on the need for this type of data to reduce errors in results and the relative importance of the number of gauges in simulation studies was stressed. Data on the Rio Grande was from five recording rain gauges covering a period of 1.5 years, including 81 daily records. A 30-year simulation was achieved by obtaining representative temporal distributions of daily precipitation. The calendar year was divided into rainfall seasons in which classes are identified based on quantity of daily precipitation. These formed a matrix of seasons and daily precipitation classes which made a two-way scheme for classifying any day's precipitation. Available hourly data was tallied into daily totals. Each value in the daily data record was disaggregated by random choice of a 24-hour sequence. After disaggregation of precipitation data, the HSP model was calibrated against observed streamflow in the usual way. The 30-year simulation for the river was calculated with and without a proposed dam. Results were shown to have good agreement with earlier findings and most error was very small. (Collins-FIRL)
W77-07945

HYDROLOGIC OPTICS. VOLUME I. INTRODUCTION,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
For primary bibliographic entry see Field 1A.
W77-07956

OBJECTIVE FUNCTION AND CONSTRAINTS IN WATER RESOURCES SYSTEMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6A.
W77-08046

OPTIMAL OPERATION OF WATER RESOURCES SYSTEMS--1,
Illinois Univ. at Urbana-Champaign. Hydrosystems Lab.
For primary bibliographic entry see Field 4A.
W77-08047

OPTIMAL OPERATION OF WATER RESOURCES SYSTEMS--II,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 4A.
W77-08048

PLANNING OF SYSTEMS FOR REGIONAL DEVELOPMENT IN WATER RESOURCES,
Technion-Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 6A.
W77-08049

LAND USE CLASSIFICATION FOR HYDROLOGIC MODELS USING INTERACTIVE MACHINE CLASSIFICATION OF LANDSAT DATA,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W77-08074

REMOTE SENSING INPUTS TO WATER DEMAND MODELING,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
For primary bibliographic entry see Field 7B.
W77-08080

2B. Precipitation

SIMULATION OF DAILY RAINFALL SERIES USING MARKOV CHAIN MODELS,
Institute for Water Resources, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2A.
W77-07660

FREQUENCY ANALYSIS OF WATER BALANCE COMPONENTS IN RELATION TO CLIMATIC FACTORS,
Ebasco Services, Inc., New York.
For primary bibliographic entry see Field 2A.
W77-07668

STOCHASTIC ANALYSIS OF SHORT-TIME RAINFALLS,
Technical Univ. of Budapest (Hungary).
J. Winter.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 226-232, 1974. 4 fig, 5 ref.

Descriptors: *Rainfall, *Curves, *Model studies, Duration curves, Probability, *Stochastic processes, Data processing, Analysis, Analytical techniques, Summer, Monthly, Probable maximum precipitation, Precipitation(Atmospheric), Distribution, Temporal distribution, Meteorology, Hydrology, Foreign research, Foreign countries.
Identifiers: *Hungary.

Research work was carried out in the Chair for Water Management of the Technical University of Budapest to establish certain rules for short-time rainfalls. It was found that the applicability of a certain distribution function does not depend only on a good fit to observed data. Additional features that were considered were the physical realities in the ranges of low and high probability, the accuracy in determining the parameters, and the trends of change of the parameters in space and time. With regard to all these points, short-time rainfalls were found to be characterized best by aid of the logarithmic normal distribution function. Since logarithmic normal distribution functions calculated for the four summer months (May through August) were found to be almost identical, it became possible to process the data of these four months together, which resulted in the multiplication of the number of data to be involved in determining the function. The reliability of estimation was thus increased considerably. The relationships established between rainfall height, duration, and probability may be applied with advantage in the dimensioning of drainage canals. (See also W77-06708) (Sims-ISWS)
W77-07671

OBJECTIVE ANALYSIS OF SNOW COVER FIELDS,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2C.
W77-07678

CHARACTERISTICS OF THE SEVERE RAINSTORM,
Tokyo Aviation Weather Service (Japan).
M. Shimada.
Geophysical Magazine, Vol. 37, No. 4, p 271-307, March 1976. 31 fig, 4 tab, 33 ref.

Descriptors: *Storms, *Rainfall, *Excessive precipitation, Cloudbursts, Storm water, Runoff, Design storm, Air masses, Cloud physics, Floods, Disasters, Fronts(Atmospheric), Weather, Meteorology.
Identifiers: *Severe rainstorms, *Japan, Synoptic structure, Mesoscale analysis, Rainstorms characteristics.

The characteristics of the several rainstorm which is accompanied by no remarkable synoptic disturbance were investigated. It was shown that the synoptic situation where the severe rainstorm occurs can be classified into three types, referring to the contour pattern of 500-mb surface maps. Two types of synoptic situations occur in relation to the location of the middle latitude high, and the other type of synoptic situation occurs in relation to the location of the upper cold vortex. Some characteristics were found peculiar to each type. It was shown that the position of the rainstorm is given relative to a particular pattern on the 500-mb map for each type, especially in relation to the location of the middle level jet axis. Association with the low level jet is confirmed for the first type, but not so clearly for the second and third types. Existence of the moist tongue is confirmed for the first and the third types, but not for the second type. Rainstorms of the first and the third types occur rather frequently in the nighttime, but not of the second type. A rainfall area of the first type is relatively large, but the area of the second and the third types is small. Duration of the rainfall is relatively long for the first type and short for the second and the third types. Association with the mesoscale disturbances is always confirmed for all the three types by mesoanalyses. Some parts of a rainfall area move with the mesoscale disturbance and others remain stationary. The results showed a close linkage between the synoptic situation and the mesoscale features of the severe rainstorm. (Sims-ISWS)
W77-07784

ANALYSIS OF IFYGL RAWINSONDE BASELINE MEASUREMENTS,
National Oceanic and Atmospheric Administration, Washington, D.C. Environmental Data Service; National Oceanic and Atmospheric Administration. Washington, D.C. Center for Experiment Design and Data Analysis.
S. Williams.
Technical Memorandum EDS CEDDA-8, July 1976. 13 p, 5 tab, 1 append.

Descriptors: *Radiosondes, *Instrumentation, *Telemetry, *Great Lakes, Temperature, Humidity, Atmosphere, Weather data, Calibrations, *Measurement, Meteorology.
Identifiers: *International Field Year for the Great Lakes, *Rawinsonde instrumentation, Hygristors, Thermistors.

Comparisons were made between factory and field baseline measurements of the rawinsonde instrumentation used during the International Field Year for the Great Lakes (IFYGL) in 1972-73. No independent check data were available, but it is believed that the comparisons make it possible to set a limit on the accuracy expected from manual baseline measurements. A simpler and more accurate baseline procedure was suggested. (Sims-ISWS)
W77-07790

STUDY OF THE RIO GRANDE, BOLIVIA HIGHLIGHTS SOME BASIC QUESTIONS ABOUT SIMULATION,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2A.
W77-07945

THE MEASUREMENT OF RAINFALL AT GROUND LEVEL,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
R. Aldridge.
Journal of Hydrology (New Zealand), Vol. 15, No. 1, p 35-40, 1976. 4 tab, 7 ref.

Descriptors: *Rainfall, *Measurement, *Rain gages, Rainfall intensity, On-site investigations, Precipitation(Atmospheric), Rain, Foreign research, Foreign countries, Slopes, Data processing, Climatic data, Correlation analysis, Climatology, Meteorology.
Identifiers: *New Zealand, Ground level raingages, Tilted raingages, Raingage exposure, Rainfall measurement.

For comparative studies of rainfall, the use of raingages similarly exposed at a height of 0.3 m above ground level is acceptable as a practical method. Errors of measurement are inherent in the exposure of raingages in this manner, and accurate point measurement of rainfall is not achieved. A possible solution to this problem is the exposure of raingages at ground level. To study the differences between the catch of raingages at 0.3 m and at ground level at Taita Experimental Station, Lower Hutt, New Zealand, a raingage exposed at ground level, in addition to the raingage at 0.3 m, has been in use in the climatological enclosure since March 1971. In addition to this comparison, a plot was set up on a hill site to study the differences in catch amongst a ground-level raingage, tilted raingages, and vertical raingages on a steep slope. In the climatological enclosure over the period April 1971 to June 1974 there were 525 raindays, with data available for both raingages. For this 39-month period, the total rainfall catch of the ground-level raingage exceeded the total catch of the raingage at a height of 0.3 m by 6.3% with a monthly difference ranging from 0.6% to 13.5%. On a daily basis the percentage differences in the catch of the raingages generally decreases with increasing rainfall. For the hill site from December 1971 to December 1972, the total mean catch of the vertical raingages was 13.5% less than the catch of the ground-level raingage. This was a larger difference between the raingages at 0.3 m and ground-level than had been found in the horizontal climatological enclosure over the same period. (Sims-ISWS)
W77-08061

2C. Snow, Ice, and Frost

OBJECTIVE ANALYSIS OF SNOW COVER FIELDS,
Hydrometeorological Service of the USSR, Moscow.
E. P. Chemerenko.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 315-318, 1974. 1 fig, 3 ref.

Descriptors: *Snow cover, *Data processing, *Analytical techniques, Networks, Precipitation(Atmospheric), Snow, Snowfall, Water resources, Statistical methods, Analysis, Hydrology, Meteorology, Foreign research, Foreign countries.
Identifiers: *USSR, Interpolation, Objective analysis.

A procedure for automatic processing of data on snow cover for the purposes of hydrological forecasting was described. Observations on snow cover depth and its water content are read into the computer which then sorts them as follows: The whole territory under study is divided into equal squares whose area is determined by the mean density of the observation network in such a way that each station falls into some square. The position of the first and last station in each square is held in the computer memory, which facilitates the selection of the required information. The coordinates of the interpolation point determine the number of the square in which the point in question is located. This number permits the selection of the data from the stations located within this square. Where these stations are too few, the stations located in the neighboring squares are selected. Then, of the total number of the stations selected, a certain proportion of the nearest stations is selected, and their data are used for interpolation purposes. When the objective analysis is carried out under optional conditions, the selection of the interpolation method is of great importance. The following conclusions were noted from the objective analysis of snow cover: The variable snow depth and water content are characterized by considerable spatial variability due to the irregularity of solid precipitation. Moreover, like all variables measured near the earth's surface, a noticeable influence of microclimatic peculiarities of the underlying surface often causes observations on snow cover to be unrepresentative, while the interest variability in the snow cover water content is often very large. It is difficult, therefore, to formulate an objective criterion for use in deciding when snow cover data should be rejected. (See also W77-06708) (Sims-ISWS)
W77-07678

OIL SPILL AT DECEPTION BAY, HUDSON STRAIT,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5G.
W77-07731

ICE MOVEMENTS IN THE BEAUFORT SEA 1973-1975: DETERMINATION BY ERTS IMAGERY,
Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Physics Branch.
L. W. Sobczak.
Journal of Geophysical Research, Vol. 82, No. 9, p 1413-1418, March 20, 1977. 4 fig, 1 tab, 7 ref.

Descriptors: *Sea ice, *Movement, *Winds, *Remote sensing, *Arctic, Ice cover, Polar regions, Cold regions, Satellites(Artificial), Ice, Spring, Data processing, Analytical techniques.
Identifiers: *ERTS, *Beaufort Sea, Sea ice movements.

Remote sensing (ERTS) imagery was used to map the distribution of leads in the sea ice over the Beaufort Sea during late February through early April in 1973, 1974, and 1975. A comparison of the bearings and speeds of ice movements obtained from ERTS-based maps with those of geostrophic winds calculated from average daily and weekly atmospheric pressure charts indicated that the ice drifts at about 1/100 of the speed of the geostrophic winds in a direction about 20 degrees to the left. During early March 1973, before excessive ice breakup, the sea ice moved slowly, about 0.3 km/d, but during periods of rapid ice fracturing (March and April 1975), the sea ice moved at rates as high as 18.2 km/d. (Sims-ISWS)
W77-07769

AN EXPERIMENTAL AND THEORETICAL STUDY OF THE TURBULENT AND LAMINAR CONVECTION GENERATED UNDER A HORIZONTAL ICE SHEET FLOATING ON WARM SALTY WATER,
Washington Univ., Seattle, Dept. of Oceanography.
S. Martin, and P. Kauffman.
Journal of Physical Oceanography, Vol. 7, No. 2, p 272-283, March 1977. 9 fig, 4 tab, 12 ref. ONR N00014-76-C-0234

Descriptors: *Ice, *Melting, *Water temperature, *Convection, Laboratory tests, Model studies, Mathematical models, Salinity, Salts, Thermal conductivity, Heat flow, Temperature, Sea water, Turbulence, Laminar flow, Sea ice, Ice-water interfaces, Oceans, Polar regions, Oceanography.
Identifiers: *Floating ice, Ice sheets.

In an experimental and theoretical study, a phenomenon was modeled which occurs in the summer polar oceans; namely, the melting of flat sheets of either glacial ice or desalinated sea ice which float over seawater held at a temperature above freezing. Laboratory results showed that when the solution salinity is such that the temperature of maximum density is below the freezing

temperature, or for seawater salinities greater than 25 parts per thousand, the heat transfer to the ice takes place in three regions. First, just beneath the ice there is a boundary layer across which the salinity increases almost to its far-field value, and the temperature increases linearly. Below the first layer, there is an unstable convective boundary layer, which appears to be part double-diffusive, part pure thermal convection. Finally, there is a region of deep thermal convection. From comarison of a one-dimensional theoretical model of the heat transfer with the laboratory study, it was found that the ice melts about twice as fast for this convective case as for a purely diffusive heat transfer model. (Sims-ISWS)
W77-07773

HEAT AND SALT TRANSFER ASSOCIATED WITH FORMATION OF SEA-ICE,
Cambridge Univ., (England). Dept. of Applied Mathematics and Theoretical Physics.
J. E. Weber.
Tellus, Vol 29, No 2, p 151-160, 1977. 3 fig, 1 tab, 30 ref, 1 append.

Descriptors: *Sea ice, *Salinity, *Freezing, *Model studies, Mathematical models, *Heat transfer, Salts, Ice-water interfaces, Sea water, Mixing, Convection, Water temperature, Water circulation, Oceans, Oceanography.
Identifiers: *Sea ice formation, *Salt rejection.

The transient state of sea-ice formation due to a given constant drop in surface temperature, and the associated change in sea-water salinity due to salt rejection, has been investigated theoretically by the heat balance integral method. The water temperature was taken to be constant. Ice, water, and salt were assumed to coexist in thermodynamic equilibrium at the ice-water interface, and the analysis is valid for small temperature perturbations. The ice growth rate was found to be reduced considerably due to the depression of the freezing point caused by salt rejection. Haline convection with typical wavelength 1-2 mm was found to occur after a characteristic time of order 1 min. Results also were presented for the ice growth problem when the ice-water interface can be regarded as a constant temperature boundary. Some effects of variable thermal properties due to brine trapping in the ice were taken into account. The case of a time-dependent surface temperature also was considered. (Sims-ISWS)
W77-07786

ELECTRICAL RESISTIVITY MEASUREMENTS ON THE ROSS ICE SHELF,
Wisconsin Univ. Madison. Dept. of Geology and Geophysics.
C. R. Bentley.
Journal of Glaciology, Vol. 18, No. 78, p 15-35, 1977. 17 fig, 2 tab, 20 ref, append. NSF GV-36963.

Descriptors: *Ice, *Electrical resistance, *Antarctic, Snow, Snowpacks, Electrical properties, On-site investigations, Measurement, Surveys, Data processing, Model studies, Mathematical models, Glaciers, Glaciology.
Identifiers: *Ice shelves, *Ross Ice Shelf.

Electrical resistivity measurements were made along two perpendicular profiles on the Ross Ice Shelf, Antarctica, in 1973-74. Apparent resistivities generally are well determined at electrode separations from 10 m out to 600 m, where the effect of the highly conducting seawater beneath the shelf becomes strongly felt. Schlumberger and equatorial-dipole data are in excellent agreement on each profile; apparent resistivities on the two profiles, however, differ by about 12% at separations greater than about 30 m. This apparent anisotropy is attributed to a presumed inhomogeneity at a few tens of meters depth, rather than to true anisotropy in the bulk resistivity. A computer program was developed to calculate apparent resistivities on an ice shelf in which the density and temperature, and thus the resistivity, vary continuously with depth. Temperatures were calculated for a steady-state ice shelf; densities were calculated from seismic velocity data. Several different models of the dependence of resistivity on density were tested--one appears to fit the observations very closely, but it must be accepted only with great caution because the assumptions on which it is based are violated in the ice shelf. (Sims-ISWS)
W77-08051

PENETRATION DEPTH OF CLOSELY SPACED WATER-FREE CREVASSES,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences; and Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering.
J. Weertman.
Journal of Glaciology, Vol. 18, No. 78, p 37-46, 1977. 11 ref. NSF AER75-00187.

Descriptors: *Glaciers, *Ice, *Cracks, *Model studies, Mathematical models, Failure(Mechanics), Fractures(Geologic), Faults(Geologic), Tensile strength, Mechanical properties, Glaciology.
Identifiers: *Crevasses.

An approximate, analytic solution was found for the profile of a water-free crevasse in a field of closely spaced crevasses. The depth of penetration of the crevasses into the glacier was found. If the fracture strength of ice is taken to be zero, the penetration depth is equal to the value found by Nye and is independent of the crevasse spacing. This conclusion is in disagreement with results reported recently by R.A. Smith. If the fracture strength of ice is taken to be finite, the penetration depth is reduced if the spacing between crevasses is reduced. The results of the analysis can be applied to other crack problems. In particular, it can be applied to thermal, secondary cracking that occurs when cooling fluid flows through the cracks created by hydraulic fracture for the purpose of extracting geothermal heat from hot, dry rock masses. (Sims-ISWS)
W77-08052

ENERGY EXCHANGE AT A GLACIER SURFACE: AN ALTERNATIVE TO AERODYNAMIC METHODS OF MEASUREMENT,
British Antarctic Survey, Cambridge (England).
A. C. Wager, and A. W. Jamieson.
Journal of Glaciology, Vol. 18, No. 78, p 47-55, 1977. 3 fig, 1 tab, 11 ref.

Descriptors: *Glaciers, *Energy transfer, *Antarctic, *Model studies, Mathematical models, Energy, Temperature, Density, Ice, Ablation, Melting, Freezing, Winds, Meteorology, Glaciology, Methodology, *Measurement.
Identifiers: *Aerodynamic method.

Analysis of wind-speed measurements made over a six-month period on an Antarctic glacier showed that conditions near the surface are dominated by gravity winds flowing downhill. In such conditons there is no satisfactory method of calculating the amount of energy exchanged between the glacier and the atmosphere. Also it is difficult to extrapolate satisfactorily energy changes measured at a single point to the whole glacier. Moreover, the loss of five days' meteorological records may cause an error as large as the total change in energy content of the glacier during a year. In view of these difficulties, it is more fruitful to measure the changes in energy content of the glacier directly. This can be done by accurate measurements of ice temperature and density near the surface. By defining the total energy content of a glacier as the heat required to melt it, fractional changes in the energy content and mass occurring over a year are equal and indicate the probable lifetime of the glacier. Estimates based on data from an Antarctic glacier suggest that the long-term change of energy of the glacier (about 1.5 W/sq m) could be measured with an accuracy of 10% within a year. (Sims-ISWS)
W77-08053

A SNOW-BANK PUSH MECHANISM FOR THE FORMATION OF SOME 'ANNUAL' MORAINE RIDGES,
Aberdeen Univ. (Scotland). Dept. of Geography.
R. V. Birnie.
Journal of Glaciology, Vol. 18, No. 78, p 77-85, 1977. 7 fig, 3 ref.

Descriptors: *Glaciology, *Geomorphology, *Glacial drift, *Antarctic, Glaciers, Till, Land forming, Snow, Movement, On-site investigations, Ablation, Glaciation, Ice.
Identifiers: *South Georgia Island, Lucas Glacier, Ridges, Ridge formation.

Ice-marginal features in South Georgia include minor moraine ridges running approximately parallel to the ice margin and developed as superficial forms in various depths of till. It was suggested that these developed as ice-contact landforms, some being created by the interaction of the ice edge and abutting marginal snow bank, whilst the glacier is advancing. This advance is essentially short-term, being part of a seasonal variation in the position of the ice margin. 'Snow-bank push' is the term proposed to describe this mechanism of ridge formation. This process of 'snow-bank push' results in an extremely variable ridge form which rapidly loses it distinctive character. It soon becomes difficult to differentiate from ridges formed by alternative processes. (Humphreys-ISWS)
W77-08054

STATISTICAL FORECASTING OF SNOW AVALANCHES, SAN JUAN MOUNTAINS, SOUTHERN COLORADO, U.S.A.,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
M. J. Bovis.
Journal of Glaciology, Vol. 18, No. 78, p 87-99, 1977. 4 fig, 10 tab, 7 ref. USBR 14-06-D-7155.

Descriptors: *Avalanches, *Forecasting, *Snow, *Colorado, On-site investigations, On-site data collections, Analytical techniques, Analysis, Statistical methods, Mathematical models, Snowpacks, Data processing.
Identifiers: *San Juan Mountains(Colo), Wet slides, Dry slides.

Meteorological and snow pack variables were measured on chronologically ordered sequences of avalanche and avalanche-free days. Discriminant analysis was used to define a subset of variables, which produced an optimal separation of the two multivariate group means. Two seasons were identified in each of the years considered, corresponding to periods of dry- and wet-snow avalanches, and formed the basic stratification of avalanche days in the analysis. Days were stratified further within each season on the basis of magnitude and number of releases. Weather and snow parameters were integrated over variable time steps prior to each avalanche or avalanche-free day, which introduced a recursive element into the forecast method. The presented results indicate that the prediction of avalanche days using discriminant functions which are derived from a previous season requires a stratification of avalanche events by slide type and magnitude. The overall level of accuracy indicates that the method generally is most effective in predicting days that have at least three events greater than or equal to magnitude two. Since this type of day often has several soft-slab or wet-slab releases, many of which can reach the highway, the method may be used to assess the overall hazard along the highway at a given time. To date (1976), the use of a single critical value, or discriminant index, to determine the status of a given day has possessed the obvious merit of simplicity in a field situation. (Humphreys-ISWS)

W77-08055

PRESENT AND PAST GLACIATION THRESHOLD IN THE CASCADE RANGE, WASHINGTON, U.S.A.: TOPOGRAPHIC AND CLIMATIC CONTROLS, AND PALEOCLIMATIC IMPLICATIONS,
Washington Univ., Seattle. Dept. of Geological Sciences; and Washington Univ., Seattle. Quaternary Research Center.
S. C. Porter.
Journal of Glaciology, Vol. 18, No. 78, p 101-116, 1977. 7 fig, 3 tab, 28 ref.

Descriptors: *Glaciation, *Washington, *Paleoclimatology, *Glaciology, Quaternary period, Topography, Statistical methods, On-site data collections, Climatic data, Regression analysis, Analytical techniques, Ablation, Precipitation(Atmospheric).
Identifiers: *Cascade Mountains(Wash), Glaciation threshold, Isoglacihypses.

Isoglacihypses depicting the configuration of the glaciation threshold in Washington broadly parallel the crest of the Cascade Range and curve around the west and south flanks of the Olympic Mountains. In both uplands, the glaciation threshold rises inland (eastward) with a mean gradient of 10-12 m/km. However, the gradient in the Cascades is more variable due to five east-trending troughs in the glaciation threshold surface that coincide with topographic depressions along the range crest and that apparently result from greater eastward penetration of moist maritime air. Mean accumulation-season precipitation correlates strongly (r squared = 0.86) with altitude of the glaciation threshold in the North Cascade Range, but the correlation of glaciation threshold with altitude of the July freezing isotherm, determined from the calculated July lapse rate within the mountains, is much weaker (r squared = 0.40). Multiple regression analysis relating independent climatic variables that affect the height of the glaciation threshold indicates that 90.4% of variance is explained by accumulation-season precipitation and estimated mean annual temperature at the glaciation threshold. The glaciation threshold during the greatest ice advance of the last (Fraser) glaciation in the southern North Cascade Range (c. 18,000-22,000 years B.P.) was 900 + or - 100 m below that of the present. Depression of the glaciation threshold by this amount probably resulted from a change in accumulation-season precipitation of no more than 30% from present values and a decrease in mean ablation-season temperature of 5.5 + or - 1.5 deg. (Humphreys-ISWS)
W77-08056

AREAL EXTENT OF SNOW ESTIMATION IN THE NORTHERN SIERRA NEVADA MOUNTAINS USING LANDSAT-1 IMAGERY,
California Univ., Berkeley. Remote Sensing Research Program.
For primary bibliographic entry see Field 7B.
W77-08081

SNOW SURVEY FROM SPACE, WITH EMPHASIS ON THE RESULTS OF THE ANALYSIS OF SKYLAB EREP S192 MULTISPECTRAL SCANNER DATA,
Environmental Research and Technology, Inc., Concord, Mass.
For primary bibliographic entry see Field 7B.
W77-08082

FACTORS AFFECTING SNOW ASSESSMENT FROM LANDSAT DATA,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 7B.
W77-08083

OPERATIONAL WATER MANAGEMENT APPLICATIONS OF SNOWCOVERED AREA OBSERVATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W77-08084

2D. Evaporation and Transpiration

THE USE OF LYSIMETERS IN THE HYDROLOGICAL INVESTIGATION OF THE UNSATURATED ZONE,
Research Inst. for Water Resources Development, Budapest (Hungary).
G. Kovacs.
Hydrological Sciences Bulletin, Vol. 21, No. 4, p 499-516, December 1976. 7 fig, 1 tab, 5 ref.

Descriptors: *Hydrologic properties, *Lysimeters, *Instrumentation, *Water balance, *Air-earth interfaces, Soil water, Methodology, Infiltration, Evapotranspiration, Measurement, Hydrology, Soil water movement.
Identifiers: Field measurements.

Data from experimental basins are frequently used in models to find the surface runoff originating from a given precipitation. It is difficult to predict the response function of a basin to a forthcoming meteorological event from observed data in the past and to use these data for other areas or larger basins because little is known of the hydrological processes occurring in the soil moisture zone. To overcome these difficulties, the experimental areas have to be equipped with lysimeters. Lysimeters themselves can be regarded as small experimental areas. The study of their water balance assists not only the understanding of the influence of the soil moisture zone on surface runoff, but also the same investigation is required for the evaluation of the directly measured data. It is necessary, therefore, to classify the different types of lysimeters. Some hydrological parameters can be measured directly by lysimeters and there are suitable methods for the calculation of the other parameters. The relationships necessary for the evaluation of the measured data were summarized for the main types of lysimeter, and the data application was represented on the basis of practical experiments. (Adams-ISWS)
W77-07780

EVALUATION OF THERMAL X/5-DETECTOR SKYLAB S-192 DATA FOR ESTIMATING EVAPOTRANSPIRATION AND THERMAL PROPERTIES OF SOILS FOR IRRIGATION MANAGEMENT,
South Dakota State Univ., Brookings. Remote Sensing Institute.
For primary bibliographic entry see Field 7B.
W77-08079

2E. Streamflow and Runoff

FLOODFLOW FORMULAS FOR URBANIZED AND NONURBANIZED AREAS OF CONNECTICUT,
Geological Survey, Hartford, Conn. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-07612

SOME APPLICATIONS OF STOCHASTIC FLOW GENERATION,
Birmingham Univ. (England).
For primary bibliographic entry see Field 2A.
W77-07647

STOCHASTIC ANALYSIS OF VELOCITY FLUCTUATIONS IN A NATURAL STREAM CHANNEL,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
M. J. Hall, and P. M. Johnston.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 26-38, 1974. 7 fig, 2 tab, 10 ref.

Descriptors: *Velocity, *Flow, *Fluctuations, *Stochastic processes, Turbulent flow, Rivers, Open channel flow, Natural flow, Turbulence, Current meters, Measurement, Analytical techniques, On-site investigations, Foreign research, Currents(Water).
Identifiers: *United Kingdom.

One of the major errors in current meter measurements of flow velocities in natural stream channels arises from the effect of low-frequency turbulent velocity fluctuations. The magnitude of this error has generally been estimated on the assumption that the velocity fluctuations are random in time. A study was carried out at a gauging station in the North of England, during which two-hour long series of velocity measurements were obtained at three depths in the same vertical of the cross section. Objectives of study were: (1) to examine the time series of velocities at each point in the vertical for the presence of periodicities; (2) to examine the cross-correlation between synchronous velocity measurements in the same vertical; and (3) to determine the influence (if any) of the type of current meter on the results of (1) and (2) above. Analysis of these data revealed a concentration of variance at low frequencies, but no obvious periodic components. This correlation structure should be taken into account when quantifying the likely error in a limited-exposure point measurement of velocity. (See also W77-06708) (Humphreys-ISWS)
W77-07648

INVESTIGATIONS ON THE STRUCTURE OF FREQUENCY DISTRIBUTIONS OF FLOODS,
Technische Universitaet, Dresden (East Germany).
S. Dyck, and C. Kluge.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 39-46, 1974. 3 fig, 2 tab, 14 ref.

Descriptors: *Floods, *Flood frequency, *Statistical methods, Annual flood, Rainfall-runoff relationships, Watersheds(Basins), Hydrology, Precipitation(Atmospheric), Analytical techniques, Mathematical studies, Flow, Historic floods, Distributions, Foreign countries, Foreign research.
Identifiers: *German Democratic Republic, Multivariate analysis.

Because of numerous influences on the runoff process, which operate in a different manner for different flood values, variable behavior of the distribution function is to be expected. To improve knowledge, it is necessary to use all additional information, from deterministic as well as from statistical sources. In this paper several possibilities were discussed, especially the influence of physical thresholds, the statistical treatment of a sample of flood discharges exceeding a base flow, and the multivariate treatment of precipitation, retention, and discharge samples. (See also W77-06708) (Humphreys-ISWS)
W77-07649

BAYESIAN ESTIMATION OF FREQUENCY OF HYDROLOGICAL EVENTS,
Institute of Hydrology, Wallingford (England).
C. Cunnane, and J. E. Nash.

In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 47-55, 1974. 2 fig, 2 tab, 9 ref, 1 append.

Descriptors: *Hydrologic aspects, *Flood frequency, *Statistical methods, Flood forecasting, Flood recurrence interval, Mathematical studies, Frequency, Hydrology, Analytical techniques, Regional flood, Floods, Analysis.

A distinction was drawn between a sampling confidence interval and a probalistic statement concerning the value of a population parameter. A method was developed which uses Bayes' theorem to combine the information of a regional flood frequency analysis and that of a sample of annual maxima to obtain a posterior probability distribution for a flood corresponding to a given return period. (See also W77-06708) (Humphreys-ISWS)
W77-07650

STOCHASTIC STRUCTURE OF A PROCESS OF AVERAGE MONTHLY FLOWS,
Technical Univ. of Warsaw (Poland).
H. Mitosek, Jr.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 56-61, 1974. 1 fig, 3 tab, 8 ref.

Descriptors: *Average flow, *Statistical models, *Markov processes, Analytical techniques, Mathematical models, Foreign countries, Hydrology, Statistical methods, Correlation analysis, Mathematical studies, Monthly, River flow.
Identifiers: *Poland.

A stochastic structure of a process of monthly average flow is considered, and a procedure was developed for testing the null hypothesis of a model with independent variables against a simple Markov process as alternative. On basis of empirical data for nine stations in Poland, it was found that (1) the process Q(t) of an average monthly inflow can not be considered as a process with independent variables; and (2) a very fair approximation to the process Q(t) is furnished by a simple Markov model. (See also W77-06708) (Humphreys-ISWS)
W77-07651

METHODS FOR THE MATHEMATICAL DESCRIPTION OF THE STRUCTURE OF RIVER RUNOFF VARIATIONS,
Hydrometeorological Service of the USSR, Moscow.
A. V. Rozhdestvensky.
In: Mathematical Models in Hydrology, Volume 1: Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 62-66, 1974. 1 fig, 2 tab.

Descriptors: *Runoff, *Statistical models, *Streamflow, Annual, Rivers, Foreign countries, Variability, Discharge(Water), Mathematical models, Mathematical studies, Statistical methods, Correlation analysis, Analytical techniques.
Identifiers: *USSR, Spectral analysis.

The structure of long-term river runoff variations was investigated by means of correlation and spectral analyses, as well as by methods of smoothing. On the basis of computations performed, the conclusion was reached that correlation and spectral functions, as well as the smoothed annual river runoff values combined with the use of the binomial filter, satisfactorily describe the structure of the cyclic river runoff variations within the observation period; but the correlation and spectral functions cannot be treated as characteristics of the process as a whole since they reflect the sporadic fluctuations of the sampling data. (See also W77-06708) (Humphreys-ISWS)
W77-07652

SPECTRAL ANALYSIS OF THE STRUCTURE OF HYDROLOGICAL SERIES,
A. I. Davydova.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 67-75, 1974. 4 fig, 8 ref.

Descriptors: *Streamflow, *Fluctuations, *Mathematical studies, *Runoff, Variability, Mathematical models, Statistical methods, Analytical techniques, Hydrology, Time series analysis, Foreign research, Foreign countries, Rivers, Cycles, Succession.
Identifiers: *USSR, Spectral analysis.

This paper examined the nature of long-range streamflow fluctuations for the purpose of investigating the internal structure of hydrological series. The mathematical techniques of the theory of stationary random processes were applied in order to obtain quantitative information on the structure of runoff series. In a study of the structure of long-term hydrological series, the basic interest lies in the regularities, their duration, and areal distrubution of cyclic runoff fluctuations. The cyclic components of the runoff process were determined with the help of spectral analysis. A mathematical model was proposed for describing the deterministic component. Its essence lies in the fact that the empirical series are represented in the form of a complex harmonic structure that takes into account the effect of 2, 5, 7, and 11-year cycles in streamflow fluctuations. This model can be of use for gaining insight into the nature of runoff fluctuations for any water basin in the world. (See also W77-06708) (Humphreys-ISWS)
W77-07653

SPATIAL AND TIME ANALYSIS AND ESTIMATION OF RIVER FLOW,
Moscow State Univ. (USSR). Dept. of Geography.
G. P. Kalinin, N. V. Nikolskaya, V. M. Evstigneyev, and V. A. Zhuk.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 76-79, 1974.

Descriptors: *Streamflow forecasting, *Discharge(Water), *Statistical methods, Streamflow, Rivers, Frequency, Frequency curves, Probability, Spatial distribution, Analysis, Runoff, Monthly, Annual, Foreign research.
Identifiers: *USSR, Coefficient of skewness, Ergodicity, Kurtosis.

A new principle of constructing probability distribution curves for characteristic streamflow values was suggested. The suggested principle is the application of the hypothesis of ergodicity to flow series which requires introducing the following changes: (1) The differences in statistical parameters due to territory should be taken into consideration in serial generalization. (2) In order to avoid the effect of correlation in generalizing serial observations, the dimensions of territories must be such that the effect of positive and negative correlations would be mutually cancelled. For investigations of the annual flow, the size of the territory must be at least 20 to 25 million sq km; for flows of other durations the size of territory can be less. (3) Since the present day samples of observations allows sufficiently accurate determination of only two statistical parameters (mean annual flow and coefficient of variation), success (at serial generalization) can be obtained only when the parameters of higher orders (coefficient of skewness and kurtosis excess E) are directly related to the precisely determined parameters. As it follows from theoretical considerations and confirmed by subsequent analysis of the observed data, this assumption generally holds satisfactorily. Equations for coefficient of skewness and E were tabulated for minimum daily discharges, minimum mean monthly discharges, flow during the dry season, flow during the wet season, maximum mean monthly discharges, maximum discharges, and mean yearly discharges. (See also W77-06708) (Humphreys-ISWS)
W77-07654

ELEMENTS OF RUNOFF PERIODICITY IN TASKS OF MODELLING,
Gruzinskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Tiflis (USSR).
I. B. Khomeriki.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 80-84, 1974. 2 fig, 1 tab, 10 ref.

Descriptors: *Streamflow, *Mathematical models, *Statistical methods, *Runoff, Rivers, Statistical models, Frequency, Cycles, Annual, Stochastic processes, Monte Carlo method, Hydrologic aspects, Time series analysis, Foreign research, Probability, Succession.
Identifiers: *USSR.

Some aspects of the use of the Monte Carlo method in the research and modelling of the periodic elements of annual runoff were considered. An attempt was made to correlate model construction and cyclicity calculation in tasks of regulation. The Grenander-Rossenblatt method was proposed to find the spectral characteristics of a hydrological series. All the statements were based on the equivalence of two alternative hypotheses: (1) runoff is a stochastic process with a periodic trend; and (2) runoff is a stochastic process which does not contain regular components. (See also W77-06708) (Humphreys-ISWS)
W77-07655

CYCLICAL STRUCTURE OF THE HYDROLOGICAL SERIES AND THE NATURE OF INDIVIDUAL COMPONENTS,
Siberian Energy Inst., Irkutsk (USSR).
S. G. Agarkov, I. P. Druzhinin, and Z. P. Konovalenko.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 85-90, 1974. 3 fig, 2 tab, 5 ref.

Descriptors: *Runoff, *Mathematical models, *Streamflow, *Rivers, Variability, Annual, Hydrological aspects, Hydrology, Air circulation, Cycles, Atmosphere, Foreign research, Statistical methods.
Identifiers: *USSR, Solar activity.

The cyclical structure of the annual river runoff of the USSR was confirmed by strict methods. The peculiarities of the river runoff variations in different atmospheric circulation epochs were exposed. By means of the coherence index, the relationship of both the 10 to 11-year components for the atmospheric circulation variations and river runoff variations with the solar activity was explained. The considered examples showed, on the one hand, the reality of the solar-hydrological relationships; but on the other hand, the examples indicated the great influence of the atmospheric circulation as an intermediate factor, which indicates the necessity of a more profound and careful study of the principal elements in the sequence leading from solar activity to river runoff. (See also W77-06708) (Humphreys-ISWS)
W77-07656

PROBLEMS ENCOUNTERED IN SYNTHETIC RIVER FLOW GENERATION PROCEDURES,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 2A.
W77-07657

ON DETERMINISTIC COMPONENTS IN NATURAL STREAMFLOW,
Akademiya Nauk SSSR, Moscow. Scientific Research Inst. of Electroenergetics.
N. S. Korganova, and N. A. Kartvelishvili.
In: Mathematical Models in hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 101-103, 1974. 4 ref.

Descriptors: *Streamflow, *Mathematical studies, *Natural streams, Mathematical models, Stochastic processes, Hydrology, Annual, Analytical techniques, Foreign research, Foreign countries.
Identifiers: *USSR.

The results were presented of research into the estimation by maximum likelihood of deterministic components in several years' record of a hydrological times series. (See also W77-06708) (Humphreys-ISWS)
W77-07658

NEW FORMS OF CORRELATION RELATIONSHIPS BETWEEN POSITIVE QUANTITIES APPLIED IN HYDROLOGY,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2A.
W77-07659

THE GENERATION OF SYNTHETIC MONTHLY RUNOFF RECORDS FOR UNGAUGED BRITISH CATCHMENTS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-07661

MULTIDIMENSIONAL STATISTIC MODELLING OF HYDROLOGICAL PROCESSES ON THE BASIS OF STRUCTURAL ANALYSIS OF THE EMPIRICAL HYDROGRAPHS OF RUNOFF,
Siberian Energy Inst., Irkutsk (USSR).
For primary bibliographic entry see Field 2A.
W77-07662

STOCHASTIC DIFFERENCE EQUATION MODELLING OF HYDROLOGICAL PROCESSES,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
R. A. Rao, and R. L. Kashyap.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 140-150, 1974. 4 fig, 4 tab, 11 ref. OWRT B-025-IND(1). NSF GK18225, AFOSR 19-1776.

Descriptors: *Hydrologic systems, *Mathematical models, *Forecasting, *Algorithms, *Indiana, Mathematical studies, Mathematics, Stochastic processes, Statistical methods, Model studies, Analytical techniques, Streamflow, Flow, River flow, Hydrologic aspects, Hydrology.
Identifiers: *Wabash River(Ill), *White River(Ind), Daily flows.

Hydrological processes are modelled in the form of finite difference equations. The problem of parameter estimation by the method of moments, especially for systems of higher order, can be formidable both from the computational and analytical points of view. In order to overcome this problem, a recursive system identification procedure, along with a predection scheme, was proposed. The identification of the system parameters and the single step or multistep prediction of the variable of interest were performed simultaneously. Three aspects of hydrological interest were discussed by using an algorithm. These aspects are the prediction of daily flows, the modelling of the systems of different orders for simulating daily flows, and an analysis of the criterion to select the 'best' system model. The performances of systems of various orders were analyzed by using their error characteristics. The method analysis was illustrated by using data from two rivers in Indiana. (See also W77-06708) (Humphreys-ISWS)
W77-07663

STRUCTURAL RELATION BETWEEN PARAMETRIC AND STOCHASTIC HYDROLOGY MODELS,
Pittsburgh Univ., Pa.
For primary bibliographic entry see Field 2A.
W77-07664

SIGNIFICANCE TESTS OF PERIODICITY IN HYDROLOGICAL TIME SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-07665

A SIMPLE STOCHASTIC MODELLING OF HURST'S LAW,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
P. E. O'Connell.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 169-187, 1974. 9 fig, 2 tab, 23 ref.

Descriptors: *Strea..flow, *Hydraulics, *Model studies, *Mathematical models, Streams, Rivers, Reservoirs, Flow, Inflow, Stochastic processes, Monte Carlo method, Water resources, Synthetic hydrology, Hydrology.
Identifiers: *Hurst's law.

A stationary stochastic linear process was proposed which models Hurst's law successfully within asymptotically large time series. The model, a mixed, moving, average-autoregressive process belonging to the Brownian domain, incorporates two parameters which preserve estimates in generated sequences from a historic record of both h, the Hurst coefficient, and rho sub 1, the first autocorrelation coefficient. For certain values of the parameters, the autocorrelation function of the model embraces a very larg time span, thereby ensuring adquat fitting of low frequency effects in a historic record and their reproduction in a generated sequence. The simultaneous preservation of fho sub 1 ensures satisfactory high frequency behavior. The elegant simplicity of the model should prove attractive to engineers wishing to preserve historic record estimates of both h and rho sub 1 within synthetic sequences. (See also W77-06708) (Sims-ISWS)
W77-07666

IN HYDROLOGY H IS A HOUSEHOLD WORD,
IBM Thomas J. Watson Research Center, Yorktown Heights, N. Y.
For primary bibliographic entry see Field 2A.
W77-07667

MATHEMATICAL MODELS RESULTING FROM STATISTICAL ANALYSIS OF THE MEAN MONTHLY FLOW,
Ebasco Services, Inc. New York.
B. S. Browzin.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 212-217, 1974. 5 fig, 3 tab, 8 ref.

Descriptors: *River flow, *Rivers, *Model studies, Mathematical models, Mathematical studies, Streamflow, Flow, Monthly, Discharge(Water), Curves, Frequency curves, Hydrology.
Identifiers: *Petawawa River(Canada).

The mean monthly flow frequencies were studied for the purpose of establishing mathematical models representing the series of mean monthly river discharges, comprised of the series of January discharges, February discharges, etc. The variance of these series is large for most months, particalarly for autumn months, while the skewness also is large. The frequency functions which describe other hydrologic series well are only partially applicable to the mean monthly flow distribution. Other models were suggested, the Petawawa River (Canada) serving as an object for this study. (See also W77-06708) (Sims-ISWS)
W77-07669

FLOOD FREQUENCY STUDIES OF RIVERS IN THE FEDERAL REPUBLIC OF GERMANY,
Technische Universitaet, Brunswick (West Germany). Leichtweiss Inst. for Water Research.
U. Maniak.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 221-225, 1974. 4 fig, 1 tab.

Descriptors: *Watersheds(Basins), *Runoff, *Model studies, Mathematical models, Precipitation(Atmospheric), Statistical methods, Flow, Foreign countries, Foreign research, Streamflow, Gaging stations, Stream gages, Analytical techniques, Hydrology.
Identifiers: *West Germany, Skewness.

The influence of the length of time series and of locally dependent statistical parameters was shown for 121 gauge stations of small watersheds in the Federal Republic of Germany. Investigations were based on the logarithmic Pearson type III distribution. (See also W77-06708) (Sims-ISWS)
W77-07670

STATISTICAL ANALYSIS APPLIED TO THE STUDY OF THE COMPONENTS OF A FLOOD WAVE,
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
V. Stanescu, and C. Catana.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 253-265, 1974. 6 fig, 3 tab, 5 ref.

Descriptors: *Flood waves, *Rivers, *Watersheds(Basins), *Model studies, Mathematical models, Correlation analysis, Probability, Discharge(Water), Peak discharge, Flow, Streamflow, Stream gages, Analytical techniques, Foreign research, Foreign countries, Hydrology.
Identifiers: *Romania.

A method of determining the main characteristics of flood wave components at the outlet of a drainage system was presented. The method is based on the correlation existing between the volume and maximum flow of component waves over the different locations of a system. The unidimensional spread of the data rows for the stream and maximum flow are converted into normal distributions, and hence, the probabilities for a simultaneous occurrence of wave components at each confluence point are calculated. A further demonstration was made of the way to pass from

one confluence point to another with a final achievement in the form of an areal distribution, tabulation for the elements characteristic to the components over a whole basin, when the outlet flood waves have a given probability, defined by their volume or the high tide. Finally, a method of determining the statistical data of the main item rows of components within points with no direct measurements was presented. (See also W77-06708) (Sims-ISWS)
W77-07674

A MULTIVARIATE MATHEMATICAL MODEL OF MONTHLY RIVER FLOW,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering.
S. Pinkayan, and R. Khaleel.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 279-288, 1974. 4 fig, 1 tab, 9 ref.

Descriptors: *River flow, *Rivers, *Monthly, *Model studies, Mathematical models, Time series analysis, Correlation analysis, Flow, Streamflow, Irrigation, Hydrology, Foreign research, Foreign countries.
Identifiers: *Thailand.

River flow data are often recorded at the site of water resource projects for a short period of time, while records are available for longer periods at other gaging stations. The purpose of this study is to find a mathematical model to represent a time series of monthly river flows at the project site, including the statistical parameters of flow at the gaging station of longer record. The model is composed of three components; namely, trend, periodic, and stochastic. The trend component was eliminated by adding irrigation diversion to measured flow and thereby obtaining the reconstructed virgin flow. The logarithm of virgin flow was then made stationary, or periodicity free, by fitting the periodic function of a 12-month period and its subharmonics. The techniques of correlogram and spectral analysis were used to detect the periods in the monthly means and to detect the standard deviations about the monthly values. The stationary stochastic series was found to fit well a linear autoregressive scheme of first order for two stations. (See also W77-06708) (Sims-ISWS)
W77-07675

FINDING REGULARITIES IN LONG-TERM STREAMFLOW FLUCTUATIONS BY ANALYSIS OF HYDROLOGICAL ENSEMBLES,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
S. N. Kritsky, and M. F. Menkel.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 299-304, 1974. 16 ref.

Descriptors: *Streamflow, *Runoff, *Fluctuations, *Model studies, Mathematical studies, Streamflow forecasting, Peak discharge, Discharge(Water), Rivers, Streams, Probability, Watersheds(Basins), Rainfall, Precipitation(Atmospheric), Maximum probable flood, Hydrology, Meteorology, Foreign research, Foreign countries.
Identifiers: *USSR.

Flow observations from each separate river basin are insufficient for the estimation of probability characteristics of runoff, especially in the evaluation of rare extremes. As it is not possible to increase the number of flow observations from each station, the only alternative is to attempt to increase the record length by a combined analysis of data from a set of river basins. The main difficulty lies in taking into account the non-uniformity of the material being jointly investigated. The report contained an approach to the solution of this problem. (See also W77-06708) (Sims-ISWS)
W77-07676

TIME AND FREQUENCY-DOMAIN IDENTIFICATION OF A CASUAL BIVARIATE STOCHASTIC PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. C. Kisiel, and L. Duckstein.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 364-371, 1974. 4 fig, 1 tab, 5 ref. OWRT B-007-ARIZ(27).

Descriptors: *Streamflow, *Rivers, *Model studies, Mathematical models, Forecasting, Stochastic processes, Time series analysis, Flow, Regression analysis, Data processing, Hydrology.
Identifiers: *San Francisco River(NM).

Short-term forecasting of river flows requires specification of either a deterministic or a stochastic model. To ascertain the utility of stochastic models, a bivariate time series analysis of flows at two stations 12 miles apart on the San Francisco River, New Mexico, was performed. Use of multiple input-output pairs indicates that later or earlier flows introduce artificial noise into bivariate correlations and spectra such that either meaningful interpretation is obscured or loss of information occurs. Consideration of individual input-output pairs grouped into seasons, then of high, medium and low flows provides more insight into the nature of the nonlinear delays and extent of linear attenuation induced by the system. The coherences are strongest for the flood peaks and for the lower part of the recessions. The effects of sample size, sampling interval, and number of lags on system identification were also considered. The analysis leads to a series of bivariate time series models for forecasting downstream flows. This method was compared to predictions by regression so as to evaluate information loss and transferability. (See also W77-06708) (Sims-ISWS)
W77-07680

RUNOFF, EROSION, AND NUTRIENT MOVEMENT FROM INTERRILL AREAS,
Purdue Univ., Lafeyette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W77-07766

REPRESENTATIVE AND EXPERIMENTAL BASINS - WHERE NEXT,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2A.
W77-07781

ASPECTS OF BANKFULL GEOMETRY IN A DISTRIBUTARY SYSTEM OF EASTERN AUSTRALIA,
Macquarie Univ., Ryde (Australia). School of Earth Sciences.
S. J. Riley.
Hydrological Sciences Bulletin, Vol. 21, No. 4, p 545-560, December 1976. 6 fig, 4 tab, 29 ref.

Descriptors: *Streams, *Cross-sections, *Channel morphology, *Energy loss, *Australia, Sediment load, Roughness(Hydraulic), Measurement, Foreign countries, Foreign research.
Identifiers: *Factor analysis.

The bankfull cross sectional geometry of a stream was described by 18 variables, and it was pointed out that each of these variables can be used to discriminate among stream sites. These variables were reduced to four factors: (1) an index of channel capacity and efficiency, (2) an index of cross sectional shape and mode of energy expenditure, (3) an index of bottom width and sediment load, and (4) an index of profile roughness. These four factors were shown to explain 84% of the correlation matrix variance. (Bhowmik-ISWS)
W77-07782

2F. Groundwater

METAMORPHIC REACTIONS IN FLYSCH ROCKS,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07609

14C EVIDENCE FOR THE ORIGIN OF ARID REGION GROUNDWATER, NORTHEASTERN PROVINCE, KENYA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-07611

USE OF CROSS-CORRELATION TECHNIQUES FOR DETERMINING THE RELATIONSHIP BETWEEN GROUNDWATER LEVELS AND SOURCES IN THE NILE DELTA AREA,
M. G. Elgizawi.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 319-325, 1974. 6 fig, 3 tab.

Descriptors: *Rivers, *Aquifers, *Water levels, *Model studies, Mathematical models, Hydrographs, Correlation analysis, Stochastic processes, Groundwater, Groundwater recharge, Water table, Surface-groundwater relationships, Hydrology, Foreign countries, Foreign research, Deltas.
Identifiers: *Nile River(Egypt).

The movement of groundwater in the River Nile delta is affected by fluctuations in the level of the river, which is the main feeder of the delta's aquifer. The relationship between the river and the adjacent aquifer water levels for any time lag was studied by the use of the cross-correlation technique. The relationship was defined, and then it was used to pedict the groundwater levels and flow from the aquifer. (See also W77-06708) (Sims-ISWS)
W77-07679

DETERMINATION OF SALT-WATER INTERFACE BY ELECTRIC RESISTIVITY DEPTH SOUNDINGS,
Tel Aviv Univ. (Israel). Dept. of Environmental Sciences.
A. Ginzburg, and A. Levanon.
Hydrological Sciences Bulletin, Vol. 21, No. 4, p 561-568, December 1976. 6 fig, 6 ref.

Descriptors: *Aquifers, *Saline water intrusion, *Saline water-freshwater interfaces, Observation wells, Geophysics, Hydrogeology, Groundwater, Monitoring, Mapping, Foreign research.
Identifiers: *Electrical resistivity, *Geophysical methods, *Israel, Coastal aquifers.

Vertical electrical resistivity soundings were measured near hydrological observation wells in order to ascertain whether geophysical means could be used to map saline water intrusion into a freshwater aquifer in Israel. The soundings showed that the low resistivity layers associated with the salt water are readily discernible. The technique was applied to the entire coastal belt and resulted in a detailed study of the saline water body and its extent. Measurements were repeated six years later, and good agreement between the two sets of measurements was noted. This technique, therefore, is judged to be an accurate tool for the mapping of

salt water intrusion in freshwater aquifers. (Adams-ISWS)
W77-07783

THE USE OF SKYLAB AND LANDSAT IN A GEOHYDROLOGICAL STUDY OF THE PALEOZOIC SECTION, WEST-CENTRAL BIGHORN MOUNTAINS, WYOMING,
Wyoming Univ., Laramie. Dept. of Geology.
For primary bibliographic entry see Field 7B.
W77-08063

2G. Water In Soils

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES, VOLUME 4, (ANALYTICAL METHODS FOR SEWAGE SLUDGE ANALYSIS),
Toronto Univ. (Ontario). Inst. of Environmental Sciences.
For primary bibliographic entry see Field 5A.
W77-07614

EXAMINATION OF SEWAGE SLUDGE FOR ENTEROVIRUSES, VOLUME 2,
Ontario Ministry of Health, Toronto. Lab. Services Branch.
For primary bibliographic entry see Field 5B.
W77-07615

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, MALHEUR LAKE DRAINAGE BASIN, APPENDIX I-12,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
Prepared for the Oregon State Water Resources Board, (Salem), 1969. 79 p, 2 fig, 10 tab, 2 map.

Descriptors: Soils, *Soil surveys, *Soil profiles, Soil properties, *Soil types, *Infiltration, *Infiltration rates, *Runoff, *Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone.
Identifiers: *Malheur Lake Drainage Basin(OR), *Available waterholding capacity(AWHC), *Shrink-swell potential, Erosion hazard, Temperature limitation.

A general soil map and soil descriptions, interpretations and acreage figures are presented on 6.3 million acres of the Malheur Lake Basin in southeastern Oregon. The Malheur Basin includes most of Harney County and parts of Lake, Malheur, Grant and Cook Counties. The report is based on information gathered by the National Cooperative Soil Survey program, with soil interpretations relating to water use and management. Major physiographic areas covered in the report are basins and valleylands, grass-shrub covered lava plains and plateaus, and forested uplands. Poor drainage and alkali conditions are found primarily in Harney and Lake Counties, in the Guano, Catlow, and Silvies sub-basins. Guidelines are given for interpreting soils for irrigation suitability, providing limits for classes of slight, moderate, severe, and very severe limitations. Fifteen of the 48 soils analyzed were unsuitable for irrigation due to shallow, stony soils or steep slopes. Those soils subject to flooding and ponding are given, as well as runoff potential for all soils. Soils are analyzed according to runoff, infiltration, permeability, available water-holding capacity (AWHC), effective root zone, shrink-swell potential, workability, erosion hazard and temperature limitations. Reconnaissance clssification units and land units identified in the Basin and shown on the soil map are described. (Gentry-NC)
W77-07617

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, GOOSE AND SUMMER LAKES DRAINAGE BASIN, APPENDIX I-13,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
B. B. Lovell, J. A. Norgren, G. H. Simonson, M. G. Lindsay, and D. Anderson.
Prepared for the Oregon State Water Resources Board, (Salem), 1969. 94 p, 2 fig, 10 tab, 2 map.

Descriptors: Soils, *Soil surveys, *Soil profiles, Soil properties, *Soil types, Infiltration, *Infiltration rates, Runoff, *Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone.
Identifiers: *Goose Lake Drainage Basin(OR), *Summer Lake Drainage Basin(OR), *Available water-holding capacity(AWHC), *Shrink-swell potential, Erosion hazard, Temperature limitation.

A general soil map and soil descriptions, interpretations and acreage figures are presented for 5 million acres of the Goose and Summer Lakes Drainage Basin in south-central Oregon, 1.5 million acres of which are suited for crops or improved pasture. The basin includes most of Lake County and parts of Harney, Klamath and Deschutes Counties. The basin consists of a varied terrain of large fault-block basins, upthrust dissected highlands and lava tablelands. Physiographic areas include lake basins and alluvial bottomlands, grass-shrub covered lava plateaus and plains, pumice-mantled high lava plains and forested mountain uplands. Most poorly drained and alkali soils occur in Lake County, mostly in the Summer Lake sub-basin. Guidelines are presented for interpreting soils into irrigation suitability groups, with 12 soil/land characteristics rated as to excellent, moderate, severe and very severe limitations. Forty-seven of the soils analyzed are poorly suited or unsuited for irrigation because of shallow soils, stony or coarsely textured soils, and/or steep slopes. A total of 1,557,800 acres are suited for irrigation. Soils are studied according to runoff, permeability, available water-holding capacity (AWHC), effective root zone, shrink-swell potential, workability, erosion hazard and temperature limitations. Soils are interpreted with regard to water use and management, based on information gathered by the National Cooperative Soil Survey program in Oregon. Descriptions are given of soil series and land types found in the basin. (Gentry-NC)
W77-07618

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, KLAMATH DRAINAGE BASIN, APPENDIX I-14,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
J. S. Cahoon, and G. H. Simonson.
Prepared for the Oregon State Water Resources Board, (Salem), 1969. 78 p, 35 fig, 18 tab.

Descriptors: Soils, *Soil surveys, *Soil profiles, Soil properties, *Soil types, Infiltration, *Infiltration rates, Runoff, *Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone.
Identifiers: *Klamath Drainage Basin(OR), *Available water-holding capacity(AWHC), *Shrink-swell potential, Erosion hazard, Temperature limitation.

A general soil map and soil descriptions, interpretations and acreage figures are presented for 3.5 million acres of the Klamath Basin, of which more than 900,000 acres are suited for crop and improved pasture production. The basin is composed of the watersheds of the Klamath, Williamson, Sprague and Lost Rivers located in south-central Oregon. The basin is divided into three physiographic divisions including the Cascade Mountains, the Basin and Range section, and the lava plateaus. Soils are interpreted with regard to water use and management, based on information gathered by the National Cooperative Soil Survey program in Oregon. Poorly drained soils are Algoma, Chinchallo, Ck, Kirk, Moyina, Tulana, and Yamsay. The Williamson River sub-basin especially has drainage problems. Guidelines are given for interpreting soils into irrigation suitability groups, with 12 soil/land characteristics rated. Soils subject to seasonal flooding are Algoma, Chinchallo, Ck, Ho, Kirk, Klamath, Moyina, Ontko, Pit, tulana, Yamsay and Yonna. Many of the soils in the Klamath Basin have become alkaline as a result of wetness. Reclamation potential for alkaline soils is discussed. Soils are analyzed according to runoff, infiltration, permeability, available water-holding capacity (AWHC), effective root zone, shrink-swell potential, workability, erosion hazard, and alkali status. Descriptions are given of the soil series, land types, and mapping units in the basin. (Gentry-NC)
W77-07619

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER, GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, ROGUE DRAINAGE BASIN, APPENDIX I-15,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
W. E. Power, and G. H. Simonson.
Prepared for the Oregon State Water Resources Board, (Salem), 1969, 69 p, 3 fig, 12 tab, 2 map.

Descriptors: Soil, *Soil surveys, *Soil profiles, *Soil properties, *Soil types, Infiltration, rates, Runoff, *Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone.
Identifiers: *Rogue Drainage Basin(OR), *Available water-holding capacity(AWHC), *Shrink-swell potential, Erosion hazard, Temperature limitation.

A general soil map and soil descriptions, interpretations and acreage figures are presented for 2,745,400 acres of the Rogue Drainage Basin in southwest Oregon, 400,000 acres of which are suited for crops or improved pasture. The basin lies mainly in Jackson and Josephine Counties. The terrain is predominantly forested and mountainous with Cascade Mountains running north-south (essentially a rolling plateau of volcanic material) and the Klamath Mountains extending westerly to the Pacific Ocean. Physiographic categories studied include stream bottomlands, low foothills and valley terraces, Klamath mountains, Cascade slopes and Cascade Mountains. Sub-basins studied are the Upper Rogue, Little Butte Creek, Bear Creek, Applegate, Middle Rogue, Illinois and Lower Rogue. Areas subject to impeded drainage, irrigation suitability, frequency of flooding and hydrologic soil groups are discussed. Soils are analyzed according to runoff, permeability, available water-holding capacity (AWHC), effective root zone, shrink-swell potential, workability, erosion hazard, temperature limitations and drain field limitations. Soils are interpreted with regard to water use and management based on information collected in the National Cooperative Soil Survey program in Oregon. Descriptions are given of the soil series and land types found in the basin and shown on the soil map. (Gentry-NC)
W77-07620

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, UMPQUA DRAINAGE BASIN, APPENDIX I-16,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
J. A. Pomerening, R. C. Paeth, E. G. Knox, and G. H. Simonson.
Prepared for the Oregon State Water Resources Board, (Salem), 1969, 77 p, 1 fig, 13 tab, 2 map.

Descriptors: Soils, *Soil surveys, *Soil profiles, Soil properties, *Soil types, Infiltration, *Infiltration rates, Runoff, *Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone.
Identifiers: *Umpqua Drainage Basin(OR), *Available water-holding capacity(AWHC), *Shrink-swell potential, Erosion hazard, Temperature limitation.

A general soil map and soil descriptions, interpretations and acreage figures are presented for 1,232,000 acres of the Umpqua Basin in western Oregon, about one third of the total drainage basin. The climates of the basin are grouped into coastal, intermountain lowlands and Cascade Mountain subdivisions with precipitation determined by elevation and proximity to the Pacific Ocean. The Coast Range lies in the western part, the Klamath Mountains in the southern portion, and the Cascade Mountains along the eastern fringe. The basin is covered with forest except where cleared for agriculture or grazing. About 275,000 acres are suitable for irrigation. Twelve soil/land characteristics are rated for irrigation suitability--excellent, good/fair, poor, very poor/nonirrigable. Soils subject to seasonal flooding are Brenner, Camas, Cloquato, Coquille, Gardiner, Nehalem, Nestucca and Newberg. Approximately 85,000 acres are subject to seasonal and occasional flooding. Soils are analyzed in terms of runoff, infiltration, permeability, available water-holding capacity (AWHC), effective root zone, shrink-swell potential, workability, and erosion hazard. A total of 113 soil series were taken. Soils are interpreted with regard to water use and management, based on information gathered by the Natonal Cooperative Soil Survey program in Oregon. Soil series and land types found in the basin and shown on the soil map are described. (Gentry-NC)
W77-07621

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, NORTH, MID-, AND SOUTH COAST DRAINAGE BASINS, APPENDIX I-17, AND 18,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
B. R. Thomas, and G. H. Simonson.
Prepared for the Oregon State Water Resources Board, (Salem), 1969, 83 p, 4 fig, 13 tab, 2 map.

Descriptors: Soils, *Soil survey, *Soil profiles, Soil properties, *Soil types, Infiltration, *Infiltration rates, Runoff, *Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone.
Identifiers: *North Coast Drainage Basin(OR), *Mid-Coast Drainage Basin(OR), *South Coast Drainage Basin(OR), *Available water-holding capacity(AWHC), *Shrink-swell potential, Erosion hazard, Temperature limitation.

A general soil map and soil descriptions, interpretations and acreage figures are presented for 588,400 acres of the North Coast, Mid-Coast and South Coast Drainage Basins. Steep forested uplands comprise nearly 90% of the total 5.15 million acres in the Coast basins. The Coast Range Mountains along the North and Mid-Coast basins are composed mostly of Tertiary marine sedimentary formations, basalt flows and basic igneous intrusions. The Klamath and Coastal Mountains are deformed, intruded and highly dissected. Soils are grouped and described according to their occurrence in estuary tidelands, stream flood plains, alluvial fans, dune lands, marine terraces, stream terraces and uplands. Soils are categorized in groups relating to adequate drainage, suitability for irrigation, possibility of flooding, and hydrologic soil types. Soils are analyzed in terms of runoff, permeability, available water holding capacity (AWHC), effective root zone, shrink-swell potential, workability, erosion hazard, and major soil limitations. Interpretations of soils are related to water use and management based on information collected by the National Cooperative Soil Survey program in Oregon. Descriptions are given of the soil series, land types and mapping units used on the soil map. (Gentry-NC)
W77-07622

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. IRRIGATION AND FOOD PRODUCTS PROJECTIONS, APPENDIX II,
Oregon State Univ., Corvallis. Cooperative Extension Service; and Oregon State Univ., Corvallis. School of Agriculture; and Oregon State Univ., Corvallis. Agricultural Experiment Station.
For primary bibliographic entry see Field 6D.
W77-07623

SIMULATION OF DAILY RAINFALL SERIES USING MARKOV CHAIN MODELS,
Institute for Water Resources, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2A.
W77-07660

A STATISTICAL FILTRATION MODEL FOR THE INSEEPAGE OF MELT WATER INTO FROZEN GROUND,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
A. B. Kasansky.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 241-245, 1974. 4 ref.

Descriptors: *Infiltration, *Porous media, *Model studies, *Mathematical models, Pores, Pore water, Soil water, Soil water movement, *Seepage, *Melt water, Melting, Snow, Snow cover, Hydraulic conductivity, Equations, Hydrodynamics, Hydrology, Foreign research.

The processes of filtration transfer of impurities into the so-called 'active' upper ground layer where the filtration circulation of water is especially intensive were considered. A general theory has been proposed previously to explain these processes on the basis of a statistical model developed for filtration flow in a porous medium; the main attention was focused on the development and the application of the methods of statistical hydrodynamics. An entirely new approach underlies this theory for describing the averaged regime of filtration flow, as well as for describing the transfer of heat and impurities. This approach takes into account the need to consider the microstructure of porous media in deriving the averaged equations, and consequently, it is based on a consideration of individual microflows in porous media. In accordance with such an approach, the very equations that describe the averaged regime of the filtration processes are to be derived from the elementary equations of dynamics, diffusion, and heat conductivity that describe these processes inside the individual pore channels. (See also W77-06708) (Sims-ISWS)
W77-07672

HETEROTROPHIC NITRIFICATION IN SOILS AND AQUATIC ENVIRONMENTS, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-07754

TRANSPORT OF REACTIVE SOLUTES THROUGH MULTILAYERED SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
H. M. Selim, J. M. Davidson, and P. S. C. Rao.
Soil Science Society of America Journal, Vol. 41, No. 1, p 3-10, January-February 1977. 15 fig, 2 tab, 18 ref. EPA R-803607.

Descriptors: *Soil water movement, *Solutes, *Adsorption, Soil water, Saturated flow, Unsaturated flow, Soils, Sands, Loam, Laboratory tests, Mathematical models, Dispersio, Effluents, 2,4-D, Sorption, Agriculture, Soil science, Path of pollutants.
Identifiers: *Solute transport, Soil layers, Multilayered soils, Nonhomogeneous soils.

Solute transport through saturated and unsaturated multilayered soils was studied using laboratory experiments and finite difference approximations of the solute transport equation. Soil water and physical charcteristics as well as solute sorption properties were measured and/or calculted for each soil layer. Linear and nonlinear equilibrium and kinetic adsorption processes were used to predict adsorption in each layer. Water flux was assumed constant for water-saturated and unsaturated layered soil profiles. For all adsorption processes considered, the calculated results showed that the order in which the soil layers were stratified in a water-saturated profile did not influence the effluent solute concentration distribution. For unsaturated layered soil profiles, the results showed that effluent solute distributions can be predicted with an average water content within individual soil layers. Experimental results from the miscible displacement of 36Cl and 14C-labeled 2,4-D ((2,4-dichlorophenoxy) acetic acid), through a two-layered soil column supported the calculated results. (Sims-ISWS)
W77-07758

SOLUTE MOVEMENT IN A FIELD SOIL,
New Mexico State Univ., Las Cruces. Dept. of Agronomy.
R. M. Van De Pol, P. J. Wierenga, and D. R. Nielsen.
Soil Science Society of America Journal, Vol. 41, No. 1, p 10-13, January-February 1977. 5 fig, 8 ref. EPA 13030GLM.

Descriptors: *Soil water movement, *Solutes, *Subsurface flow, On-site investigations, Soils, Porous media, Infiltration, Adsorption, Leaching, Dispersion, Variability, Spatial distribution, Tracers, Tritium, Chlorides, Pore water, Soil water, Agriculture, Soil science, Path of pollutants.
Identifiers: *Solute transport.

Solute and water movement was studied under steady-state flow conditions in a field soil consisting of 70 cm of clay to silty clay over a medium sand. A steady-state water flow condition was maintained by applying irrigation water at a constant flux of 2 cm per day. During the steady-state conditions, some of the water leached into the plot was labelled with chloride and tritium. The positions of the chloride and tritium as functions of soil depth and time were measured by extracting samples of the soil solution with soil suction probes. Extremes in solute displacement occurred at equal and different depths within the plot. An analysis of these measurements indicated that observations of the pore water velocity and the apparent diffusion coeficient were log normally distributed. Twenty-four soil suction probes, used to identify the rate at which a solute was displaced in the soil, will yield an estimate of the mean pore water velocity of this soil within a range of approximately plus or minus 25% of its true value, providing that the effects of potential solute-soil interactions are taken into account. (Sims-ISWS)
W77-07759

FRITTED GLASS BEAD MATERIALS AS TENSIOMETERS AND TENSION PLATES,
Newfoundland Forest Research Centre, St. John's.
T. L. Chow.
Soil Science Society of America Journal, Vol. 41, No. 1, p 19-22, January-February 1977. 1 fig, 3 tab, 5 ref.

Descriptors: *Tensiometers, *Moisture tension, *Instrumentation, Materials, Porous media, Particle size, Hydraulic conductivity, Saturated flow, Laboratory tests, Materials testing, Materials engineering, Soil water, Soil science.
Identifiers: *Fritted glass bead material, Glass, Fritted glass, Porous cups, Air-entry value.

A maximum temperature of 655 C, which was reached in six steps with approximately 100 C/step/hour for 90 min, was used to frit glass beads. Tensiometer or tension plate with desired dimension and operational characteristics can be constructed from the product. Uniformity tests on the product indicate negligible horizontal temperature variations during the fritting process, and slow heat dissipation during the cooling phase tends to limit its thickness. Tests on the particle size distributions suggest that glass beads graded to very narrow distribution are required to produce fritted material with both the maximum saturated hydraulic conductivity and maximum air-entry value. (Sims-ISWS)
W77-07760

MODEL OF SALT FLOW IN SOIL WITH A SOURCE-SINK TERM,
Utah State Univ., Logan. Dept. of Soil Science.
D. Melamed, R. J. Hanks, and L. S. Willardson.
Soil Science Society of America Journal, Vol. 41, No. 1, p 29-33, January-February 1977. 4 fig, 12 ref. EPA 9801040.

Descriptors: *Saline soils, *Irrigation, *Salts, *Model studies, Mathematical models, Laboratory tests, On-site investigations, Soil properties, Salinity, Electrical conductance, Conductivity, Soil chemical properties, Effluents, Chemical precipitation, Leaching, Soil science, Path of pollutants.
Identifiers: *Soil salt movement, Source-sink terms.

Irrigation management practices require a knowledge of the salinity in the root zone. Models which simulate the simutaneous movement of water and soils but ignore the buffering property of the soil fail to predict the root zone salinity distribution in many field situations. A model was developed that takes into consideration source and sink processes. It was tested under laboratory and field situations. In determining a 'source-sink' term to be included in the model, it was assumed that precipitation and dissolution were the most important source processes and that the rate of the processes was a function of the surrounding concentration. The parameters for the 'sink-source' term for soil columns were determined from effluent data and were found suitable for predicting the salinity of the entire soil column. Under field conditions, individual parameters for each layer were needed for good prediction. (Sims-ISWS)
W77-07761

SOIL FORMATION ON LOESS IN SOUTHWESTERN INDIANA: I. LOESS STRATIGRAPHY AND SOIL MORPHOLOGY,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
P. W. Harlan, and D. P. Franzmeier.
Soil Science Society of America Journal, Vol. 41, No. 1, p 93-98, January-February 1977. 5 fig, 2 tab, 15 ref.

Descriptors: *Soil formation, *Loess, *Indiana, Stratigraphy, Geomorphology, Paleosols, Residual soils, Soil classification, Weathering, Particle size, Soil horizons, On-site investigations, Cores, Sampling, Moisture content, Perched water, Depth.
Identifiers: Fragipan, Soil morphology, Parent material.

Thin loess deposits and underlying Sangamon paleosols were studied and then were related to modern soil development. Ninety-one sites we sampled along four traverses extending 60-80 km eastward from the lower Wabash River, the mail loess source. The ground soils, located mostly on primary divides, have a parent material sequence of silty loess (Peoria), sandy loess, upper part of Sangamon paleosol, and lower part of Sangamon paleosol. The paleosols developed in till or outwash of Illinoisan age or in residuum of Pennsylvanian or Mississippian age. Soil development increases with increasing distance from the loess source. Thick loess (greater than 2 m) soils have an A-B2t-C horizon sequence, whereas the thinner loess 81-2 m) soils have an A-B2t-(A'2)-Bx horizon sequence. Soils with less than 0.75 to 1 m of loess have B2t horizons in both loess and residuum and usually do not have fragipans. Fragipans tend to be associated with sandy loess, but they usually do not coincide with it. Fragipans may be just above the sandy loess, coincident with it, or in some combination of sandy loess and adjacent parent materials. It is believed that soil moisture relations influenced by the sandy loess, or by the underlying paleosols, or by both, promote fragipan development. (See also W77-07763) (Visocky-ISWS)
W77-07762

SOIL FORMATION ON LOESS IN SOUTHWESTERN INDIANA: II. DISTRIBUTION OF CLAY AND FREE OXIDES AND FRAGIPAN FORMATION,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
P. W. Harlan, D. P. Franzmeier, and C. B. Roth.
Soil Science Society of America Journal, Vol. 41, No. 1, p 99-103, January-February 1977. 4 fig, 1 tab, 10 ref.

Descriptors: *Soil formation, *Loess, *Indiana, Soil profiles, Soil surveys, Drainage, Clays, Oxides, Iron oxides, Aluminum, Manganese, Silica, On-site investigations, Cores, Sampling, Distribution.
Identifiers: Fragipan, Catenas.

Fourteen soil profiles from southwestern Indiana were studied to determine the effects of loess thickness and natural soil drainage on the profile distribution of clay and free oxides (CBD-extractable) of Fe, Al, Mn, and Si. In all soils, Fe and Al curves follow the clay curve, suggesting that the oxides are adsorbed on clays and move with them. Natural soil drainage has little effect on profile distribution of clay, Si or Fe. Free A1203 contents increase slightly with poorer drainage. With thinning loess, clay and free Fe203 distribution changes little, free A1203 contents increase slightly, free Mn02 curves have more pronounced minima and maxima, and free Si02 increases significantly in fragipan horizons. It was proposed that free silica moves down the profile in solution and precipitates, possibly with aluminum hydrous oxides on clays. The resulting silica or alumino silicate binds particles together to form the hard, brittle soil material of fragipans. (See also W77-07762) (Visocky-ISWS)
W77-07763

GULLY WALL STABILITY IN LOESS-DERIVED ALLUVIUM,
Agricultural Research Service, Columbia, Mo.
For primary bibliographic entry see Field 4D.
W77-07764

HYDROLOGIC DIFFERENCES BETWEEN SELECTED FORESTED AND AGRICULTURAL SOILS IN HAWAII,
Pacific Southwest Forest and Range Experiment Station, Berkley, Calif.
H. B. Wood.
Soil Science Society of America Journal, Vol. 41, No. 1, p 132-136, January-February 1977. 3 fig, 3 tab, 15 ref.

Descriptors: *Land use, *Hawaii, *Forest soils, Soil types, Drying, Infiltration, Soil investigations, Soil aggregates, Bulk density, Agriculture.
Identifiers: Oxisols, Ultisols, Inceptisols, Histosola.

Comparisons of hydrologic characteristics of soil under different land uses were made at 15 sites on the islands of Hawaii, Maui, and Kauai. A site consisted of at least 2 adjacent but different land uses on the same soil series. One land use at a site was always an ungrazed forest; the other sites were planted either to sugarcane or pinaeapple, or used as pasture. Infiltration rates on 14 of the 15 sites were found to be higher under forest cover than under agriculture uses. Mean weight diameters of the surface soil aggregates were larger for forested soils than for soils planted to sugarcane or pineapple. Aggregate size also varied with soil order and soil moisture content at time of testing. Lower bulk densities and greater porosities were found in forest-covered soils than in the non-forested soils. (Roberts-ISWS)
W77-07765

PREDICTIONS OF THE SOIL WATER FLUX BASED UPON FIELD-MEASURED SOIL-WATER PROPERTIES,
Arizona Univ., Tucson.
A. W. Warrick, G. J. Mullen, and D. R. Nielsen.
Soil Science Society of America Journal, Vol. 41, No. 1, p 14-19, January-February 1977. 5 fig, 4 tab, 12 ref.

Descriptors: *Soil water movement, *Variability, *Soil properties, Soil water, On-site investigations, Sampling, Hydraulic conductivity, Mathematical models, Spatial distribution, Moisture content, Soils, Clay loam, Monte Carlo method, Infiltration, Soil science.
Identifiers: *Soil water flux, Panoche clay loam.

Predictions of soil water flux are made taking into account spatial variability of the soil water parameters. A conductivity of the form K = K sub 0 exp (alpha(theta-theta sub 0)) is utilized where theta is the volumetric water content with K sub 0 and theta sub 0 the values of hydraulic conductivity and water content for steady-state intake from water ponded on the soil surface. The value of alpha is an empirical constant for each site and for each depth. Monte Carlo simulations were used to simulate the flux distribution from the simplified drainage equation J sub L = K sub 0/ (1 + alpha K sub 0 t/L). The flux of J sub L is a random output dependent upon the stochastic nature of K sub 0 and alpha. Log-normal distributions of K sub 0 and alpha are chosen from field data published for Panoche soil. Output of J sub L is approximately log-normal for all times studied. The mean value of J sub L in larger than the flux calculated using the average K sub 0 and alpha values in the above equation. Sample numbers necessary to estimate the means of the flux at t = 0, 1, and 10 days were plotted. For t = 0, samples of 1,000, 100, and 50 result in estimates of J sub L within 16, 50, and 60% of the true mean 95% of the time. For t = 1 and 10 days similar figures for samples of 1,000, 100, and 50 are 4, 14, and 20%. Values of water content stored in the profile using the above equations also were examined as a random function. Unlike the flux values, the range in values stays about the same for at least 20 days. The research points out a need for meaningful methods for sample stratification in order to reduce variances. (Sims-ISWS)
W77-07772

ESTABLISHING SOIL ELECTRICAL CONDUCTIVITY-SALINITY CALIBRATIONS USING FOUR-ELECTRODE CELLS CONTAINING UNDISTURBED SOIL CORES,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. D. Rhoades, M. T. Kaddah, A. D. Halvorson, and R. J. Prather.
Soil Science, Vol. 123, No. 3, p 137-141, March 1977. 4 fig, 2 tab, 7ref.

Descriptors: *Calibrations, *Conductivity, *Soils, *Salinity, *Electrical conductance, Physical properties, Resistivity, Electrodes, Saline soils, Soil

types, Soil analysis, Soil chemistry, Instrumentation, Soil moisture, Analytical techniques, Measurement, Pollutant identification.
Identifiers: *Soil electrical conductivity, *Conductivity-salinity calibrations, *Four-electrode cells, Soil cores, Wenner array method, Soil conductivity, Soil salinity calibration, Conductivity method, Soil core sampler, Field salinity, Sandy loam soils, Clay loam soils.

A simpler and more accurate method than previously used methods for calibrating soil salinity against soil electrical conductivity (EC sub a) was presented. Results were given which show that these calibrations are applicable to the Wenner array method of field EC sub a determinations. (Henley-ISWS)
W77-07776

COMPARISONS OF TWO MODELS FOR PREDICTING THE RELATIVE HYDRAULIC CONDUCTIVITY OF SALT-AFFECTED SWELLING SOILS,
Khartoum Univ. (Sudan). Dept. of Biochemistry and Soil Science.
M. A. Mustafa, and K. S. Hamid.
Soil Science, Vol. 123, No. 3, p 149-154, March 1977. 3 fig, 3 tab, 8 ref.

Descriptors: *Hydraulic conductivity, *Model studies, *Conductivity, *Soil physical properties, *Saline soils, Mathematics, Analytical techniques, Properties, Hydrology, Land reclamation, Soil chemical properties, Soil properties, Salinity, Soil types, Irrigation effects, Soil analysis, Foreign countries.
Identifiers: *Swelling soils, *Sudan, Salt-affected soils, Faragin soil, Drushab soil, Interlayer swelling, Macroscopic swelling.

Macroscopic swelling (MS) of samples from two montmorillonitic soils of the Sudan increased as the exchangeable sodium percentage (ESP) increased and as the electrolyte concentration (C) of mixed-salt solutions decreased. Threshold ESP values existed with significant swelling occurring beyond such threshold levels. Macroscopic swelling accounted for 86 and 71% (r sub .001 = 0.62) of the variability of the relative hydraulic conductivity (RHC) of the two soils, respectively. Macroscopic swelling data qualitatively fitted McNeal's (1968) demixed-ion model, especially beyond the threshold ESP values. The fit was essentially quantitative for soils or ESP less than 50. Generally, deviations of theoretical interlayer swelling values from experimental MS values increased with ESP, with maximum theoretical values being 3 to 15 times experimental values. Interlayer swelling values were found to account for about 98% (r sub .001 = 0.742) of the variability in MS values for the two soils, and accounted for 87 and 75% (r sub .001 = 0.62) of the variability in RHC of two soils, respectively. The agreement between predicted and experimental RHC was fairly good for solutions of SAR equal to or greater than 50, but poorer for lower SAR values. The Lagerwerff (1969) mixed-ion model failed to predict MS both qualitatively and quantitatively. However, agreement between calculated and experimental RHC was found to be fairly good, even for this model. (Henley-ISWS)
W77-07777

THE USE OF LYSIMETERS IN THE HYDROLOGICAL INVESTIGATION OF THE UNSATURATED ZONE,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2D.
W77-07780

NITRATES IN SOME SOIL-WATER SYSTEMS IN QUEBEC, (IN FRENCH),
For primary bibliographic entry see Field 5B.
W77-07858

NITRIFICATION IN SOIL TREATED WITH DOMESTIC AND INDUSTRIAL SEWAGE SLUGE,
Georgia Univ., Experiment. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W77-07862

EFFECTS OF TRACE ELEMENTS ON NITROGEN MINERALIZATION IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-07864

APPLICATION OF SEWAGE SLUDGE TO CROPLAND.
For primary bibliographic entry see Field 5E.
W77-07869

ORGANIC MATTER AND HEAVY METAL UPTAKE,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W77-07870

A TECHNIQUE TO INDEX SOIL PORES AND AGGREGATES LARGER THAN 20 MICROMETERS,
Agricultural Research Service, Salinas, Calif.
D. E. Wilkins, W. F. Buchele, and W. G. Lovely.
Soil Science Society of America Journal, Vol. 41, No. 1, p 139-140, January-February 1977. 1 fig, 9 ref.

Descriptors: *Indexing, *Soil structure, *Technology, Soil science, Pore pressure, Porosity, Methodology, Aggregates, Fluorescence, Analytical techniques, Photography, Pores.
Identifiers: *Soil pores, Pore orientation, Aggregate orientation, Fluorescent polyester resin, Flying spot particle analyzer, Nonswelling soils, Black light.

A laboratory technique was developed to measure soil pore size, soil aggregate size, and orientation of soil pores and soil aggregates. The technique consists of fixing soil samples with a fluorescent polyester resin, sectioning the soil samples, and taking a photograph under black light. The black light provides sharp contrast between pores and soil aggregates. The photographs were scanned with a Flying Spot Particle Analyzer (FSPA). From the FSPA scanning information, means, variances of soil aggregate size, soil pore size, and apparent soil porosity were calculated. The described technique is limited to nonswelling soils with pore and aggregate intercepts less than 20 micrometers. (Roberts-ISWS)
W77-08059

URBAN LAND USE: REMOTE SENSING OF GROUNDBASIN PERMEABILITY,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
For primary bibliographic entry see Field 7B.
W77-08065

MICROWAVE REMOTE SENSING OF SOIL MOISTURE,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 7B.
W77-08066

SOIL MOISTURE DETECTION FROM SKYLAB,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 7B.
W77-08067

THE CORRELATION OF SKYLAB L-BAND BRIGHTNESS TEMPERATURES WITH ANTECEDENT PRECIPITATION,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 7B.
W77-08068

EVALUATION OF THERMAL X/5-DETECTOR SKYLAB S-192 DATA FOR ESTIMATING EVAPOTRANSPIRATION AND THERMAL PROPERTIES OF SOILS FOR IRRIGATION MANAGEMENT,
South Dakota State Univ., Brookings. Remote Sensing Institute.
For primary bibliographic entry see Field 7B.
W77-08079

2H. Lakes

CYCLING OF DISSOLVED ORGANIC PHOSPHORUS COMPOUNDS IN NATURAL WATERS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5C.
W77-07608

APPLICATION OF STOCHASTIC HYDROLOGICAL MODELS IN THE DESIGN OF LAKE LEVEL CONTROL,
Technical Univ. of Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W77-07681

VERTICAL MIXING MECHANISMS AND THEIR EFFECTS ON PRIMARY PRODUCTION OF PHYTOPLANKTON,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5C.
W77-07733

THE SCALING OF VELOCITY FLUCTUATIONS IN THE SURFACE MIXED LAYER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2L.
W77-07768

EVALUATION OF POTENTIAL USE OF VEGETATION FOR EROSION ABATEMENT ALONG THE GREAT LAKES SHORELINE,
Dames and Moore, Cincinnati, Ohio.
For primary bibliographic entry see Field 4D.
W77-07788

CLASTIC SEDIMENTATION IN A MODERN ALPINE LAKE,
Wyoming Univ., Laramie, Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-07791

STUDIES OF THE BENTHIC ENVIRONMENT OF TWIN LAKES.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 5C.
W77-07806

FEEDING OF FORAGE FISH IN TURBID KANSAS RESERVOIRS,
Kansas Univ., Lawrence. Dept. of Systematics and Ecology.
W. J. O'Brien.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 286, Price codes: A02 in paper copy, A01 in microfiche.
Kansas Water Resources Research Institute, Lawrence, KWRRI Contribution No. 187,

Completion Report, February 1977. 17 p, 8 fig, 12 ref. OWRT A-061-KAN(1), 14-31-0001-3816.

Descriptors: *Turbidity, *Food chains, Zooplankton, *Kansas, *Reservoirs, Lakes, *Sunfishes, *Fish diets, Fish food organisms, *Light intensity, Silts, Forage fish.
Identifiers: *Gizzard shad.

Turbidity is a considerable water quality problem throughout the Midwest. This project investigated the effect of high turbidity levels and the resulting low light intensities within lakes on the feeding (ecology) of two important large fish: bluegill sunfish (Lepomis macrochirus) and gizzard shad (Dorosoma cepedianum). Because the distance at which visual-feeding fish can see their prey has been shown to be important to their feeding ecology. The reactive distance of bluegill sunfish to different sizes of zooplankton prey under a variety of light intensities and turbidities was measured. The fishes' reactive distance was greatest at light intensities greater than 10 lx and at low turbidities; as the turbidity gets higher and light lower, fish have more difficulty finding their prey. Thus high turbidity has a detrimental effect on such visual feeding forage fish as the bluegill. Gizzard shad, however, do not feed visually but instead pump water through their gills as they swim and retain any particles large enough to be held by the gill rakers. Since silt is fine and passes through the gill rakers, the feeding of these fish would not be expected to be altered by turbidity. It therefore appears that turbid conditions give gizzard shad feeding fish a competitive advantage over the visual feeders.
W77-07817

INVESTIGATION OF ACID MINE DRAINAGE EFFECTS ON RESERVOIR FISHERY POPULATIONS,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5C.
W77-07827

HYDROCHEMISTRY OF THE NIGULA SWAMP, (IN ESTONIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
U. Maelgi.
Eesti Nsv Tead Adak Toim Biol 25(3), p 245-248, 1976.

Descriptors: *Water chemistry, *Swamps, *Peat, Precipitation(Atmospheric), Organic matter, Infiltration, Wetlands, Water pollution.
Identifiers: *Estonian-SSR(Nigula Swamp), USSR.

Hydrochemical studies indicated that the surface swamp (Estonian SSR, USSR) was fed by atmospheric precipitation. While it flows down and infiltrates through peat layers, it is enriched by water-soluble organic substances, but it does not contact water rich in minerals.--Copyright 1977, Biological Abstracts, Inc.
W77-07859

A SECOND LOOK AT WATER REUSE,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-07908

PHYTOPLANKTON PRODUCTION IN LAKE MEMPHREMAGOG, QUEBEC (CANADA)--VERMONT (U.S.A.),
For primary bibliographic entry see Field 5C.
W77-07962

PHYSICAL, CHEMICAL, AND BIOLOGICAL FACTORS IN THE INITIATION AND DESTRUCTION OF BIOGENIC MEROMIXIS IN A SOFT-WATER LAKE,
For primary bibliographic entry see Field 5C.
W77-07963

WHOLE-LAKE EUTROPHICATION EXPERIMENTS WITH PHOSPHORUS, NITROGEN AND CARBON.
For primary bibliographic entry see Field 5C.
W77-07965

A CARBON BUDGET FOR LAKE ONTARIO,
For primary bibliographic entry see Field 5C.
W77-07967

DIEL PHOSPHATE FLUX IN LAKE WASHINGTON, U.S.A.,
For primary bibliographic entry see Field 5C.
W77-07968

HYDROPHYTE BIOMASS AND COMMUNITY STRUCTURE IN A SMALL OLIGOTROPHIC NEW HAMPSHIRE LAKE,
For primary bibliographic entry see Field 5C.
W77-07969

PHOSPHORUS REGENERATION BY NATURAL POPULATIONS OF LIMNETIC ZOOPLANKTON,
For primary bibliographic entry see Field 5C.
W77-07972

TEMPORAL AND SPATIAL PATTERNS OF DINOFLAGELLATE BLOOMS IN LAKE KINNERET, ISRAEL (1969-1974),
For primary bibliographic entry see Field 5C.
W77-07973

NUTRIENT LIMITATION IN A SMALL OLIGOTROPHIC LAKE IN NEW HAMPSHIRE,
For primary bibliographic entry see Field 5C.
W77-07974

INFLUENCE OF SUSPENDED SEDIMENT ON THE TEMPERATURES OF SURFACE WATERS OF RESERVOIRS,
For primary bibliographic entry see Field 5C.
W77-07975

OXYGEN UPTAKE OF SEDIMENTS IN CASTLE LAKE, CALIFORNIA,
For primary bibliographic entry see Field 5C.
W77-07976

PLANKTONIC PRIMARY AND BACTERIAL PRODUCTIVITY IN SHALLOW WATERS WITHIN A LARGE PHRAGMITES COMMUNITY (NEUSIEDLERSEE, AUSTRIA),
For primary bibliographic entry see Field 5C.
W77-07977

POPULATION ECOLOGY AND PRODUCTION OF BENTHIC DETRITIVORES,
For primary bibliographic entry see Field 5C.
W77-07979

SEDIMENTATION IN LOWER GREEN BAY, WISCONSIN,
For primary bibliographic entry see Field 2J.
W77-07980

THE APPLICATION OF ERTS-1 DIGITAL DATA TO WATER TRANSPORT PHENOMENA IN THE POINT PELEE-RONDEAU AREA,
For primary bibliographic entry see Field 2J.
W77-07981

VISUAL OBSERVATIONS OF PHOSPHORUS MOVEMENT BETWEEN ALGAE, BACTERIA, AND ABIOTIC PARTICLES IN LAKE WATERS,
Department of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
For primary bibliographic entry see Field 5C.
W77-07983

LOW FREQUENCY TURBULENCE AND VERTICAL TEMPERATURE MICROSTRUCTURE IN LAKE TAHOE, CALIFORNIA-NEVADA,
T. M. Dillon, T. M. Powell, and L. O. Myrup.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 110-115, 1975. 2 fig., 1 tab., 12 ref.

Descriptors: *Instrumentation, *Water temperature, *Bathythermographs, *Differential thermal analysis, Analytical techniques, Measurement, Depth, Diffusivity, Nevada, California, Water pollution sources.
Identifiers: *Lake Tahoe(Calif-Nev), *Vertical temperature gradients.

Lake depth temperature profile plots are usually presented as smooth curves, masking considerable detailing in structure of temperature, including 'stair steps' and inversions. Thus, estimates of thermal eddy diffusivities can be obtained from a careful analysis of the small-scale irregularities. A device is described which can resolve the 50 cm spectral level by modifying an expendable bathythermograph probe, which consists of a thermistor mounted on a streamlined body containing a 450 m section of fine two-conductor copper wire mounted on a spool from which it freely unwinds. A second section of the same wire is wound on a similar spool which remains on board when the probe is launched. Modification of the probe involves attaching a large funnel to slow the rate of descent and mounting four large rectangular wings on the drag funnel to provide further drag and spin the probe about its vertical axis to ensure uniform vertical descent. The descent rate is taken concurrently with a conventional thermistor. The fall rate is normally about 13 cm/sec and the time constant for XBT thermistor is 0.1 seconds, so that under ideal conditions features on the order of 3 cm might be resolved. The spectrum was uncontaminated at wavelengths greater than 25 cm during measurements taken at Lake Tahoe. (Auen-Wisconsin)
W77-07984

STABILITY IN STRUCTURE AND FUNCTION OF THE MUD-WATER INTERFACE,
For primary bibliographic entry see Field 5C.
W77-07985

THE INVERTEBRATES ON SUBMERGED MACROPHYTES IN THREE MASURIAN LAKES,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W77-07987

THE INFLUENCE OF MINERAL FERTILIZATION ON PHYTOPLANKTON PRODUCTION IN LAKES OF VARIOUS TROPHIC TYPES,
Instytut Rybactwa Srodladowego Olsztyn Kortowo (Poland). Zaklad Hydrobiologii.
For primary bibliographic entry see Field 5C.
W77-07988

PHOSPHORUS: CHANGES IN ECOSYSTEM METABOLISM FROM REDUCED LOADING,
For primary bibliographic entry see Field 5C.
W77-07989

SEDIMENTATION: MEASUREMENTS IN EXPERIMENTAL ENCLOSURES,
For primary bibliographic entry see Field 5C.
W77-07990

BACTERIAL DECOMPOSITION OF DIFFERENT POLYSACCHARIDES IN A EUTROPHIC LAKE,
For primary bibliographic entry see Field 5C.
W77-07991

ELECTRON TRANSPORT ANALYSIS AS AN INDICATOR OF BIOLOGICAL OXIDATION IN FRESHWATER SEDIMENTS,
For primary bibliographic entry see Field 5C.
W77-07992

OPTIMAL GROWTH TEMPERATURES AND MEDIA PARAMETERS OF BACTERIAL COMMUNITIES FROM LAKES OF DIFFERENT TROPHIC STATES,
For primary bibliographic entry see Field 5C.
W77-07994

THE INFLUENCE OF TEMPERATURE AND BACTERIAL NUMBERS ON THE HETEROTROPHIC UPTAKE OF C14 GLUCOSE IN WEST BLUE LAKE, MANITOBA,
For primary bibliographic entry see Field 5C.
W77-07995

BIOLOGICAL LONG-TERM INVESTIGATIONS OF SWEDISH LAKES,
For primary bibliographic entry see Field 5C.
W77-07998

PHOSPHORUS RELEASE FROM A HIGHLY EUTROPHIC LAKE SEDIMENT,
For primary bibliographic entry see Field 5C.
W77-07999

THE EFFECT OF HIGHWAY DEICING SALT ON CHLORIDE BUDGETS AT LAKE GEORGE, NY,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5B.
W77-08000

STUDIES ON THE ROLE OF DETRITUS IN FRESH WATER LAKES,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5C.
W77-08001

CHEMICAL INTERACTIONS IN A EUTROPHIC LAKE,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5C.
W77-08002

THE AVAILABILITY OF CHLOROPHYLLIDE IN HYDROPHYTES AND ALGAS OF LAKE TRASIMENO AND THE VARIABILITY OF PIGMENT CONTENT IN SPIROGYRA, (IN ITALIAN),
Perugia Univ. (Italy). Istituto di Orto Obot.
For primary bibliographic entry see Field 5C.
W77-08044

MODELING MULTIPLE-USE IN NATURAL AREAS: PART II - THE SANTEE SWAMP STUDY,
Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo.
For primary bibliographic entry see Field 6A.
W77-08050

THE APPLICATION OF REMOTE SENSING TECHNOLOGY TO THE INVENTORY OF PLAYA LAKES IN THE HIGH PLAINS OF TEXAS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 7B.
W77-08077

2J. Erosion and Sedimentation

EVALUATION OF SEDIMENT YIELDS DUE TO URBAN DEVELOPMENT,
Old Dominion Univ., Norfolk, Va. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W77-07705

EFFECTS OF SAMPLE HANDLING ON THE COMPOSITION OF MARINE SEDIMENTARY PORE WATER,
Lehigh Univ., Bethlehem, Pa. Center for Marine and Environmental Studies.
For primary bibliographic entry see Field 5A.
W77-07742

SEDIMENT MEASUREMENT IN ESTUARINE AND COASTAL AREAS,
EG and G Washington Analytical Services Center, Inc., Rockville, Md.
For primary bibliographic entry see Field 2L.
W77-07748

FLOODING FREQUENCE OF HYPERSALINE COASTAL ENVIRONMENTS DETERMINED BY ORBITAL IMAGERY: GEOLOGIC IMPLICATIONS,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2L.
W77-07751

SOIL FORMATION ON LOESS IN SOUTHWESTERN INDIANA: I. LOESS STRATIGRAPHY AND SOIL MORPHOLOGY,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-07762

SOIL FORMATION ON LOESS IN SOUTHWESTERN INDIANA: II. DISTRIBUTION OF CLAY AND FREE OXIDES AND FRAGIPAN FORMATION,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-07763

GULLY WALL STABILITY IN LOESS-DERIVED ALLUVIUM,
Agricultural Research Service, Columbia, Mo.
For primary bibliographic entry see Field 4D.
W77-07764

RUNOFF, EROSION, AND NUTRIENT MOVEMENT FROM INTERRILL AREAS,
Purdue Univ., Lafeyette, Ind. Dept. of Agricultural Engineering.
E. J. Monke, H. J. Marelli, L. D. Meyer, and J. F. DeJong.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 1, p 58-61, January-February 1977. 4 fig, 6 tab, 9 ref.

Descriptors: *Runoff, *Erosion, Laboratory tests, Simulated rainfall, Precipitation(Atmospheric), Soil erosion, Suspended solids, *Nutrients, Nitrogen, Phosphorus, Inflow, *Overland flow, Soils, Loam, Silts, Sediments, Agriculture, *Rainfall.

The influence of rainfall and overland flow on interrill erosion and associatied nutrient losses was studied for flatland conditions. Interrill erosion rates were substantially large. However, amounts of eroded soil reaching actual stream systems may be greatly reduced, depending on the severity of storms. Interrill erosion rates can be decreased substantially by inproved tilth. In soils with excellent tilth, the silt fraction in the eroded soil was higher than in the original soil, and the clay and sand fractions were lower. Although N and P concentrations in the soils with excellent tilth were quite high, losses of these nutrients in sediment runoff were low because of increased infiltration. (Sims-ISWS)
W77-07766

EVALUATION OF POTENTIAL USE OF VEGETATION FOR EROSION ABATEMENT ALONG THE GREAT LAKES SHORELINE,
Dames and Moore, Cincinnati, Ohio.
For primary bibliographic entry see Field 4D.
W77-07788

DEVELOPMENT OF THE TURBIDITY MAXIMUM IN RAPPAHANNOCK ESTUARY; SUMMARY,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W77-07789

CLASTIC SEDIMENTATION IN A MODERN ALPINE LAKE,
Wyoming Univ., Laramie, Dept. of Geology.
D. Mankiewicz, J. R. Steidtmann, and L. E. Borgman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A016 078, Price codes: A02 in paper copy, A01 in microfiche. Report ARO 10087.1-EN, Reprinted from Journal of Sedimentary Petrology, Vol. 45, No. 2, p 462-468, June 1975. 4 fig, 7 ref. Army DA-ARO-D-31-124-72-G76.

Descriptors: *Sedimentation, *Lakes, *Lake sediments, *Wyoming, Geology, Rocks, On-site investigations, Data collections, On-site data collections, Analytical techniques, Sediments, Sediment sorting, Mineralogy, Heavy metals, Sediment transport, Sedimentology.
Identifiers: *Sediment sources, *Green Lake(Wyo).

The redistribution of sediment by lacustrine processes operating in Green Lake, Teton County, Wyoming, was in order to determine the factors which control sediment entrapment and to evaluate the effectiveness of entrapment as a control on downstream sediment mineralogy. Sediment patterns in the lake were identified by means of factor analysis of heavy minerals data. The results of these analyses showed that detritus from sedimentary sources to the west is trapped in the lake, whereas sediment derived from Precambrian crystalline rocks to the east is carried through the lake and out the outlet. These relations are controlled by drainage slope and pattern, lake geometry and bathymetry, and source lithology. Because of the selective sediment entrapment, it would not be possible to predict the source rock compositions in Green Lake Basin by examining the mineralogy of downstream sediments. (Sims-ISWS)
W77-07791

OXYGEN UPTAKE OF SEDIMENTS IN CASTLE LAKE, CALIFORNIA,
For primary bibliographic entry see Field 5C.
W77-07976

SEDIMENTATION IN LOWER GREEN BAY, WISCONSIN,
J. M. Pezzetta.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 123-132, 1975. 3 fig., 28 ref.

Descriptors: *Sedimentation rates, *Deposition(Sediments), *Sediment transport, *Shallow water, Particle shape, Particle size, Powerplants, Estuaries, Obstruction to flow, *Wisconsin, *Lake Michigan, Bays.
Identifiers: *Lower Green Bay(Lake Michigan), *Fox River(Wis).

As part of a research program to determine effects of a coal-fired power plant on the waters of the partially-restricted southern extreme end of Green Bay, Lake Michigan, an evaluation was made of textural characteristics and dispersal patterns of the sediments in this semi-enclosed portion of the bay. Of 27 pre-determined sampling sites, 13 were sampled in January, 11 in February and the full complement in March, 1973. Trends of three primary textural parameters (mean grain size, standard deviation or sorting, and skewness) indicate that a complex interaction occurs between two processes: (1) the fluvial system, mainly the discharge of the Fox River as the main mechanism to deposit coarse silt; and (2) the lacustrine environment of the shallow lower bay receiving basin, in which the sediment distribution patterns are controlled largely by wind-induced turbulence and a general counterclockwise current system. Texture is generally uniform, although seasonal fluctuations in the Fox River discharge affect the quantity of transported sediment. The mean gradient of the river is sufficient to produce at the river mouth a flow velocity of 9.0 cm/sec, more than adequate to transport coarse silt-sized sediments. Even if the velocity were reduced by a factor of two during the winter, such a flow rate would still be enough to carry the sediments and to transport them into the lower bay. (Harris-Wisconsin)
W77-07980

THE APPLICATION OF ERTS-1 DIGITAL DATA TO WATER TRANSPORT PHENOMENA IN THE POINT PELEE-RONDEAU AREA,
R. P. Bukata, W. S. Haras, and J. E. Bruton.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 168-178, 1975. 8 fig., 14 ref.

Descriptors: *Telemetry, *Remote sensing, *Satellites(Artificial), *Land forming, *Sediment transport, *Currents(Water), Sedimentology, Fluid mechanics, *Canada, Digital computers, *Lake Erie, Lakes.
Identifiers: ERTS-1, Point Pelee-Rondeau area(Canada).

Digital data was telemetered from ERTS-1 satellite to develop a conceptual 'mirror-image' model defining the temporal evolution of the Point Pelee-Rondeau landforms on the Canadian shoreline of Lake Erie. Data are given in a 4-band energy response covering the visible and reflected infrared portions of the electromagnetic spectrum from 0.50 micron to 1.1 microns. The Band 5 Multispectral Scanner Subsystem data is directly correlated to surface turbidity and the Band 6 MSS data represent surface biomass concentration. Band 5 digital computer printout data illustrate bifurcating sediment transport, the fluid mechanics flow around Point Pelee and the delineation of the Archimedes spiral/vortex flow pattern. Representations of color-infrared vertical aerial photographs illustrate convergence of relict beach ridges. An illustration of the model shows a 'Quick-Look' ERTS-1 image, which depicts the appearance of geophysical formations east of Point Pelee and West of Rondeau, and the high degree of spring runoff from the Lake Huron-Lake St. Clair-Lake Erie sediment transport system with the northern half of Lake St. Clair being relatively sediment-free, and the sediment deposition extending considerably further into Lake Erie. (Auen-Wisconsin)
W77-07981

STABILITY IN STRUCTURE AND FUNCTION OF THE MUD-WATER INTERFACE,
For primary bibliographic entry see Field 5C.
W77-07985

SEDIMENTATION: MEASUREMENTS IN EXPERIMENTAL ENCLOSURES,
For primary bibliographic entry see Field 5C.
W77-07990

REMOTE SENSING OF MISSISSIPPI RIVER CHARACTERISTICS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 7B.
W77-08070

2K. Chemical Processes

MERCURY IN WATER, A BIBLIOGRAPHY, VOLUME 3,
Office of Water Research and Technology. Washington, D. C.
For primary bibliographic entry see Field 5A.
W77-07605

METAMORPHIC REACTIONS IN FLYSCH ROCKS,
Geological Survey, Menlo Park, Calif. Water Resources Div.
I. Barnes, and J. R. O'Neil.
In: Proceedings of the International Symposium on Water-Rock Interaction, Prague, Czechoslovakia, September 1974: Published by the Geological Survey, Prague, Czechoslovakia, p 309-315, 1976. 3 tab, 19 ref.

Descriptors: *Geochemistry, *Water chemistry, *Metamorphic rocks, *Carbon dioxide, *Chemical reactions, Chemical analysis, Inorganic compounds, Chemical properties, Groundwater, Springs, Isotope studies, Meteoric water.
Identifiers: *Flysch rocks.

C02-rich fluids are found to issue from eugeosynclinal (flysch) rocks. The fluids are characteristically Na-HC03 solutions and free C02. The mineral assemblages in the flysch rocks are quartz, chlorite, white mice, albite, and calcite. Alteration products (metamorphic minerals) include laumontite, pumpellyite prehnite, and epidote, singly or in various combinations. The only source in the rocks of free C02 is calcite of marine origin from isotopic evidence. The only source in the rocks of Na is albite. The flux of C02 is far greater than that of Ca. The flux of Na is much greater than that of Al or Si. Therefore, Ca, Al, and Si are conserved by whatever processes occur but Na and C02 are fugitive. The Ca, Al, and Si remaining from the solution of albite and calcite probably form laumontite, pumpellyite, prehnite, and epidote. The free C02 may move independently of water involved in the reactions. No other likely mechanism will explain the high C02 pressure in the shallow meteoric water, identified by isotopic data, issuing from flysch sediments. (Woodard-USGS)
W77-07609

WATER SAMPLING FROM UNPUMPED WELLS WITH STATIC WATER LEVELS DEEPER THAN 10 METRES,
Ministry of Works and Development, Christchurch (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 5A.
W77-07787

WATER QUALITY STATUS AND TRENDS IN MINNESOTA--INDICES FOR WATER SUPPLY AND GROUND WATER POLLUTION,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W77-07794

EFFECT OF MAJOR ION VARIATIONS IN THE MARINE ENVIRONMENT ON THE SPECIFIC GRAVITY--CONDUCTIVITY--CHLORINITY--SALINITY RELATIONSHIP,
Naval Underwater Systems Center, Newport, R.I.
D. N. Connors, and D. R. Kester.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A006 724, Price codes: A02 in paper copy, A01 in microfiche. Reprinted from: Marine Chemistry, Vol 2, p 301-304, 1974. 7 tab, 33 ref. ONR-N00014-68-A-0215-0003.

Descriptors: Water properties, *Specific gravity, *Conductivity, *Salinity, *Ions, Water resources, *Chlorine, *Sea water.
Identifiers: Marine environment, *Clorinity.

Partial equivalent conductances and partial equivalent volumes of the major constituents in seawater were used to evaluate the specific gravity--conductivity--chlorinity--salinity relationships in the marine environment. For example, in the open ocean, the relationships between Cl o/oo and both S o/oo and specific gravity are valid to within 0.014 o/oo and 0.014 sigma t, respectively. The relationships between conductivity and S o/oo and specific gravity are valid to within 0.006 o/oo and 0.007 sigma t. In river diluted nearshore areas specific gravity anomalies inferred from Cl o/oo, can be as great as 0.06 sigma t and 0.04 sigma t when inferred from a conductivity ratio measurement. (Sinha-OEIS)
W77-07802

A RAPID VOLUMETRIC METHOD OF DETERMINING FLUORINE IN WATER, (IN RUSSIAN),
Kiev Sanitary-Epidemiology Station (USSR).
For primary bibliographic entry see Field 5A.
W77-07950

HYDROLOGIC OPTICS. VOLUME I. INTRODUCTION,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
For primary bibliographic entry see Field 1A.
W77-07956

THE DETERMINATION OF NITRATES IN WATER, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W77-07966

2L. Estuaries

MUTAGENIC POTENTIAL OF PETROLEUM BYPRODUCTS IN CHESAPEAKE BAY WATERS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W77-07606

PRELIMINARY STUDIES OF MENHADEN AND THEIR MASS MORTALITIES IN LONG ISLAND AND NEW JERSEY WATERS,
New Jersey Agricultural Experiment Station, New Brunswick.
For primary bibliographic entry see Field 5C.
W77-07724

COMPARATIVE STUDY OF CLADOCERA FROM THE 1ST METER OF SEA WATER, COLLECTED IN A POLLUTED ZONE AND IN

ANOTHER RELATIVELY CLEAN ZONE, (IN FRENCH),
Athens Univ. (Greece). Zoological Lab. and Museum.
For primary bibliographic entry see Field 5C.
W77-07730

THE STUDY OF THE BENTHOS COMMUNITY AROUND THE MOUTH OF THE PORT OF TAGONOURA IN SURUGA BAY, (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W77-07735

EFFECT OF SOUTH LOUISIANA CRUDE OIL AND NO. 2 FUEL OIL ON GROWTH OF HETEROTROPHIC MICROORGANISMS, INCLUDING PROTEOLYTIC, LIPOLYTIC, CHITINOLYTIC AND CELLULOYTIC BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-07736

MANGROVE ECOLOGY AND DELTAIC-ESTUARINE GEOMORPHOLOGY: CAMBRIDGE GULF-ORD RIVER, WESTERN AUSTRALIA,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
B. G. Thom, L. D. Wright, and J. M. Coleman.
Available from the National Technical Information Service, Springfield VA 22161 as AD A015 161, Price 03 in paper copy, A01 in microfiche. Technical Report No. 198, December 1975. Reprinted from: Journal of Ecology, Vol 63, p 203-232, March 1975. 13 fig, 4 tab, 20 ref.

Descriptors: *Mangrove swamps, *Estuaries, *Deltas, *Geomorphology, Aquatic plants, *Australia, *Ecology, *Estuarine enironment.
Identifiers: *Cambridge Gulf-Ord River(WA).

Mangrove distributions and growth forms in tropical deltaic-estuarine environments in may ways reflect the control of plant habitat by landform change. In the Cambridge Gulf-Ord River region of Western Australia, and area which experiences a dry monsoonal climate and a high tidal range, a variety of mangrove habitats were recognized. Those habitats are sediment complexes which have evolved over the last several thousand years as a result of certain combinations of geomorphic processes operating at a sea level very close to its present position. In that part of the Cambridge Gulf exposed to wave action, tidal and wave processes combine to produce prograding shorelines upon which grow bands of mangrove in a successional sequence. However, where the direct influence of river discharge and waves is negligible, or considerably reduced, tidal sedimentation has given rise to extensive flats bare of vegetation at approximately the high spring tide level. These flats are fringed by mangroves and associated halophytes growing along the margins of tidal creeks and channels. Stratigraphic evidence suggests more extensive halophytic plant coverage of the flats 6000-7000 years ago during the waning phase of the Holocene transgression. Since that time 3-4 m of sediment has accumulated by vertical accretion, and mangroves have become pregressively restricted to sites near channels which are frequently inundated by tides. Self-maintaining mangrove communities are characteristic of these sites. (Sinha-OEIS)
W77-07738

RESULTS OF R/V YAQUINA CRUISE YALOC-74, LEG 3: SEABED DISPOSAL PROGRAM, NORTH PACIFIC STUDY AREA MPG-2, 33 DEGREES 20'N, 151 DEGREES 00'W, NOV. 30 - DEC. 21, 1974,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5E.
W77-07739

MONITORING DISSOLVED HYDROCARBONS AS A FUNCTION OF THE TIDAL CYCLE (NEW YORK HARBOR),
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W77-07740

EFFECTS OF SAMPLE HANDLING ON THE COMPOSITION OF MARINE SEDIMENTARY PORE WATER,
Lehigh Univ., Bethlehem, Pa. Center for Marine and Environmental Studies.
For primary bibliographic entry see Field 5A.
W77-07742

TIDAL AND CURRENT PREDICTION FOR THE AMAZON'S NORTH CHANNEL USING A HYDRODYNAMICAL-NUMERICAL MODEL,
Naval Postgraduate School, Monterey, Calif.
L. A. Ferraz.
Available from the National Technical Information Service Springfield, VA 22161 as AD-A017 572. Master's Thesis, September 1975. 82 p, 22 fig, 3 tab, 21 ref, append.

Descriptors: *Tides, *Currents(Water), *Estuaries, Water resources development, Model studies, Hydrodynamics, Mathematical models, Model studies.
Identifiers: *Amazon River, Prediction models.

The hydrodynamical-numerical prediction model developed by W. Hansen is applied to the North Channel of the Amazon River for computation of tides and currents; the results are compared with tidal prediction obtained by the harmonic method and to actual current measurements. A medium size grid of square mesh cells, 1800 m in length, represents the North Channel. The driving forces are the tides at the northern opening of the channel near the river's mouth and the river discharge into the channel at the southern end. The numerical results for tides were verified at three tidal stations, and it was observed that the tides predicted at the northern part of the channel agreed, in the worse case, within 12% of the tidal range, but those predicted at the southern end were unsatisfactorily reproduced. This fact is attributed to the size of the grid which is too coarse to describe adequately the variable and irregular cross-sections and bottom topography at the southern part the channel. The predicted currents were in acceptable agreement with a few available measurements. (Sinh-OEIS)
W77-07743

AN ANALYTICAL SEA CURRENT MODEL FOR COASTAL REGIONS WITH APPLICATION TO THE NEW YORK BIGHT,
Coast Guard, Washington, D.C. Oceanographic Unit.
J. M. Bishop.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 372, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 75-2, September 1975. 33 p, 7 fig, 6 ref, 3 append.

Descriptors: *Continental shelf, *Currents(Water), *Oceanography, Model studies, Seasonal, Coasts, Estuaries, New York.
Identifiers: *Outer Continental Shelf, *New York Bight.

Seasonal coastal currents on a continental shelf are modeled for use in Search and Rescue planning. The model considers a balance of Coriolis, pressure gradient, and frictional forces. Input parameters are the climatological wind and density fields. Comparison of results to currents depicted on climatological atlases for the New York Bight indicates the validity of the approach. In this light, oceanographic conditions prevail. (Sinha-OEIS)
W77-07744

VERIFICATION BY REMOTE SENSING OF AN OIL SLICK MOVEMENT PREDICTION MODEL,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5B.
W77-07745

WASTE MANAGEMENT FOR THE COASTAL ZONE: CONCEPTS FOR THE ASSESSMENT OF OCEAN OUTFALLS,
Assembly of Engineering Marine Board, Washington, D.C.
For primary bibliographic entry see Field 5E.
W77-07747

SEDIMENT MEASUREMENT IN ESTUARINE AND COASTAL AREAS,
EG and G Washington Analytical Services Center, Inc., Rockville, Md.
P. E. Shelley.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA CR-2769, Price codes: A06 in paper copy, A01 in microfiche. National Aeronautics and Space Administration, Wallops Flight Ctr., Wallops Island, Va., Contractor Report No. NASA CR-2769, December 1976. 102 p, 17 fig, 6 tab, 60 ref. NASA-NAS6-2325.

Descriptors: *Estuaries, *Coasts, *Sediment transport, *Sediments, *Measurement, Management, *Remote sensing.

A survey of uses of estuarine and coastal areas is given. Problems associated with these uses are discussed, and data needs for intelligent management of these valuable areas are outlined. Suspended sediment measurements are seen to be one of the greatest needs. To help understand the complexity of the problem, a brief discussion of sediment mechanics is given, including sediment sources, characteristics, and transport. The impact of sediment mechanics on its direct measurement (sampling and analysis) is indicated, along with recommendations for directly obtaining representative data. Indirect measurement of suspended sediment by remote sensors is discussed both theoretically and in the light of some recent experiences. The need for an integrated, multidisciplinary program to solve the problem of quantitatively measuring suspended sediment with remote sensors is stressed, and several important considerations of such a program and benefits to be derived therefrom are briefly addressed. It is recommended that the present, very preliminary look be expanded into a full-blown program plan for developing a timely and affordable solution to the problem. (Sinha-OEIS)
W77-07748

UTILIZATION OF MIXED HYDROCARBON SUBSTRATE BY PETROLEUM-DEGRADING MICROORGANISMS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-07749

FLOODING FREQUENCE OF HYPERSALINE COASTAL ENVIRONMENTS DETERMINED BY ORBITAL IMAGERY: GEOLOGIC IMPLICATIONS,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
S. P. Vonder Haar, and D. S. Gorsline.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024

588, Price codes: A02 in paper copy, A01 in microfiche. Southern California University Report USC-GEOL 76-04, April 1976. Reprinted from: Science, Vol 190, p 147-149, 10 October 1975. 5 p, 2 fig, 12 ref. ONR-N00014-76-C-0061.

Descriptors: Flooding, *Sedimentation, *Coasts, Geology, Geography, Frequency, *Mexico, *Monitoring, *Remote sensing.
Identifiers: *Coastal environments, Orbital imagery, *Baja California.

Available satellite imagery in the infrared and near-infrared wavelengths provides a simple, rapid, and low-cost method for monitoring the extent and duration of the flooding of coastal ecosystems. Hypersaline environments in Baja California, Mexico are flooded as a result of complex interactions between the higher of the two spring tides each month and local winds. Such flooding necessitates a reappraisal of ideas on rhythmic lamination in algal mats, stromatolites, and evaporite sediments preserved in the geologic record. (Sinha-OEIS)
W77-07751

IMPACTS OF OFFSHORE OIL ON NORTH EAST SCOTLAND,
Massachusetts Inst. of Tech. Cambridge.
For primary bibliographic entry see Field 5C.
W77-07752

PRELIMINARY PROJECTIONS OF OIL SPILL MOVEMENT FOR THREE POTENTIAL DEEP-WATER PORT SITES IN THE GULF OF MEXICO,
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W77-07753

TAR BALL DISTRIBUTION IN THE WESTERN NORTH ATLANTIC,
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W77-07757

THE SCALING OF VELOCITY FLUCTUATIONS IN THE SURFACE MIXED LAYER,
Woods Hole Oceanographic Institution, Mass.
I. S. F. Jones, and B. C. Kenney.
Journal of Geophysical Research, Vol. 82, No. 9, p 1392-1396, March 20, 1977. 3 fig, 1 tab, 12 ref. BNL 325373-S.

Descriptors: *Velocity, *Fluctuations, *Waves(Water), *Winds, Oceans, Lakes, Turbulence, Shear stress, Mixing, On-site investigations, Measurement, Data processing, Ocean waves, Limnology, Oceanography.
Identifiers: *Velocity spectra, Mixed layer.

Turbulent velocity fluctuations in the upper portions of the wind-driven mixed layer of oceans or lakes appear to have a velocity scale proportional to the friction velocity and a length scale proportional to the distance below the free surface, as is usual in shear flows near a boundary. A number of one-dimensional velocity spectra were measured in aquatic mixed layers, and these spectra, when they are scaled with the surface stress and the distance from the free surface, were compared with turbulent boundary layer measurements. The good agreement suggests that the surface wave orbital velocities act merely as 'inactive' motions and do not interfere with the lower-frequency stress-carrying eddies.(Sims-ISWS)
W77-07768

OBSERVATIONS OF WAVE HEIGHT AND WAVE CELERITY IN THE SURF ZONE,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
J. N. Suhayda, and N. R. Pettigrew.
Journal of Geophysical Research, Vol. 82, No. 9, p 1419-1424, March 20, 1977. 11 fig, 18 ref.

Descriptors: *Waves(Water), *Beaches, *Surf, Height, Celerity, Ocean waves, Coasts, On-site investigations, On-site data collections, Measurement, Data processing, Oceanography.
Identifiers: *Surf zone waves, *Barbados(West Indies).

Observations of wave crest elevation, wave trough elevation, and wave celerity were made in the surf zone on a natural beach. A series of 22 wave poles having vertical gradations of 7 cm (near shore) and 11 cm (off shore) was placed across the surf zone from outside the break point to the swash zone. Movements of 10 individual waves, all having a break point within one wave pole spacing of each other, were photographed, and the data on wave height changes and wave speed changes were analyzed. Wave celerity within the surf zone, given as a ratio M to solitary wave celerity, shows a systematic increase of wave speeds near the break point to a peak of M approximately equal to 1.2, thence a decrease farther shoreward to M approximately equal to 0.8, and finally, a second increase where M is greater than 1. Wave height decay after breaking follows the theory of turbulent dissipatation recently presented by Sawaragi and Iwata. The wave height to water depth and ratio within the surf zone is a function of distance from the break point and ranges from 2.0 to 0.6. The results indicated that the use of linear and nonlinear nonviscous wave theories to quantify surf zone wave characteristics is misleading insofar as quantitative prediction is concerned. (Sims-ISWS)
W77-07770

OBSERVATIONAL AND NUMERICAL EVIDENCE FOR WIND-FORCED COASTAL TRAPPED LONG WAVES,
Massachusetts Inst. of Tech. Cambridge. Dept. of Earth and Planetary Sciences.
A. J. Clarke.
Journal of Physical Oceanography, Vol. 7, No. 2, p 231-247, March 1977. 5 fig, 6 tab, 47 ref, append. NSF ID07503998

Descriptors: *Waves(Water), *Winds, *Coasts, *Lake Ontario, *Oregon, Oceans, Ocean waves, Lakes, Model studies, Mathematical models, On-site investigations, Topography, Shores, Stress, Mixing, Limnology, Oceanography.
Identifiers: *Coastal trapped waves.

Recent work has shown that the linear, wind-forced quasi-geostrophic motion of stratified water over shelf topography can be described by a sum of modes, the amplitude of each of these modes satisfying a forced, first-order wave equation. The analysis presented suggests that this forced wave equation can qualitatively explain a wide range of observational and numerical results. (Sims-ISWS)
W77-07771

AN EXPERIMENTAL AND THEORETICAL STUDY OF THE TURBULENT AND LAMINAR CONVECTION GENERATED UNDER A HORIZONTAL ICE SHEET FLOATING ON WARM SALTY WATER,
Washington Univ., Seattle, Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W77-07773

THE ERRORS INVOLVED IN INFERRING SALINITY FROM SOUND VELOCITY,
Texas A and M Univ., College Station. Dept. of Oceanography.
W. J. Emery.
Journal of Physical Oceanography, Vol. 7, No. 2, p 293-297, March 1977. 2 fig, 5 tab, 8 ref.

Descriptors: *Salinity, *Oceans, *Measurement, *Equations, Conductivity, Pressure, Temperature, Water temperature, Sound waves, Density, Sea water, *Instrumentation, Oceanography.
Identifiers: *Error analysis.

Four empirical equations relating sound velocity, salinity, temperature, and pressure were examined to derermine the errors in computing salinity from measurements of temperature, pressure, and sound velocity. The measurement errors in these variables lead to rms salinity errors of 0.2 parts per thousand for an expendable device and 0.04 parts per thousand for a moored instrument. The magnitude of the salinity error appears independent of the equation used. Salinities computed using Lovett's and Del Grosso's equations agreed well, but differed from salinities computed using either of Wilson's equations. (Sims-ISWS)
W77-07774

THE GENERATION OF SALINITY FINESTRUCTURE BY VERTICAL DIFFUSION,
City Univ. of New York. Inst. of Marine and Atmospheric Sciences.
E. S. Posmentier.
Journal of Physical Oceanography, Vol. 7, No. 2, p 298-300, March 1977. 3 fig, 5 ref.

Descriptors: *Diffusion, *Salinity, *Equations, Mathematical models, Oceans, Model studies, Estuaries, Stability, Numerical analysis, Oceanography.
Identifiers: *Salinity finestructure, Diffusion equations, Vertical diffusion, Equation solutions.

The nonlinear differential equation for the vertical diffusion of salt (or heat) has initially unstable solutions under conditions of high gravitational stability. The solutions stabilize as they approach alternating layers of high and low salinity gradient. A numerically computed example of this phenomenon resembles salinity finestructure observed in the Hudson Estuary. However, similar computations may result in the generation of mathematically artificial finestructure if the diffusion coefficient is not adequately smoothed or if unrealistic initial conditions are used. (Sims-ISWS)
W77-07775

DETERMINATION OF SALT-WATER INTERFACE BY ELECTRIC RESISTIVITY DEPTH SOUNDINGS,
Tel Aviv Univ. (Israel). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2F.
W77-07783

HEAT AND SALT TRANSFER ASSOCIATED WITH FORMATION OF SEA-ICE,
Cambridge Univ., (England). Dept. of Applied Mathematics and Theoretical Physics.
For primary bibliographic entry see Field 2C.
W77-07786

DEVELOPMENT OF THE TURBIDITY MAXIMUM IN RAPPAHANNOCK ESTUARY; SUMMARY,
Virginia Inst. of Marine Science, Gloucester Point.
M. M. Nichols.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 786, Price codes: A02 in paper copy, A01 in microfiche. Report ARO 8524. 1-EN Reprinted from Memoires de l'Institut de Geologie du Bassin d'Aquitaine, No 7, p 19-25, 1974. 7 p, 6 fig, 1 tab, 4 ref. Army DA-ARO-D-31-124-70-G47.

Descriptors: *Estuaries, *Turbidity, *Suspended solids, Tides, Tidal waters, Coasts, Rivers, Continental shelf, Sedimentation, Currents(Water), Circulation, Water circulation, Salinity, Saline water-freshwater interfaces, On-site investiga-

tions, On-site data collections, Sedimentology, *Virginia, Pollutant identification.
Identifiers: *Turbidity maximums, *Rappahannock Estuary(Va).

The dynamic behavior of the turbidity maximum in the Rappahannock Estuary of the Chesapeake region has been traced through a full life cycle with changes in river inflow and haline mixing. At all levels of inflow, the maximum resides within the estuary. Its locus lies just upstream of the 1 part per thousand isohaline, and its position shifts upstream with penetration of the salt intrusion. Development follows a sequence beginning with high inflow or a major seaward surge of turbulent flood water: (1) formation of an enriched turbid aureole with near-surface and near-bottom maxima and a lean core at mid-depth, (2) progressive upstream migration and vertical (i.e. turbid) homogeneity in a narrow zone, (3) local intensification near the bottom with a partly layered structure, and (4) slow decay and dispersion over a broad zone. The maximum reappears with each seasonal (spring) inflow, and it subsists for a life span of 4-16 weeks as estuarine mixing increases. Time-series observations of velocity over 16 to 26 tidal cycles through the maximum define a near-bottom convergence or node where river and estuarine flow meet. Measurements of residual sediment transport show that a significant amount of suspended sediment accumulates in the maximum, approximately four times the river load, despite losses by downstream advection in near-surface water, diffusion and settling-out on the bottom or in bordering marshes. The observations point to river inflow as the chief factor controlling position of the maximum. (Sims-ISWS)
W77-07789

CITIZEN ATTITUDES TOWARD MANAGEMENT OF THE CHESAPEAKE BAY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-07796

INVENTORY OF BENTHIC ORGANISMS AND PLANKTON AT MOKAPU, OAHU,
Hawaii Univ., Honolulu. Water Resources Research Center.
A. R. Russo, Steven J. Dollar, and E. A. Kay.
Technical Report No. 101, January 1977. 30 p, 16 fig, 7 tab, 9 ref, append.

Descriptors: *Biological communities, *Coral, Benthic fauna, *Hawaii, Marine animals, *Outfall sewers, Sewage effluents, Benthos, Marine fish, Standing crops, Water pollution, Waste disposal, Mollusks, Data collections, Plankton.
Identifiers: *Oahu(Hawaii).

An inventory of benthic and planktonic marine communities at Mokapu Point, Oahu, compiled in July to August 1975, prior to the completion of an outfall and discharge of secondary sewage effluent, has been prepared for the City and County of Honolulu. Data were obtained from five transects between Mokapu Point on the northeastern tip of Oahu to Alala Point, approximately 6 km (4 miles) south, at depths of from 6 to 30 m (20 to 100 ft). The area is exposed to predominant northeast tradewinds. Coral cover ranges from 20% at the 6 m depth stations to 85% at greater depths, with the most abundant corals at depths of from 12 to 18 m (40 to 60 ft). Four species of corals dominate the survey area, Pocillipora meandrina, Porites lobata, P. compressa, and Montipora sp. Most of the stations surveyed had little or no algal cover. Standing crop of fishes and mollusks decreases from stations A through C (north to south) and increases at stations D and E (the southernmost of the transects). The dominant fish are acanthurids and chaetodontids. The dominant mollusks are gastropods, primarily the archaeogastropods Tricolia variabilis and Leptothyra rubricincta, rissoids, cerithids, and dialids. Total numbers of fish are not dependent on coral cover, but standing crop of micromollusks decreases with increasing coral cover and depth. Standing crop of net phytoplankton cells (<100 micro) Measure 3 2000 to 3000 cells per cm3 but does not vary significantly with area. Macrozooplankton abundance decreases from north to south. Transect A is distinguished by an especially high energy environment, reflected by the low standing crop and mixed species composition of micromolluks. Transect B, the proposed outfall site, is hard and flat, and mostly devoid of coral cover; very few fish were seen at this station.
W77-07798

DETERMINATION OF THE LEEWAY OF OIL SLICKS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5B.
W77-07800

EFFECT OF MAJOR ION VARIATIONS IN THE MARINE ENVIRONMENT ON THE SPECIFIC GRAVITY--CONDUCTIVITY--CHLORINITY--SALINITY RELATIONSHIP,
Naval Underwater Systems Center, Newport, R.I.
For primary bibliographic entry see Field 2K.
W77-07802

PHYSIOLOGICAL RESPONSE OF THE CUNNER, TAUTOGOLABRUS ADSPERSUS, TO CADMIUM.
National Marine Fisheries Service, Seattle, Wash.
For primary bibliographic entry see Field 5C.
W77-07830

EFFECT OF SALINITY ON THE FRESHWATER SHRIMP DIKEROGAMMARUS HAEMOBAPHES (EICHWALD) FROM THE MOUTH OF THE DNEPR,
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W77-07848

HYDROLOGIC OPTICS. VOLUME V. PROPERTIES,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
For primary bibliographic entry see Field 1A.
W77-07960

A GOAL INTERVAL PROGRAMMING MODEL FOR RESOURCE ALLOCATION IN A MARINE ENVIRONMENTAL PROTECTION PROGRAM,
Texas Univ. at Austin. Center for Cybernetic Studies.
For primary bibliographic entry see Field 6G.
W77-08042

INFLUENCE OF MUSSEL METABOLITES ON THE DYNAMICS OF NUTRIENTS IN THE COASTAL WATERS OF THE EASTERN MURMAN COAST, (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Institut (USSR).
For primary bibliographic entry see Field 5C.
W77-08043

A THEORETICAL FRAMEWORK FOR THE DESCRIPTION OF ESTUARIES,
Goteborg Univ. (Sweden). Dept. of Oceanography.
G. Walin.
Tellus, Vol. 29, No. 2, p 128-136, 1977. 2 fig, 2 ref.

Descriptors: *Estuaries, *Basins, *Model studies, Mathematical models, Salinity, Salts, Flow, Mass transfer, Heat transfer, Radiation, Tracers, Mixing, Inflow, Oceanography, Foreign research.
Identifiers: *Baltic Sea.

A theoretical framework for the description of an estuarine system was outlined, with particular reference to the Baltic. The description, in terms of continuous functions of salinity and time, may be considered as an improvement of existing 'box models', which are inherently incapable of making efficient use of hydrographic data. Relations between deep water supply and internal mixing properties, as well as the equations controlling diffusion of substances in general, were derived, and their applicability was discussed. (Sims-ISWS)
W77-08057

THE LATERAL MOVEMENT OF THE COASTAL WATER AND ITS RELATION TO VERTICAL DIFFUSION,
Nordland Regional Coll., Bodo (Norway). Fishery Div.
M. Haakstad.
Tellus, Vol. 29, No. 2, p 144-150, 1977. 5 fig, 1 tab, 22 ref.

Descriptors: *Coasts, *Estuaries, *Fjords, Circulation, Water circulation, Ocean circulation, Model studies, Mathematical models, Diffusion, Flow, Movement, Salinity, Saline water-freshwater interfaces, Oceans, Foreign countries, Foreign research, Oceanography.
Identifiers: *Norway.

Lateral oscillations in the transition between coastal and oceanic waters are likely to be a general phenomenon. Along the Norwegian coast this phenomenon has been observed and discussed since the time of Fridtjof Nansen and other early Norwegian pioneers, but so far no satisfactory explanation has been given. This article showed that a seasonal variation in the vertical diffusion may cause a corresponding oscillation in the lateral extent of the coastal water. (Sims-ISWS)
W77-08058

HYDROCARBONS IN EASTERN CANADIAN MARINE WATERS DETERMINED BY FLUORESCENCE SPECTROSCOPY AND GAS-LIQUID CHROMATOGRAPHY,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5A.
W77-08060

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PREPARATION OF COMPOSITE REVERSE OSMOSIS MEMBRANES BY PLASMA POLYMERIZATION,
Research Triangle Inst., Research Triangle Park, N.C.
H. Yasuda, and N. Morosoff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 359, Price codes: A14 in paper copy, A01 in microfiche. Final Report No. OWRT/S--77/3, April 27, 1977. 314 p. OWRT 14-30-3157 and 14-30-3301.

Descriptors: *Reverse osmosis, *Membranes, *Membrane processes, *Desalination processes, Plastic polymers, Desalination apparatus, Porous media.
Identifiers: *Plasma polymerization, *Composite RO membranes, Porous substrates.

Composite reverse osmosis membranes are formed by plasma polymerization onto a porous substrate. An inductively coupled system is used with the substrate in a fixed position relative to the monomer inlet and to the coil supplying power to

the system. Deposition rate is independent of power if one works with the 'full glow' regime. The chemical nature of the polymer is also independent of power over a wide range. A system is described for a study of the effect of the chemical nature of the monomer(s) on the physical and chemical properties of the plasma polymer formed. The chemical nature of the polymer, the concentration of trapped free radicals, its stability, permeability, surface energy and internal stress can be controlled by choice of monomer(s). Composite reverse osmosis membranes are formed using a porous polymeric film substrate in the inductively coupled system using nitrogen containing monomers or a combination of a hydrocarbon plus nitrogen or carbon monoxide. Up to 99.5% salt rejections from 3.5% NaCl at 1500 psi have been achieved together with high water fluxes. Good salt rejection accompanied by resistance to chlorine has been found using CO as a comonomer. The effects of pretreatment of the substrate with nonpolymerizing nitrogen followed by coating using nitrogen as a comonomer is to increase salt rejection at the expense of chlorine resistance. A method of measuring porosity in dry membranes was developed and the porosity of composite membranes was measured and related to their salt rejection. The shift from hydraulic to diffusive water permeability with increasing salt rejection has also been demonstrated. Preliminary studies have been carried out using hollow fibers which move through the plasma using both an inductively coupled system and a capacitively coupled system with internal electrodes.
W77-07792

3B. Water Yield Improvement

MANUEL TECHNIQUE DU VILLAGE, (VILLAGE TECHNOLOGY HANDBOOK), (VOLS. 1 AND 2).
Volunteers in Technical Assistance, Mt. Rainier, Md.
For primary bibliographic entry see Field 3F.
W77-07628

MAKING AQUATIC WEEDS USEFUL: SOME PERSPECTIVES FOR DEVELOPING COUNTRIES.
National Academy of Sciences, Washington, D.C. Commission on International Relations.
For primary bibliographic entry see Field 4A.
W77-07964

STATISTICAL FORECASTING OF SNOW AVALANCHES, SAN JUAN MOUNTAINS, SOUTHERN COLORADO, U.S.A.,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W77-08055

3C. Use Of Water Of Impaired Quality

MODEL OF SALT FLOW IN SOIL WITH A SOURCE-SINK TERM,
Utah State Univ., Logan. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-07761

ESTABLISHING SOIL ELECTRICAL CONDUCTIVITY-SALINITY CALIBRATIONS USING FOUR-ELECTRODE CELLS CONTAINING UNDISTURBED SOIL CORES,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 2G.
W77-07776

COMPARISONS OF TWO MODELS FOR PREDICTING THE RELATIVE HYDRAULIC CONDUCTIVITY OF SALT-AFFECTED SWELLING SOILS,
Khartoum Univ. (Sudan). Dept. of Biochemistry and Soil Science.
For primary bibliographic entry see Field 2G.
W77-07777

HYDROGEOLOGICAL INVESTIGATIONS IN THE PAMPA OF ARGENTINA,
Bundesanstalt fuer Geowissenschaften und Rohstoffe, Hannover (West Germany).
For primary bibliographic entry see Field 7B.
W77-08064

3D. Conservation In Domestic and Municipal Use

WORKSHOP PROCEEDINGS -- RESEARCH NEEDS RELATED TO RECYCLING URBAN WASTEWATER ON LAND,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W77-07607

MUNICIPAL INFORMATION SYSTEMS: EVALUATION OF POLICY RELATED RESEARCH. VOLUME 2. COMPUTER UTILIZATION IN LOCAL GOVERNMENT,
California Univ., Irvine. Urban Information Systems Research Group.
For primary bibliographic entry see Field 6B.
W77-07631

WATER RESOURCES AND WATER-SUPPLY DEVELOPMENT IN TRINIDAD AND TOBAGO,
Wisconsin Univ., Madison. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W77-07785

HIERARCHICAL MODELING FOR THE PLANNING AND MANAGEMENT OF A TOTAL REGIONAL WATER RESOURCE SYSTEM: JOINT CONSIDERATION OF THE SUPPLY AND QUALITY OF GROUND AND SURFACE WATER RESOURCES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4B.
W77-07793

SURVEY PREDICTS 33 PERCENT MUNICIPAL COMPLIANCE WITH 1977 DEADLINE,
For primary bibliographic entry see Field 5G.
W77-07877

JOINT MUNICIPAL CORPORATION WASTE WATER TREATMENT,
For primary bibliographic entry see Field 5D.
W77-07920

3E. Conservation In Industry

LAWS NEEDED TO EXPEDITE ELECTRIC GENERATION SCHEDULES FOR THE PACIFIC NORTHWEST: FINANCING, ENVIRONMENTAL LAWS AND SITING AND LICENSING PROCEDURES, VOLUME I, FINANCING PACIFIC NORTHWEST ELECTRIC GENERATION,
Kell, Alterman and Runstein, Portland, Oreg.
For primary bibliographic entry see Field 8C.
W77-07601

LAWS NEEDED TO EXPEDITE ELECTRIC GENERATION SCHEDULES FOR THE PACIFIC NORTHWEST: FINANCING, ENVIRONMENTAL LAWS AND LICENSING PROCEDURES, VOLUME II, ENVIRONMENTAL LAWS AND SITING AND LICENSING PROCEDURES,
Kell, Alterman and Runstein, Portland, Oreg.
For primary bibliographic entry see Field 6E.
W77-07602

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. SELECTED MAJOR WATER USING INDUSTRIES AND POPULATION PROJECTIONS, APPENDIX III.
CH2M/Hill, Corvallis, Oreg.
For primary bibliographic entry see Field 6D.
W77-07624

REVIEW OF COLOUR REMOVAL TECHNOLOGY IN THE PULP AND PAPER INDUSTRY,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.
W77-07734

WATER RESOURCES AND WATER-SUPPLY DEVELOPMENT IN TRINIDAD AND TOBAGO,
Wisconsin Univ., Madison. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W77-07785

HIGH GRADIENT MAGNETIC SEPARATION OF FOOD PROCESSING WASTEWATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.
W77-07852

JOINT MUNICIPAL CORPORATION WASTE WATER TREATMENT,
For primary bibliographic entry see Field 5D.
W77-07920

INDUSTRY MONITORS COUNTY STORM SEWER WATER,
Case (J. I.), Co., Racine, Wis.
For primary bibliographic entry see Field 5D.
W77-07933

COMPOSITION AND METHOD OF INHIBITING GROWTH OF SLIME IN WATER,
Betz Lab., Inc., Trevose, Pa. (Assignee).
For primary bibliographic entry see Field 5G.
W77-08027

3F. Conservation In Agriculture

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, MALHEUR LAKE DRAINAGE BASIN, APPENDIX I-12,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07617

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, GOOSE AND SUMMER LAKES DRAINAGE BASIN, APPENDIX I-13,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07618

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, KLAMATH DRAINAGE BASIN, APPENDIX I-14,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07619

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER, GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, ROGUE DRAINAGE BASIN, APPENDIX I-15,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07620

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, UMPQUA DRAINAGE BASIN, APPENDIX I-16,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07621

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, NORTH, MID-, AND SOUTH COAST DRAINAGE BASINS, APPENDIX I-17, AND 18,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07622

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. IRRIGATION AND FOOD PRODUCTS PROJECTIONS, APPENDIX II,
Oregon State Univ., Corvallis. Cooperative Extension Service; and Oregon State Univ., Corvallis. School of Agriculture; and Oregon State Univ., Corvallis. Agricultural Experiment Station.
For primary bibliographic entry see Field 6D.
W77-07623

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. FOREST PRODUCTS PROJECTIONS AND RECREATION PROJECTIONS, APPENDICES IV AND V,
Oregon State Univ., Corvallis. Forest Research Lab.
For primary bibliographic entry see Field 6D.
W77-07625

MANUEL TECHNIQUE DU VILLAGE, (VILLAGE TECHNOLOGY HANDBOOK), (VOLS. 1 AND 2).
Volunteers in Technical Assistance, Mt. Rainier, Md.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 094, Price codes: A19 in paper copy, A01 in microfiche. Prepared for Agency for International Development, February 6, 1976. 430 p. Translation into French from English document, Village Technology Handbook, First edition, Volumes 1, 2, 1963.

Descriptors: *Water supply, *Irrigation construction, *Irrigation design, *Irrigation systems, *Water wells, Water storage, Water purification, Concrete construction, Food processing.
Identifiers: *Village water supply, *Bamboo construction, *Refrigeration construction, *Latrine construction, Food storage, Agricultural implement construction.

This is a collection of articles which deals with the construction of various devices to improve the standards of sanitation, water supply, buildings, agriculture, and food processing in a village-level technology; there is also a section on information dissemination. Each article contains a general description, a list of materials, complete instructions and diagrams, and predicted results. The volume also contains conversion charts and equations from English-system measures to metric measures and back. (Ward-NC)
W77-07628

SIMULATION OF IMPOUNDMENT TERRACE HYDRAULICS,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W77-07767

DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5D.
W77-07816

OPTIMIZATION OF WATER USE FOR IRRIGATION,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
J. M. Van Deman, R. S. Sowell, and R. E. Sneed.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 473, Price codes: A02 in paper copy, A01 in microfiche. Paper presented at ASCE 1976 Winter Meeting, Palmer House, Chicago, Illinois, December 14-17, 1976. 20 p, 15 tab, 5 ref. Paper No. 76-2526. OWRT B-068-NC(4). 14-31-0001-4114.

Descriptors: *Agricultural water, *Water demand, *Irrigation water, *Water requirements, Irrigation, Irrigation practices, *Computer models, Linear programming, Irrigation efficiency, *North Carolina, Water utilization, Water supply, *Optimization.
Identifiers: *Agricultural water demand, Water use models, Irrigation policy, Beaufort County(NC).

A computer system has been developed for determining optimal use of a limited supply of water for the irrigation of crops. The system includes: a computer program which determines water requirements of a particular crop/soil/irrigation policy combination; a linear program; a computer program to reduce data to the input format required by MPS/360; and MPS/360 program for solution of the linear program; and a computer program to reduce the MPS/360 solutions to user oriented output reports. This system was used in a study of optimal water use in a county in eastern North Carolina. Results of the study indicate the potential of increased return from agriculture by optimally using water available for irrigation. (Kiger-NC State)
W77-07851

NITRATES IN SOME SOIL-WATER SYSTEMS IN QUEBEC, (IN FRENCH),
For primary bibliographic entry see Field 5B.
W77-07858

FLOW CONTROLLER DEVICE,
Reed Irrigation Systems, El Cajon, Calif. (Assignee).
M. F. Hinton, and D. Allport.
U. S. Patent No. 3,993,089, 6 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 952, No 4, p 1579, November 23, 1976.

Descriptors: *Patents, *Irrigation, *Flow control, *Irrigation practices, *Irrigation efficiency, Irrigation systems, Application equipment.
Identifiers: Drip irrigation.

In various fluid distribution systems such as drip type irrigation systems it is necessary to control the flow rate and pressure of the fluid within fairly narrow limits in order to assure proper functioning of the system. A combination shutoff, flow control and pressure relief valve that comprises a body with a movable spool and inlet and outlet portions are adapted for use with a drip irrigation system that will allow the pressure components in the system to be set at a preselected level despite the pressure of the water supply and will provide pressure controlling as well as full shut-off. Regulation of the fluid pressure in the chamber and thus in the outlet can be maintained at the preselected level by controlling the size of the inlet orifice at a point just below the actuation level of the valve spring. (Sinha-OEIS)
W77-08017

FLUID FLOW REGULATOR,
Harmony Emitter Co., Inc., Tucson, Ariz. (Assignee).
R. C. Harmony.
U.S. Patent No. 3,993,248, 9 p, 14 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 952, No 4, p 1632, November 23, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Flow, *Flow control, Flow system, Irrigation practices, Irrigation efficiency, Application equipment.

A primary object of the invention is to provide a fluid discharge device for an irrigation system which discharges water at a constant rate despite variations in fluid pressure. It also provides a device which will pass suspended particulate matter. The fluid flow regulator has a discharge outlet which is generally coincident with the wall of the conduit. A pair of opposed flexible elements from opposite sides of the outlet define a passageway from within the conduit to the outlet. Bias means constrict the passageway in proportion to variations in fluid pressure within the conduit. A pressure gradient within the passageway functions within the conduit so that the rate of water discharge through the outlet is maintained at constant rate despite variations in pressure within the conduit. (Sinha-OEIS)
W77-08018

IRRIGATION SYSTEM,
A. J. Hieb.
U.S. Patent No. 3,993,249, 6 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 952, No 4, p 1632, November 23, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation system, *Irrigation efficiency, Irrigation practices, Sprinkler irrigation, Conveyance structures, Application equipment.

An orbital irrigation system employes a rotatable pivot head as a supply take-off which comprises a sprinkler conduit issuing horizontally from the pivot head. The sprinkler conduit includes distally placed sprinkler heads. The sprinkler conduit is carried by wheel sets placed at intervals along the length of the sprinkler conduit. The wheel sets are provided with a gear box driven by combination means for providing mechanical rotation to the gear box and for dispensing a spray of water. The sprinker conduit has horizontal and lateral stressing including a number of spars conduit at a point distant from the pivot and over the terminal ends of the spars to alternate bases of the spars drives a carriage assembly. (Sinha-OEIS)
W77-08019

SPRINKLER ADAPTED FOR ATTACHMENT TO THE GROUND,
Beatrice Foods Co., Moonachie, N.J. (Assignee).
J. E. Testa.
U.S. Patent No. 3,994,441, 5 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 952, no 5, p 2043, November 30, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Water distribution(Applied), Stand pipes.

One type of sprinkler has its nozzle elevated to a given height from the ground to accommodate a particular need. The size of the sprinkled area is dependent on the distance of the nozzle from the ground. Thus, given a particular water pressure, a greater area is sprinkled when the height of the nozzle is increased. In order to prevent its being tipped over easily, the base support of such a tall unit must either be relatively wide or it must be firmly fastened to something stationary and stable. The prime object of this invention is to provide a secure, rigid, and reliable attachment for securing a spike to a fluid-carrying tube in a sprinkler unit without the necessity for drilling holes in the tube. A further object is to provide a sprinkler that can be secured to the ground and having a foot-step. The nozzle is attached to one end of a fluid carrying tube. The earth-penetrating element is attched to a section at the other end by a projection-recess combination. The snugness of the fit of the projection within a recess provides a strong, rigid and reliable attachment without any need for drilling holes in the tube. (Sinha-OEIS)
W77-08025

AN INTEGRATED MODEL-APPROACH TO THE EFFECT OF WATER MANAGEMENT ON CROP YIELD,
Institute for Land and Water Management Research, Wageningen, (Netherlands).
R. A. Feddes, and A. L. M. van Wijk.
Agricultural Water Management, Vol. 1, No. 1, p 3-20, December 1976. 10 fig, 3 tab, 11 ref.

Descriptors: *Water management(Applied), Effects, *Drainage, *Simulation analysis, *Computer models, *Arable land, *Grassland, Agriculture, Seasonal, Crops, Soil moisture, Evapotranspiration, Equations, Systems analysis, *Crop production.
Identifiers: *Netherlands, Growing seasons, Integrated model approach.

A simulation model is presented which quantifies the effect of drainage on crop yield. For both arable land and grassland, the factors acting in spring, summer, and autumn are considered separately. For arable land in spring, the course in time of the soil water tension of the upper layer is simulated in terms of rainfall, evaporation, drain depth, and drain intensity data; the dates and number of workable days are established from model output. The expected yield depresion is then derived, using an experimental relationship between yield depression and number of days of sowing delay. During summer, the yield can be otained from the relationship between yield and relative evapotranspiration. Combining this yield, obtained using a known evapotranspiration model, with the yield depression, objected by means of the workability model used in the above example for spring, gives the actual yield. For autumn, the workability model determines the dates and number of days available for harvesting. Yields are derived from an experimental relation between yield depression and the number of days of earlier harvesting. An example is given for summer cereals growing on heavy sandy loam soil in the Netherlands. For grassland, the effect of shallow groundwater table depths in winter and spring on the yield of the first and second cut can be determined using the workability model. Combining the yield depression with the yield obtained with the evapotranspiration model gives the actual yield. An example representative for the Netherlands is given for grass on peat soil. (Bell-Cornell)
W77-08038

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

OPERATING POLICY ADAPTATIONS FOR A RESERVOIR SYSTEMS, (PHASE I),
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
G. H. Toebes, and C. Rukvichai.
Purdue University Water Resources Research Center, Technical Report No. 79, August 1976. 72p.

Descriptors: *Reservoir Operation, *Reservoir releases, Simulation analysis, Management, Water policy, Model studies, Kentucky, Algorithms, Data collections.
Identifiers: *Green River Basin(KY), *Dam tender reports, Operating policy algorithm, Reservoir regulation rules, *Operating policy.

Daily reservoir regulation records in the form of historical daily releases, Qht(cfs), were constructed for the four Corps of Engineers reservoirs in the Green River Basin, KY. The Qht time series were constructed from the daily Dam Tender Reports for the Barren, Green, Nolin, and Rough River Reservoirs, KY. The Qht-values were compared on a day-by-day basis with the release decisions, Qt, yielded by an operating policy algorithm based on the official Resevoir Regulation Schedules. These schedules are merely guides and will, in practice, be supplemented by various rules and practices. An attempt was made to capture these practices in an operating policy algorithm. The building of the models to obtain Qht, Qt, and the various exogeneous data series needed by the operating policy algorithm. The building of the models to obtain Qht, Qt, and the various exogeneous data series needed by the operating policy algorithm, constitutes the major aspect of the work reported herein. An initial analysis of the results, mainly in the form of daily flow deviation series, Qht-Qt, for up to eight years and four reservoirs has provided considerable insight into the many practical constraints associated with the operation of an actual reservoir system. This is of value to researchers in reservoir systems analysis. Further analysis involving interviews with COE staff are needed to exploit all the computed data series. Initial analysis points to possible improvements in computer assisted operations of reservoir systems. (See also W77-07604)
W77-07603

OPERATING POLICY SIMULATION OR A RESERVOIR SYSTEMS, (PHASE II),
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
G. H. Toebes, C. Rukvichai, and Y. S. Lin.
Purdue University Water Resources Research Center, Technical Report No. 80, August 1976, 104p, 7 ref, 5 append.

Descriptors: *Reservoir operation, *Reservoir releases, *Algorithms, Simulation analysis, Regulation, Data collections, Model studies, Kentucky, Data processing.
Identifiers: *Green River Basin(KY), *Dam tender reports, *Operating policy algorithm, Reservoir inflow models, Regulation schedules.

The large amount of data needed in constructing the Operating Policy Algorithm reported in PWRRC Report no. 79 required the construction of a Data Base and its associated access routines. Among the data used as input to the Operating Policy Algorithm are the reservoir inflow predictions. These are generated by Reservoir Inflow Models. An initial analysis of the obrtained 'deviation series, ' delta Q = Qht -Qt, for up to eight years and four reservoirs has provided considerable insight into the many practical constraints associated with the operation of an actual reservoir system. A general discussion and interpretation of results is found in a companion publication (PWRRC no. 79). This report amplifies the following: (a) Data Acquisition, Data Base construction, and the mode of Data Base use, (b) Algorithm for converting Dam Tender Reports into reservoir outflow and storage time series, (c) Construction of one of the Reservoir Inflow Models, (d) Construction of the Operating Policy Algorithm. Suffiecient detail has been provided to extend the work along the lines set forth in PWRRC Report no. 79. (See also W77-07603).
W77-07604

GENERATION OF MULTIVARIATE SYNTHETIC FLOWS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-07610

FLOODFLOW FORMULAS FOR URBANIZED AND NONURBANIZED AREAS OF CONNECTICUT,
Geological Survey, Hartford, Conn. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-07612

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. PROTECTION OF AREAS OF ORIGIN, APPENDIX VII,
Wendell and Schwan, Washington, D.C.
For primary bibliographic entry see Field 6D.
W77-07627

AN ANALYSIS OF ALTERNATIVE FLOOD MANAGEMENT PLANS IN UPSTREAM WATERSHEDS. CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY, PHASE 2,
Soil Conservation Service, Durham, N.H.
For primary bibliographic entry see Field 6F.
W77-07632

FLOOD PLAIN INFORMATION: THOMPSONS CREEK AND TRIBUTARIES, BRYAN, TEXAS,
Army Engineer District, Fort Worth, Tex.
Prepared for the City of Bryan, December 1975, 41 p, 7 fig, 23 plates, 7 tab.

Descriptors: *Texas, Floods, Flooding, *Flood flow, *Flood forecasting, *Flood profiles, *Flood data, *Peak discharge, *Flood plains, Storms, Historic floods, Flood frequency, Flood stages, Flow characteristics, Flood protection, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Building codes, Zoning, Control structures, Standard Project Flood.
Identifiers: Bryan(TX), *Thompsons Creek(TX), Thompsons Branch(TX), Still Creek(TX), West Fork Still Creek(TX), Cottonwood Branch(TX), South Fork Cottonwood Branch(TX), 10-year flood, 50-year flood, 100-year flood, 500-year flood.

The report covers 33.8 miles of channel of Thompsons Creek and its tributaries in the vicinity of Bryan, Brazos County, Texas. The tributaries include Thompsons Branch, Still Creek, West Fork Still Creek, Cottonwood Branch and South Fork Cottonwood Branch. Thompsons Creek drains 54 square miles. The flood plains are largely undeveloped and sparsely populated, with some residential, commercial and light industrial development in the upper reaches of Cottonwood Branch and Still Creek. Floods result from heavy rains in spring and fall, usually associated with frontal type storms, tropical hurricanes and thunderstorms. No stream gaging stations are main-

tained in the watershed. Data were obtained from U.S. Geological Survey records. Little specific data are available on past floods. There are no major flood damage prevention measures in the study area at this time. Peak discharge at the mouth of Thompsons Creek for a 50-year, 100-year and 500-year flood are 20,700 cubic feet per second (cfs), 24,500 cfs, and 34,800 cfs respectively. The discharge of a 100-year flood on Thompsons Branch, Still Creek, West Fork Still Creek, Cottonwood Branch and South Fork Cottonwood Branch is 5,800 cfs, 12,500 cfs, 1,280 cfs, 6,300 cfs, respectively. Channel velocities on Thompsons Creek for a 100-year flood are 2.0 to 6.0 feet per second, and 0.7 to 3.0 ft/sec in the overbank areas. Guidelines for flood plain management are discussed, including flood plain management tools such as zoning and subdivision control ordinances, building and health codes and several non-regulatory methods. (Gentry-NC)
W77-07634

FLOOD PLAIN INFORMATION; SAN ANTONIO RIVER, BEXAR COUNTY, TEXAS.
Army Engineer District, Fort Worth, Tex.
Prepared for the San Antonio River Authority, June 1975, 36 p, 7 fig, 19 plates, 7 tab.

Descriptors: *Texas, Floods, Flooding, *Flood flow, *Flood profiles, *Peak discharge, *Flow duration, Flow characteristics, *Flood plains, *Flood plain zoning, Dams, *Channel improvement, Streamflow forecasting, Flood forecasting, Storms, Hurricanes, Historic floods, Flood data, Flood frequency, Flood protection, Non-structural alternatives, Flood plain insurance, Building codes, Control structures.
Identifiers: *San Antonio River(TX), Bexar County(TX), San Antonio(TX), 50-year flood, 100-year flood, 500-year flood, Olmos Dam.

The report covers 22.3 miles of the San Antonio River near San Antonio, Texas, in Bexar County. The source of the San Antonio River lies within the city limits of San Antonio. The river slope averages 9.7 feet per mile. Development in the flood plain consists mainly of agriculture. Most floods occur in the fall resulting from hurricanes and thunderstorms. Flood control measures include the San Antonio Channel Improvement Project, the Olmos Dam, and land use controls, building codes and subdivision regulations. Stream gaging stations have been maintained by the U.S. Geological Survey at Various locations in the study area, the longest one being for 53 years. Data were obtained from records of these gages, and also from precipitation records, newspapers and historical documents and records. Significant floods on the San Antonio River occurred in 1921, 1931, 1946, 1963, 1968 and 1973, the largest being the 1921 flood with a discharge at the San Antonio gage of 15,300 cubic feet per second (cfs). Peak discharge on the San Antonio River at the Bexar County line for a 50-year, 100-year, and 500-year flood are 79,900 cfs, 111,100 cfs and 227,000 cfs, respectively. During a 100-year flood, the river would rise at a rate of 7.9 feet per hour, cresting at one foot above bankfull and remain above bankfull for 14 hours. Guidelines are presented for land usse in the river basin, with discussion of non-structural controls such as flood plain zoning, subdivision control, building and health codes, and others. (Gentry-NC)
W77-07635

SPECIAL FLOOD HAZARD REPORT: JERSEY CREEK, KANSAS CITY, KANSAS.
Army Engineer District, Kansas City, Mo.
Prepared for City of Kansas City, KS. December 1969. unp, 2 fig, 4 plates.

Descriptors: *Kansas, *Floods, *Flood plains, Flooding, Regional flood, Flood flow, Streamflow forecasting, Historic floods, Flood data, Peak discharge, Flood damage, Obstructions to flow, Velocity.
Identifiers: *Jersey Creek(KS), *Kansas City(KS), Standard Project Flood, Intermediate Regional Flood.

Though Jersey Creek flows through heavily populated sections of Kansas City, actual developments in the flood plains of the stream are rather limited, but do include some industrial areas, commercial and residential development, railroads and highways. The Jersey Creek basin has a drainage area of 5.42 sq mi, all within the city limits. The flood plain averages 200 to 400 feet wide. The main stem channel is well incised with a rather steep bed slope of 28 feet per mile. In contrast, tributary areas entering from the south are served by swale type surface drainage with no identifiable channels. There is no stream gaging station on this creek, but reports indicate floods occurred in 1906 and 1969. The 1969 event resulted from a storm which deposited from 6 to 8.5 inches of rain over the basin. Overflow from this storm was not observed at any point along the main channel or on tributaries having well developed channels. Flooding did occur on tributaries with swale type drainage. Businesses and streets were inundated. In the event of an Intermediate Regional Flood (IRF), Jersey Creek would have a peak discharge of 5,900 cfs, along with water velocities of 3 to 5 ft/sec. In a Standard Project Flood (SPF) a peak discharge of 10,700 cfs is predicted, and water velocities of 4 to 8 ft/sec. Tributaries to Jersey Creek would have smaller peak discharges. Many of the bridges in the area would be obstructive to flood flow. No information is given in this report on any flood control methods which may have been taken in this area. (Smith-North Carolina)
W77-07636

FLOOD PLAIN INFORMATION, SOUTH ANNA RIVER, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, Va.
Prepared for Hanover County, VA, July 1976. 27 p, 7 tab, 9 fig, 28 plates.

Descriptors: *Floods, *Flood data, *Flood control, *Historic floods, *Maximum probable flood, *Virginia, Flood peak, Flood protection, Building codes, Flood plains, Flood damage.
Identifiers: *South Anna River(VA), Hanover County(VA), 100-year flood, 500-year flood, Richmond(VA).

The study area includes approximately 36 miles of the South Anna River in Hanover County, VA. This stretch of river drains approximately 287 square miles of land. There is little development on the flood plain, but the close proximity of the expanding Richmond urban area makes future development likely. Flood data dating back to 1930 were obtained from a U.S. Geological Survey stream gage near Ashland, U.S.G.S. 1:24,000 scale topographic sheets, and precipitation records. Supplementary data were obtained from newspaper files and historical documents. Floods occur at any time of year and are caused by intense short term rainfall or tropical disturbances. The worst flood of record occurred on August 23, 1969, discharging 17,100 cubic feet/sec (cfs) and cresting at 108.73 feet mean sea level (MSL), which is 12.99 feet above flood stage. Flood damages exceeded $250,000. The 500-year flood is expected to crest at 115.4 MSL and discharge 31,000 cfs at the U.S.G.S. gage station; the 100-year flood will crest at 109.8 feet MSL, and discharge 19,000 cfs. Some existing residential property would be damaged by these floods. There are no existing or planned flood control structures that affect the 100- or 500-year flood. The statewide building code requires protection of buildings from the 100-year flood. The report does not provide solutions to flood problems, but provides a basis for adoption of land use controls to guide future flood plain development. (Nessa-NC)
W77-07637

FLOOD PLAIN INFORMATION, NORTH ANNA RIVER, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, Va.
Prepared for Hanover County, VA, July 1976. 27 p, 7 tab, 26 plates, 8 fig.

Descriptors: *Floods, *Flood data, *Flood control, *Historic floods, *Maximum probable flood, *Virginia, Flood peak, Flood protection, Building codes, Flood plains, Flood flows, Flood damage.
Identifiers: *North Anna River(VA), Hanover County(VA), 100-year flood, 500-year flood.

The study area includes approximately 50 miles of the North Anna River in Hanover County, VA, which drains 597 square miles of land. The flood plain consists mostly of wooded areas and open space, but development within the watershed is rapid and could soon impinge on the flood plain. Flood data dating back to 1927 were obtained from a Virginia State Water Control Board stream gage, U.S. Geological Survey 1:24,000 scale topographic sheets, and precipitation records. In addition, high water marks were obtained following the floods of August 1969 and June 1972. Although the highest flood of record (August 12, 1928) crested at 89.36 feet mean sea level (MSL), which is 20.7 feet above flood stage, its discharge of 18,400 cubic feet/sec (cfs) has been exceeded by recent floods with lower crests. The flood of August 24, 1969 crested at 88.26 MSL (19.6 feet above flood stage), discharging 24,800 cfs, and the flood of June 22, 1972 crested at 87.24 feet MSL (18.6 feet above flood stage), discharging 23,300 cfs. The 500-year flood will crest at 95.47 feet MSL and discharge 45,000 cfs at the existing gage. The 100-year flood will crest at 88.57 feet MSL and discharge 25,500 cfs. There are no existing or planned flood control structures that would affect the 100- or 500-year floods. The statewide building code requires protection of buildings from the 100-year flood. The report does not provide solutions to flood problems, but provides a basis for adoption of land use controls to guide future flood plain development. (Nessa-NC)
W77-07638

FLOOD PLAIN INFORMATION, CHERRY CREEK-CHERRY CREEK LAKE THROUGH FRANKTOWN, COLORADO.
Army Engineer District, Omaha, Nebr.
Prepared for Arapahoe County, Douglas County, Urban Drainage and Flood Control District, Colorado Water Conservation Board, October 1976. 40 p, 6 tab, 13 fig, 54 plates.

Descriptors: *Floods, *Flood data, *Flood control, *Flood plain zoning, *Flood profiles, Non-structural alternatives, *Colorado, Historic floods, Flood protection, Maximum probable flood, Flood plains, Flood peak.
Identifiers: *Cherry Creek(CO), Franktown(CO), Parker(CO), Douglas County(CO), Arapahoe County(CO), 100-year flood, 500-year flood.

The study area includes approximately 20 miles of Cherry Creek from about 7 miles downstream from Parker to about 2.5 miles upstream from Franktown in Douglas and Arapahoe Counties, CO. Development on the flood plain is primarily agricultural, with more congested urban development remaining external to the flood plain. The close proximity of the expanding Denver urban area makes future development on the flood plain likely. Flood data were obtained from two stream gages maintained by the U.S. Geological Survey, one near Parker, from 1933 to 1969 with a few interruptions, and one near Franktown since 1939. Earlier information was obtained from Corps of Engineers flood records. The main flood season occurs from May to August and results from either heavy general rainfall or intense local storms. The greatest recorded flood flow at the Franktown gage occurred on August 5, 1945, discharging 9,170 cubic feet/sec (cfs). The greatest recorded flood flow at the Parker gage occurred on June 16, 1965, discharging 39,900 cfs. The 100-year flood is

expected to discharge 13,300 cfs at the Franktown gage and 51,000 cfs at the Parker gage. The 500-year flood is expected to discharge 63,000 cfs at the Franktown gage and 150,000 cfs at the Parker gage. Damages from floods having a once in 25 year probability or less are unlikely due to 32 floodwater retarding structures completed in 1965 by the Soil Conservation Service. Flood plain zoning and other non-structural alternatives could minimize damages from larger floods. (Nessa-NC)
W77-07639

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, WARREN COUNTY, PENNSYLVANIA,
Army Engineer District, Pittsburgh, Pa.
Prepared for Warren County Planning Commission and the Pennsylvania Department of Environmental Resources, June 1975, 29 p, 13 fig, 17 plates, 5 tab.

Descriptors: *Pennsylvania, *Floods, Flooding, *Flood profiles, *Historic floods, *Flood stages, *Peak discharge, Flood flow, Streamflow forecasting, Flood frequency, Flow duration, Flow characteristics, Ice jams, Control structures, Dams, Reservoirs.
Identifiers: Warren County(PA), *Allegheny River, 100-year flood, 500-year flood, Warren(PA), Tidioute(PA), Kinzua Dam(PA).

The report concerns flooding of the 37.4 mile segment of the Allegheny River lying within Warren County located in northwestern Pennsylvania. Warren and Tidioute are the main towns in the County. The bed slope of the Allegheny River within Warren County averages 3.6 feet per mile, with valley floor widths ranging from 0.1 to 0.6 mile. The Kinzua Dam has reduced flood threats so that camps, trailer parks and industrial sites are now being developed on what was previously marginal land. Flood flow data were obtained from U. S. Geological Survey, National Weather Service, and U. S. Army Corps of Engineers stream gages, including one in Warren established in 1884. In addition, records were obtained from newspapers and historical documents. Main flood season is December through April. The most recent high flood occurred on March 8, 1956, reaching a gage height of 18.3 feet at the Warren gage and discharging 80,500 cubic feet per second (cfs). Ice jams have historically caused unpredictable rises in river stage. Peak discharge for a 100-year flood (Intermediate Regional Flood) is 40,000 cfs and 46,500 cfs for a 500-year flood. Channel velocities for 100-year and 500-year flood would be 4.4 and 4.8 ft/sec, respectively. The 100-year flood would crest in 24 hours while the time of rise for a 500-year flood would be 30 hours. (Gentry-NC)
W77-07640

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, VENANGO COUNTY, PENNSYLVANIA,
Army Engineer District, Pittsburgh, Pa.
Prepared for Venango County Planning Commission and the Pennsylvania Department of Environmental Resources, December 1974, 33 p, 12 fig, 16 plates, 7 tab.

Descriptors: *Pennsylvania, *Floods, Flooding, Flow characteristics, *Peak discharge, *Flood plains, Flood flow, Streamflow forecasting, Flood forecasting, Historic floods, Flood data, Flood frequency, Flow duration, Flood damage, Channels, Flood protection, Control structures, Dams, Reservoirs, Standard Project Flood.
Identifiers: *Allegheny River, Venango County(PA), Kinzua Dam(PA), Oil City(PA), Franklin(PA), Tionesta Dam(PA), Union City Dam(PA), Woodcock Dam(PA), Intermediate Regional Flood.

The study covers the 60 miles of the Allegheny River lying within Venango County (PA). The average bed slope of the Allegheny River in the study reach is 3.0 ft/mile, with valley floor widths ranging from 0.1 to 0.4 miles. Residential and industrial development in the flood plain is concentrated at Franklin (PA) and Oil City (PA). Data were obtained from U. S. Geological Survey records for stream gaging stations maintained at Parker, Franklin, and West Hickory (PA). Newspaper files and historical records and documents were used to supplement these data. The main flood season is December through April, resulting from heavy rainfall and snowmelt. Four upstream dams have been built to control floods--Tionesta Dam. Kinzua Dam, Union City Dam, and Woodcock Dam. The highest known flood occurred on March 17, 1865, cresting at 25 feet at the Franklin gage. Ice gorges caused a higher crest in February 1917--26 feet. Since the completion in 1967 of the Kinzua Dam, only an ice jam in 1970 has exceeded a stage of 20 feet. Peak discharge for an Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) are 120,000 cubic feet per second (cfs), and 157,000 cfs, respectively. For an IRF and SPF, the channel and overbank velocities are 12 and 14 ft/sec, and 4.0 and 4.0 ft/sec, respectively. An IRF should crest after 24 hours, remaining 0.5 days above bankfull. An SPF should crest in 30 hours and be above bankfull for 1 day. There are no significant obstructions to flood flow. (Gentry-NC)
W77-07641

FLOOD PLAIN INFORMATION: NORTHWEST STREAM GROUP, STOCKTON, CALIFORNIA,
Army Engineer District, Sacramento, Calif.
Prepared for San Joaquin County, CA, July 1976. 43 p, 11 tab, 21 fig, 19 plates.

Descriptors: *Floods, Flooding, *Flood data, *Tidal waters, *Peak flows, *California, Flood control, Flood frequency, Flood damage, Flood plain zoning, Flood plains, Historic floods, Flood protection, Standard Project Flood, Levees, Reservoirs, Flood profiles, Storms, Winds.
Identifiers: *Stockton(CA), San Joaquin County(CA), *San Joaquin River(CA), Bear Creek(CA), Lower Mosher River(CA), Disappointment Slough(CA), Fourteen Mile Slough(CA), Calaveras River(CA), Intermediate Regional Flood.

The study area involves six streams and waterways in Stockton and San Joaquin County, California. The rivers involved are the San Joaquin, Bear Creek, Lower Mosher, Disappointment slough, Fourteen Mile Slough, and the Calaveras River. They are the termini of a complex system of waterways draining a relatively small watershed. These rivers and streams cause flooding in the Stockton area; tidal action also causes flooding. The area is very flat, and is consequently very susceptible to flooding. Development in flood-prone areas is extensive, ranging from agriculture to residential and commercial buildings. Flood data were obtained from 15 stream gaging stations and 7 tide gaging stations, numerous precipitation stations, U. S. Geological Survey (USGS) topographic maps, and newspaper files. General rain floods occur from November through April, while snowmelt floods occur from April through June. The most severe floods result when very high tides and strong onshore winds occur coincidentally with flood periods. The worst flood in the recorded history of the central valley occurred in December 1955. A portion of stockton was inundated. Flood water reached 3 feet and covered an area over 2 miles wide. Damage totalled over $1.5 million. Another large flood occurred in April 1958. Several reservoirs and extensive levees exist, and further-reaching flood plain zoning and other land use control measures will all contribute to minimizing the impact of the Standard Project Flood. The Intermediate Regional Flood would only affect small agricultural areas. The report does not contain plans or recommend action for flood control. (Nessa-NC)
W77-07642

FLOOD PLAIN INFORMATION: WICHITA RIVER AND TRIBUTARIES, WICHITA FALLS, TEXAS,
Army Engineer District, Tulsa, Okla.
Prepared for City of Wichita Falls, May 1976, 40 p, 11 fig, 21 plates, 5 tab.

Descriptors: *Texas, *Floods, Flooding, *Flood forecasting, *Flood profiles, *Peak discharge, Flow characteristics, *Flood plains, Flood flow, Historic floods, Flood data, Flood frequency, Flood peak, Flow duration, Flood damage, Channels, Flood protection, Non-structural alternatives, Flood plain zoning, Building codes, Land use, Zoning, Dams, Reservoirs, Water storage, Standard Project Flood, Control structures.
Identifiers: *Wichita River(TX), Pond Creek(TX), East Fork Pond Creek(TX), *Wichita Falls(TX), Beaver Creek, Buffalo Creek, Plum Creek, Intermediate Regional Flood.

The study covers the Wichita River, and Pond and East Fork Pond Creeks, draining altogether approximately 3,349 square miles, in the vicinity of Wichita Falls, TX. Lake Kemp, on the Wichita River, had flood control storage capacity so that emphasis is placed on the 41.3 mile segment of Wichita River below the lake, and the river's tributaries which include Beaver creek, Buffalo Creek, Pond Creek and Plum Creek. The average streambed slope for the Wichita River in the study area is 1.3 feet per mile, and 5.8 and 7.7 ft/mi for Pond and East Fork Pond Creeks, respectively. Floods result from thunderstorms and frontal movements, occurring most frequently from May through October. Data were obtained from a U. S. Geological Survey stream gaging station loated near the center of the study area, and other information was obtained from local records and field investigation. A flood in October 1941 was the largest since gage records have been kept, with a discharge of 17,800 cubic feet per second (cfs). Peak discharge for the Intermediate Regional Flood and Standard Project Flood on the Wichita River, Pond Creek and East Fork Pond Creek are 24,800 and 70,500 cfs, 4,790 and 10,108 cfs, and 3,036 and 6,486 cfs, respectively. Main channel velocity during an IRF for Wichita River, Pond Creek and east Fork Pond Creek is 4.0 feet per second, 5.86 ft/sec and 4.17 ft/sec, respectively. Guidelines for flood plain management are discussed, including non-structural alternatives such as zoning, subdivision and health regulations, and building codes. (Gentry-NC)
W77-07643

FLOOD PLAIN INFORMATION: IPSWICH RIVER, NORTH READING AND WILMINGTON, MASSACHUSETTS,
Army Engineer District, Waltham, Mass. New England Div.
Prepared for the Towns of North Reading and Wilmington, September 1971. 58 p, 9 fig, 6 plates, 8 tab.

Descriptors: *Floods, Flood stages, Flood plains, Channel improvement, *Flood plain zoning, *Swamps, *Massachusetts, *Flood profiles, Flooding, Historic floods, Flood data, Peak discharge, Flow duration, Flow characteristics, Flood damage, Flood protection, Zoning, Planning.
Identifiers: *Ipswich River(MA), North Reading(MA), Wilmington(MA), Intermediate Regional Flood, Standard Project Flood.

The study area of the Ipswich River, located in Northeastern Massachusetts, covers 13.3 miles between the towns of Wilmington and North Reading. Meandering in a northeasterly direction, the river drains 43.4 sq mi above the study area and slopes at an average of 3 ft/mi. The flood plain, consisting of much fill, contains residential, commercial and industrial development with continued development taking place in flood-prone areas. Flooding occurs in the spring, resulting from a combination of heavy rains and melting

snow. High flood stages are the result of storms which produce large volumes of runoff rather than high intensity, low duration storms. Particular to Ipswich River Basin are the swamp systems which function as huge reservoirs and reduce peak storm runoff by temporarily impounding large volumes of water. No flood control measures exist except for minor channel improvement, but the local governments have enacted Flood Plain Zoning Ordinances. The greatest flood occurred on March 19, 1968 with a flood level of 7.09 ft and an estimated peak discharge of 833 cubic ft/sec. Damage in a 1962 flood was well over $100,000. An Intermediate Regional Flood would have a peak discharge of 1,100 cfs, a 1 foot stage higher than 1968 flood. A Standard Project Flood would have peak discharge of 1,500 cfs and a stage 2.5 higher than the 1968 flood. (Salzman-North Carolina).
W77-07644

FLOOD PLAIN INFORMATION: MERRIMACK AND SOUHEGAN RIVERS, LITCHFIELD AND MERRIMACK, NEW HAMPSHIRE.
Army Engineer District, Waltham, Mass.
October 1973. 28 p, 13 fig, 9 plates, 6 tab.

Descriptors: *Floods, Flooding, *Peak discharge, Flow characteristics, *Flood plains, *Flood protection, Control structures, Dams, Historic floods, Flood data, Flood stages, Flow duration, Rivers, Planning, Diversion structures, *New Hampshire.
Identifiers: *Merrimack River(NH), *Souhegan River(NH), Litchfield(NH), Merrimack(NH), Intermediate Regional Flood, Standard Project Flood.

The Merrimack River, located in South Central NH, flows southeasterly in this study area for 9 miles, sloping at an average of .84 ft per mile. Its flood plains range from .1 to 1 mile wide and contain primarily agricultural areas with some residential, commercial and industrial development. The Souhegan River flows in an easterly direction for 7.5 miles in study area, sloping at 12.4 ft per mile. Varying from 200 ft to 3400 ft wide, its flood plains are mostly agricultural and wooded. Both flood plains are under pressure for development. Major floods, caused by runoff from general rainfall, occur during all seasons. Other causes include hurricane activity and snowmelt. Flood flow stages rise in a relatively short period of time with high velocities (10 to 15 ft per sec) in channel. Eleven of 13 proposed flood retarding structures have been built on the Souhegan River. To maintain flood control and low flow augmentation, 5 dams have been constructed on the Merrimack. Greatest known flood on the streams occurred March 19-20, 1936 with a peak discharge of 173,000 cubic ft/sec on the Merrimack. An Intermediate Regional Flood and Standard Project Flood on the Merrimack would result in peak discharges of 102,000 cfs and 142,000 cfs, respectively. Similar flood conditions would exist on the Souhegan River, though with discharge of 22,000 and 12,500 cfs for the SPF and IRF, respectively. This report furnishes a suitable basis for the adoption of land use controls to guide flood plain development. (Salzman, North Carolina)
W77-07645

THE REPRESENTATION OF A SHORT PERIOD OF EXPERIMENTAL CATCHMENT DATA BY A LINEAR STOCHASTIC DIFFERENCE EQUATION,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2 .
W77-07646

INVESTIGATIONS ON THE STRUCTURE OF FREQUENCY DISTRIBUTIONS OF FLOODS,
Technische Universitaet, Dresden (East Germany).
For primary bibliographic entry see Field 2E.
W77-07649

BAYESIAN ESTIMATION OF FREQUENCY OF HYDROLOGICAL EVENTS,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2E.
W77-07650

STOCHASTIC STRUCTURE OF A PROCESS OF AVERAGE MONTHLY FLOWS,
Technical Univ. of Warsaw (Poland).
For primary bibliographic entry see Field 2E.
W77-07651

SPATIAL AND TIME ANALYSIS AND ESTIMATION OF RIVER FLOW,
Moscow State Univ. (USSR). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W77-07654

THE GENERATION OF SYNTHETIC MONTHLY RUNOFF RECORDS FOR UNGAUGED BRITISH CATCHMENTS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-07661

STOCHASTIC DIFFERENCE EQUATION MODELLING OF HYDROLOGICAL PROCESSES,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-07663

SIGNIFICANCE TESTS OF PERIODICITY IN HYDROLOGICAL TIME SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-07665

MATHEMATICAL MODELS RESULTING FROM STATISTICAL ANALYSIS OF THE MEAN MONTHLY FLOW,
Ebasco Services, Inc. New York.
For primary bibliographic entry see Field 2E.
W77-07669

DETERMINATION OF THE DEGREE OF PROTECTION OFFERED BY FLOOD CONTROL SYSTEMS ON THE BASIS OF DISTRIBUTION FUNCTIONS,
Water Resources Centre, Budapest (Hungary).
For primary bibliographic entry see Field 8B.
W77-07673

A MULTIVARIATE MATHEMATICAL MODEL OF MONTHLY RIVER FLOW,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering.
For primary bibliographic entry see Field 2E.
W77-07675

TIME AND FREQUENCY-DOMAIN IDENTIFICATION OF A CASUAL BIVARIATE STOCHASTIC PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2E.
W77-07680

APPLICATION OF STOCHASTIC HYDROLOGICAL MODELS IN THE DESIGN OF LAKE LEVEL CONTROL,
Technical Univ. of Budapest (Hungary).
I. Kontur.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, Volume 1, July 1971. IAHS/Unesco, Paris, France, 1974, + 379-384.

Descriptors: *Lakes, *Hydrologic systems, Water demand, *Water levels, *Simulation analysis, Control, Design, Correlation analysis, Water balance, Digital computers, Inflow, Outflow, Meteorology, Economic efficiency, Probability, Monte Carlo method, Equations, Systems analysis, Mathematical models.
Identifiers: *Lake levels, *Lake Balaton, Hungary.

Reported is an analysis made of the hydrological system of Lake Balaton, the largest lake of Central and Western Europe. The analysis was made in order to yield data for the preliminary design of structures that are to serve the control of lake level and the meeting of various water demands. The economy and the future operation method of the structures to be built were studied using simulation. When analyzing long series consisting of annual and monthly data of hydrometeorological elements observed at stations at and near the shores of Lake Balaton, use was made of correlation analysis, the function of the sum of quadratic differences, and spectrum analysis, and seven types of relationships have been established. The analysis of time sequences has proved the inhomogeneity of long sequences and an attempt was therefore made to derive results from intensive analysis of data from recent times and from generated data. The water balance equation of the lake and basin was used to produce a data sequence of water content changes, based upon the various elements of water balance, using various methods. A method of generating simultaneous data sequences with the appropriate cross-correlational structure has been proposed; simulation runs were made on a digital computer and the range of water stage fluctuations has been established for various control rules on inflow and outflow. (See also W77-06708) (Bell-Cornell)
W77-07681

SOME ARITHMETICAL RELATIONS OF A MATRIX FOR A CALCULUS OF RESERVOIRS, (QUELQUES RELATIONS ARITHMETIQUES DE MATRICE DANS LE CALCUL DES RESERVOIRS),
Direction des Eaux, Baja (Hungary).
I. Zsuffa.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Volume 1, July 1971. IAHS/Unesco, Paris, France, 1974, p 385-394. 2 fig, 7 tab, 6 ref.

Descriptors: *Reservoirs, *Optimum development plans, *Dimensions, *Probability, Water demand, Discharge(Water), Computer programs, Equations, Mathematical models, Systems analysis.
Identifiers: Reservoir capacity.

When planning the optimum dimensions of a reservoir, the so-called reservoir characteristic curves showing the relations between reservoir capacity K, water demand M, and the probability of occurrence P should be plotted. Dividing the ranges K, M and V, to the tenths of the mean discharge (V stands for the natural annual discharge), the 'transition probability matrix' belonging to all K=k and M=m pairs of data can easily be plotted on the basis of the fundamental matrix derived from the values of the distribution function of the natural discharges. In this way, the computer quickly gives the points of the reservoir characteristic curves by means of a simple program; furthermore, vectors show the probabilities of occurrence of the contents of the reservoir having the capacities K=k and the demands for water M=m. The product obtained by the matrices consisting of these vectors and by the matrix composed of the values of the distribution function to the natural discharges will give the distribution function of the water quantities discharging through the spillway. For the calculus of a system consisting of two reservoirs a compartively simple

three-dimensional matrix should be composed. (See also W77-06708) (Bell-Cornell)
W77-07682

EMPTINESS OF A FINITE DAM--TIME DEPENDENT THEORY,
Indian Inst. of Tech., Madras. Dept. of Mathematics.
For primary bibliographic entry see Field 8B.
W77-07683

MULTIPLE MARKOV PROCESSES IN HYDROLOGY AND THEIR IMPORTANCE FOR STOCHASTIC ANALYSIS OF WATER ACCUMULATION PROBLEMS,
Technical Univ. of Prague (Czechoslovakia).
K. Nachazel.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July, 1971, Volume 1. IAHS/Unesco, Paris, France, 1974, p 401-407. 3 fig, 5 ref.

Descriptors: *Markov processes, *Reservoirs, *Reservoir storage, Evaluation, Design, Hydrology, Rivers, Runoff, Inflow, Correlation analysis, Equations, Systems analysis, Mathematical models.
Identifiers: *Random flow, *Long-term storage, Statistical parameters.

This study considers the possibility of using composed Markov chains for mathematical modeling of random flow series, given statistical parameters. Evaluated is their importance for the design of storage reservoirs for long-term usage. A comparative analysis is made with the existing assumption where the flow series are expressed as random series or a simple Markov chain. From the resulting solution it is seen that the use of Markov chains of higher order leads to more economical design of water storage reseroirs for long-term usage. In addition to the statistical parameters of the distribution function, the internal structure of the flow series expressed by the correlation function also influences the size of the long-term storage reservoirs. The statistical qualities of flow series are therefore to be checked by detailed analyses in each given case. (See also W77-06708) (Bell-Cornell)
W77-07684

MATHEMATICAL MODELS OF RUNOFF FOR THE COMPUTATION OF STORAGE RESERVOIRS,
Tbilisskii Gosudarstvennyi Universitet (USSR). Dept. of Hydrology.
G. G. Svanidze.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 1. IAHS/Unesco, Paris, France, 1974, p 408-413. 1 fig, 14 ref.

Descriptors: *Reservoirs, *Reservoir storage, *Runoff, *River regulation, Water resources, Monte Carlo method, Stochastic processes, Hydrology, Probability, Markov processes, Equations, Mathematical models, Systems analysis.

A study of the regime of river runoff and its regularities has been conducted for purposes of rational water reources utilization and the control of floods. Calculations for the two basic cases of river runoff regulation (for both static and dynamic regimes) are systematized. A scheme is given for the selection of one-dimensional probability distribution. The most general distribution laws (limited on both sides) are indicated for most of the rivers. A unified method is set forth for modeling both uncondtional and conditional realizations of river runoff. (See also W77-06708) (Bell-Cornell)
W77-07685

MODEL OF A LAKE RESERVOIR,
Wasserwirtschaftsdirektion, Halle, (East Germany).
E. Weber.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971. IAHS/Unesco, Paris, France, 1974, p 422-427. 5 fig. Volume 1.

Descriptors: *Lakes, *Reservoirs, *Monte Carlo method, *Simulation analysis, *Reservoir operation, Water supply, Flood control, Stochastic processes, Economics, Markov processes, Flow, Hydrologic data, Drainage area, Equations, Mathematical models, Systems analysis.
Identifiers: Lake yield, Operating schedule, Muritzseen(German Democratic Republic).

Water demands in the North German Low Lands are increasing from year to year. There is little chance of constructing reservoirs at reasonable costs. The natural lakes continue to be used; drainage is controlled through energy generation and navigational structures and the water supply is designed by experience. Flood control is frequently neglected. The largest group of lakes in the area, called the Muritzseen, are being called upon to furnish higher amounts of water for irrigation. Described is a mathematical model constructed for the reservoir considerations of these lakes. Using the Monte Carlo Method, the economic reservoir program was calculated. The calculations were done according to a simple model, which only considers the lake and describes the yield of the lake as a first-order Markov chain. It is concluded that the concept of hydrological phenomena as a process in a system enables models to be constructed, by means of which complex reservoir calculations may be performd. The undetectable influence on the effective lake yield is allowed for in the generating equation, summarized as a stochastic component. The Monte Carlo method results in a short calculating time size of reservoir are varied. (See also W77-06708) (Bell-Cornell)
W77-07687

SOME PROBLEMS OF STOCHASTIC STORAGE WITH CORRELATED INFLOW,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
Z. Kaczmarek.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971. IAHS/Unesco, Paris, France, 1974, p 453-439. 1 fig, 8 ref.

Descriptors: *Reservoir operation, *Stochastic processes, *Reservoir storage, *Evaluation, *Probability, *Simulation analysis, Inflow, Reservoir releases, Water policy, Markov processes, Equations, Mathematical models, Systems analysis.
Identifiers: Operating rules, Moran model.

This paper considers a stochastic storage model analyzed under the assumption that inflows to the reservoir are non-stationary and correlated. General principles allowing for evaluation of the probability distributions of water stored Vi and reservoir releases Qoi are presented. The proposed scheme can be applied as a simulation model for analysis of the reservoir operation under different operational policies. (See also W77-06708) (Bell-Cornell)
W77-07689

SIMULATION OF IMPOUNDMENT TERRACE HYDRAULICS,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W77-07767

IMPLEMENTATION OF NON-STRUCTURAL ALTERNATIVES IN FLOOD DAMAGE ABATEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Virginia Water Resources Research Center.
For primary bibliographic entry see Field 6F.
W77-07795

RESIDUES OF EMULSIFIED XYLENE IN AQUATIC WEED CONTROL AND THEIR IMPACT ON RAINBOW TROUT, SALMO GAIRDNERI,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W77-07805

CHANNELIZATION: ENVIRONMENTAL, GEOMORPHIC, AND ENGINEERING ASPECTS,
North Carolina Univ. at Charlotte. Dept. of Geography and Earth Science.
For primary bibliographic entry see Field 8B.
W77-07809

IMPROVEMENT AND EXPANSION OF THE DRAINAGE SYSTEM OF HAMBURG,
Abwassentechnische Vereinigung e. V., Bonn (West Germany).
For primary bibliographic entry see Field 5D.
W77-07890

LAKES WILL TAKE THE POLLUTION LOAD OFF OLD FATHER TAME,
For primary bibliographic entry see Field 5G.
W77-07913

DRAINAGE--WHO PAYS, RESPONSIBILITIES AFTER THE 1973 WATER ACT,
Welsh National Water Development Authority Cardiff. Dee and Clwyd Sewage Div.
For primary bibliographic entry see Field 5G.
W77-07932

TREATING URBAN DRAINAGE AS A UTILITY
Kramer, Chin and Mayo, Inc., Seattle, Wash.
For primary bibliographic entry see Field 5G.
W77-07947

MAKING AQUATIC WEEDS USEFUL: SOME PERSPECTIVES FOR DEVELOPING COUNTRIES.
National Academy of Sciences, Washington, D.C. Commission on International Relations.
1976. 183 p. 184 ref. AID/csd-2584.

Descriptors: *Aquatic weed control, *Harvesting *Biocontrol, *Fertilizers, Aquatic weeds, Foods Feeds, Energy, Sewage treatment, Carp, Cray fish, Ducks(Domestic), Poultry, Swans, Dewate ing, Herbivores, Forage fish, Mammals, Fish.
Identifiers: *Utilization, Paper, Grass carp Manatees, Developing countries, Water buffalo Silver carp, Tilapia species, Silver dollar fish.

Methods for controlling aquatic weeds and makin productive use of them are examined, with pa ticular regard to their application in less-develope countries. Techniques for converting weeds int soil additives, especially fertilizer, processe animal feeds, food, pulp, paper, fiber and energ production, as well as their use in treating sewag effluents are discussed. Biological contr techniques in which herbivorous animals conve the weeds directly to meat is considered promi ing. The grass carp, a quick growing fish whic prefers hard-to-control submerged weeds, t Tilapia species, South American silver dollar fis and silver carp are evaluated. Manatees, a grou of almost extinct tropical mammals, are shown

e extremely proficient weed consumers, while rayfish farmed on aquatic weeds in rice fields ring premium prices as gourmet food. Ducks, eese, and swans hold promise for clearing ponds nd small waterways. It is suggested that grazing f other herbivorous animals such as capybara, utria, donkeys, pigs, sheep and water buffalo ould be worth testing. Harvesting aquatic weeds, ough difficult because of their environment, is onsidered and two promising methods of de-atering the weeds-mechanical pressing and solar rying, are described. (Luedtke-Wisconsin)
/77-07964

OCAL CONTROL OF LAND USE: PROFILE F A PROBLEM,
Visconsin Univ., Madison. Dept. of Rural ociology.
or primary bibliographic entry see Field 6F.
/77-08003

LOATING BREAKWATER,
ridgestone Tire Co., Ltd., Tokyo (Japan). Assignee).
or primary bibliographic entry see Field 8A.
/77-08009

IATHEMATICAL MODELING OF REGIONAL VATER-SUPPLY SYSTEMS IN YUGOSLAVIA,
nergoprojekt, Belgrade (Yugoslavia).
I. Kordic, D. Obradovic, B. Zimonja, and M. ikic.
ournal of the American Water Works Associa-on, Vol. 69, No. 4, p 203-205, April 1977. 2 fig, 1 ef.

Descriptors: *Regional development, *Water esources development, *Optimization, Simulation analysis, *Computer programs, Economic efficiency, *Mathematical models, Design, Projects, Financing, Investment, Operat-ng costs, Pumping plants, Pipes, Water demand, ize, *Water supply, Equations, Systems analysis. Identifiers: *Yugoslavia, Pipe diameters, Staging, Locations, Benefit maximization, Economic anal-sis, Direct search method.

resented is a mathematical model for solving the esign problems of a regional water supply ystem. The multifaceted problems--calling for echnical, economic, and financial analyses--are olved via a computer program and the direct earch method which determines the technically easible solution that possesses the maximum in-ernal rate of return. The economic analysis is ac-omplished by discounting all investments, operat-ng and maintenance costs, as well as income from ater to present value. The optimal solution hav-ng been found together with the corresponding in-ernal rate of return, the program automatically imulates the states of the system throughout the roject's life on a yearly basis. Flows and pres-ures at different nodes are computed as well as ower consumption; the aging of pipes is also aken into account. Then maintenance and operat-ng costs per year are computed. Finally, the finan-ial analysis is performed, computing the real rice of water every year under given loan condi-ons and also the average price of water in this eriod. Output tables contain all data about the esign adopted and the results of hydraulic, conomic, and financial analyses. (Bell-Cornell)
/77-08033

OLLS: EFFICIENCY AND EQUITY ISSUES OR INLAND WATERWAYS,
ssociation of American Railroads, Pittsburgh, a.
or primary bibliographic entry see Field 6C.
/77-08039

OPTIMAL OPERATION OF WATER RESOURCES SYSTEMS--I,
Illinois Univ. at Urbana-Champaign. Hydrosystems Lab.
V. T. Chow.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 3. IAHS/Unesco, Paris, France, 1974, p 1300-1314 (Session XVI). 3 fig, 2 tab, 9 ref.

Descriptors: *Water resources development, *Reservoir operation, *Simulation analysis, *Optimization, *Analytical techniques, Planning, Monte Carlo method, Economics, Hydrology, Water supply, Dynamic programming, Design, Flood control, Mathematical models, Systems analysis.
Identifiers: Open-channel hydroplants, Cost minimization.

Modern water resources systems are often very complex, being multi-purpose, multi-constraint, multi-unit, multi-state, and multi-stage. For the optimization of a tangible water resources system, two categories of modeling techniques may be distinguished: the analytical technique and the simulation technique. These two techniques are described and compared in some detail. Five papers falling within the topic of the optimal operation of water resources systems in Volume 2 of the Symposium are reviewed. Two of the papers deal with the application of the analytical technique for optimization (herein, dynamic programming) and consider the optimal seasonal and short-term operation of a reservoir used for flood control and water supply and the optimization of a three-reservoir system, respectively. The other three papers deal with the application of simulation for optimization. They consider optimal reservoir operation in the Harz Mountains, the optimal design and operation of reservoir systems, and an optimization model of a system of two open-channel hydroplants, respectively. This paper concludes with a brief discussion of the merits of discrete differential dynamicprogramming and of the efficiency of the Monte Carlo generating technique. Following the article are discussions by those authors whose papers were reviewed. (See also W77-06708) (Bell-Cornell)
W77-08047

OPTIMAL OPERATION OF WATER RESOURCES SYSTEMS--II,
Water Research Association, Marlow (England).
J. A. Cole.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 3. IAHS/Unesco, Paris, France, 1974, p 1315-1333 (Session XVII). 9 fig, 2 tab, 7 ref.

Descriptors: *Water resources, *Mathematical models, *Optimization, Economic efficiency, Water utilization, River basins, Flood control, Projects, Aquifers, Deltas, Conjunctive use, Desalination plants, Streamflow, Regulation, Artificial recharge, Water storage, Hydrology, Dynamic programming, Linear programming, Equations, Operations research.
Identifiers: Control rules, Benefit maximization, Hill climbing procedure.

This article considers seven of the papers falling within the topic of the optimal operation of water resources systems in Volume 2 of the Symposium. The seven authors differ greatly in the importance they attach to presenting (1) the general philosophy of their subject, (2) the mathematical framework of modeling and optimizing a chosen type of system (expressed in algebra and flow diagrams), (3) numerical results (expressed as graphs or tables), and (4) the computational efficienty of their methods. This article emphasizes mathematical models and thus presents tabular versions of the seven papers which are set into the following framework: System (diagram); Mathematical modeling (Input data, Objective, Methodology, and Output data); Computational details; and Examples. Discussions are included along with the tabular framework. The papers considered include: (1) a mathematical model of water resources utilization in a river basin; (2) the integration of aquifers in flood control projects; (3) construction and adjustment of a two-layer mathematical model of the Llobregat Delta; (4) conjunctive use of a multi-reservoir system and a dual-purpose desalination plant; (5) methods for control of the regimes for water resources systems; (6) optimal complex use of controlled water resources of a basin; and (7) streamflow regulation by artificial recharge fed from upstream storage. (See also W77-06708) (Bell-Cornell)
W77-08048

PLANNING OF SYSTEMS FOR REGIONAL DEVELOPMENT IN WATER RESOURCES,
Technion-Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 6A.
W77-08049

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY "SYMPOSIUM, JUNE 1975, TECHNICAL SESSION PRESENTATIONS, WATER RESOURCES, VOLUME I-D,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W77-08062

HYDROGEOLOGICAL INVESTIGATIONS IN THE PAMPA OF ARGENTINA,
Bundesanstalt fuer Geowissenschaften und Rohstoffe, Hannover (West Germany).
For primary bibliographic entry see Field 7B.
W77-08064

FLOOD HAZARD STUDIES IN CENTRAL TEXAS USING ORBITAL AND SUBORBITAL REMOTE SENSING IMAGERY,
Texas Univ., Austin. Dept. of Geological Sciences.
For primary bibliographic entry see Field 7B.
W77-08069

REMOTE SENSING OF MISSISSIPPI RIVER CHARACTERISTICS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 7B.
W77-08070

APPLICATION OF THERMAL SCANNING TO THE STUDY OF TRANSVERSE MIXING IN RIVERS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5B.
W77-08071

UTILIZATION OF LANDSAT DATA FOR WATER QUALITY SURVEYS IN THE CHOPTANK RIVER,
General Electric Co., Beltsville, Md.
For primary bibliographic entry see Field 5A.
W77-08072

HYDROLOGIC LAND USE CLASSIFICATION OF THE PATUXENT RIVER WATERSHED USING REMOTELY SENSED DATA,
General Electric Co., Beltsville, Md.
For primary bibliographic entry see Field 7B.
W77-08073

LAND USE CLASSIFICATION FOR HYDROLOGIC MODELS USING INTERAC-

TIVE MACHINE CLASSIFICATION OF LANDSAT DATA,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W77-08074

REMOTE SENSING TECHNIQUES FOR PREDICTION OF WATERSHED RUNOFF,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 7B.
W77-08075

THE USE OF LANDSAT DCS AND IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 7B.
W77-08076

THE APPLICATION OF REMOTE SENSING TECHNOLOGY TO THE INVENTORY OF PLAYA LAKES IN THE HIGH PLAINS OF TEXAS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 7B.
W77-08077

REMOTE SENSING APPLICATIONS IN WATER RESOURCES MANAGEMENT BY THE CALIFORNIA DEPARTMENT OF WATER RESOURCES,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 7B.
W77-08078

OPERATIONAL WATER MANAGEMENT APPLICATIONS OF SNOWCOVERED AREA OBSERVATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W77-08084

4B. Groundwater Management

14C EVIDENCE FOR THE ORIGIN OF ARID REGION GROUNDWATER, NORTHEASTERN PROVINCE, KENYA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-07611

USE OF CROSS-CORRELATION TECHNIQUES FOR DETERMINING THE RELATIONSHIP BETWEEN GROUNDWATER LEVELS AND SOURCES IN THE NILE DELTA AREA,
For primary bibliographic entry see Field 2F.
W77-07679

ANALYZING NITRATES IN WELL WATER,
For primary bibliographic entry see Field 5A.
W77-07690

ENERGY DEVELOPMENT AND ITS EFFECT ON GROUND WATER,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5B.
W77-07691

GROUND WATER ENERGY AND THE GROUND WATER HEAT PUMP,
National Water Well Association, Worthingon, Ohio.
For primary bibliographic entry see Field 8C.
W77-07694

LAW, RULES, AND REGULATIONS PERTAINING TO GROUNDWATER IN NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Survey Div.
June 1, 1976. 68 p, 6 ref. Compiled by G. R. Svoboda.

Descriptors: *Water law, Water rights, Legislation, *Well regulations, *Groundwater, Water pollution control, Water conservation, *Nebraska, Potable water, *Regulation.
Identifiers: *Nebraska Safe Drinking Water Act.

Nebraska laws pertaining to groundwater are presented, and the duties assigned to, or the rules and regulations developed by, various Nebraska agencies charged with the regulation of groundwater use are described. Separate chapters deal with the State Department of Water Resources, the Conservation and Survey Division of the University of Nebraska, the Nebraska Safe Drinking Water Act, portions of the 1943 Reissue Revised Statutes of Nebraska, and miscellaneous regulations. In general, surface water in Nebraska is the property of the public and subject to regulated appropriation, while water occurring beneath the land surface is regarded as pertaining to the land. The Nebraska Constitution and Revised Statutes established preferential use of water for domestic, agricultural, and industrial purposes in that order. As the Nebraska legislature has never specifically adopted any one system of groundwater rights, rules governing ground water use are derived primarily from case laws and from common-law theories. The Nebraska Groundwater Management Act of 1975 provides for regulation consistent with the California rule of correlative rights, but this new act has not been sufficiently interpreted to determine the extent to which it may have altered common-law rights. (Eberle-NWWA)
W77-07695

E.L.C. WATER DEVELOPMENT PROJECT, BETUL (M.P.) INDIA: FIFTH ANNUAL REPORT, 1975-1976,
Evangelical Lutheran Church, Betul (India). Water Development Project.
For primary bibliographic entry see Field 8B.
W77-07696

ELIMINATING IRON-BEARING WATER FROM WELL NO. 7,
Ottawa City Engineers Office, Ill.
For primary bibliographic entry see Field 5G.
W77-07702

SALTWATER-FRESHWATER INTERFACES IN THE '2,000-' AND '2,800-FOOT' SANDS IN THE CAPITAL AREA GROUND WATER CONSERVATION DISTRICT,
Louisiana Capital-Area Ground Water Conservation Commission, Baton Rouge.
C. G. Smith.
Bulletin No. 1, October 1976. 23 p, 7 fig, 10 ref, append.

Descriptors: *Saline water intrusion, *Encroachment, *Saline water-freshwater interfaces, *Groundwater barriers, Groundwater movement, Faults(Geology), Pumping, Aquifers, *Louisiana.
Identifiers: *Baton Rouge(Louisiana).

A study was undertaken by the Capital Area Groundwater Conservation Commission (Baton Rouge, LA.) to determine origin and potential effects of saltwater found north of the Baton Rouge fault in the '2000-foot' and '2800-foot' sand aquifers.Both aquifers are heavily pumped for municipal use, and both contain saltwater at present, but the extent to which the Baton Rouge fault prevented northward encroachment of saline water had yet to be determined. The fault created a hydrological discontinuity in the '2000-foot' sand restricting, most, but not all, saline water movement; because of salt-fresh interface in the '2800-foot' sand is already north of the fault, the effects of any existing discontinuity in this aquifer are negligble. More than 100 years were required to advance saltwater to the vicinity of public supply wells. Recommendations to ensure long-term supply of good quality water for the area included close monitoring of water level and chemical composition in certain specific wells, discouraging location of wells near the fault line in order to reduce head differential across the fault, and increased use of surface water where feasible. (Eberle-NWWA)
W77-07703

HYDROCHEMICAL OBSERVATION OF THE GROUND WATER FOR TROUT CULTURE AROUND HINO-TOWN, TOKYO, (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W77-07709

SOME EXPERIMENTS ON THE GAS-DISEASE IN FRESHWATER FISHES, (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W77-07714

DETERMINATION OF SALT-WATER INTERFACE BY ELECTRIC RESISTIVITY DEPTH SOUNDINGS,
Tel Aviv Univ. (Israel). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2F.
W77-07783

WATER SAMPLING FROM UNPUMPED WELLS WITH STATIC WATER LEVELS DEEPER THAN 10 METRES,
Ministry of Works and Development, Christchurch (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 5A.
W77-07787

HIERARCHICAL MODELING FOR THE PLANNING AND MANAGEMENT OF A TOTAL REGIONAL WATER RESOURCE SYSTEM: JOINT CONSIDERATION OF THE SUPPLY AND QUALITY OF GROUND AND SURFACE WATER RESOURCES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
Y. Y. Haimes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 293, Price codes: A15 in paper copy, A01 in microfiche. Ohio State University, Columbus, Water Resources Center Completion Report 494X, August 1976. 319 p, 24 fig, 35 tab, 80 ref. OWRT B-062-OHIO(1).

Descriptors: *Model studies, Planning, Management, *Regional analysis, *Ohio, *Mathematical models, *Conjunctive use, *Water quality control, *Systems analysis, *Surface-groundwater relationships, Pumping, Drawdown, Aquifers, Costs, Groundwater, Water supply, Optimum development plans.
Identifiers: *Hierarchical models, Multiobjective planning models, *Lower Great Miami River Valley(Ohio).

This research utilizes the concept and methodologies from systems engineering theory for the advanced structuring, formulating and solving of mathematical models. A planning and management methodology for a regional water quality control is presented. The planning framework is developed based on a multiobjective analysis in order to take into consideration the conflicting objectives of

surface water quality and the cost of expansion and operation of wastewater treatment plants (both secondary and tertiary). The following conclusions may be drawn: The modeling technique provides a procedure by which an accurate map of drawdown is predicted at different parts of a complex and large-scale groundwater system. The applications of the stream-aquifer response functions to the various case studies illustrate the usefulness of this study's approach in extending these important functions' applicability. They may be used either to predict infiltration from streams due to pumpage (which is an important factor for stream balance as well) or to be utilized in a management model. It is restricted to linear aquifer systems where the stream acts as a constant head boundary. Results obtained from applying the management model to the Fairfield-New Baltimore area indicate that: The model is not restricted to certain system's structure, and actually may be applied to any mathematical analysis involving groundwater linear systems' control. The effect of pumpage on drawdown is given, aggregated in cells resulting from ten-year requirement projections. The drawdowns predicted here for the Cincinnati well field exceed the figures predicted by the use of the analog model. This result should be carefully considered. The future infiltration rates from the stream provide the Miami Conservancy District with much needed information for future evaluation of stream flow balance under low flow conditions in this area. The management control mathematical model provides a comprehensive analysis of the most complicated problem of conjunctive use of ground and surface water. Case Study illustrates the model's applicability and practicability in solving problems involving groundwater system control conjunctively with other systems. The tax-quota model presented provides an improved solution strategy and also extends the capability of management models to handle groundwater recharge and surface water supply in addition to well pumpage.
W77-07793

WATER QUALITY STATUS AND TRENDS IN MINNESOTA--INDICES FOR WATER SUPPLY AND GROUND WATER POLLUTION,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W77-07794

WASTE WATER RECLAMATION IN ST. CROIX,
Black, Crow and Eidsness, Gainesville, Fla.
For primary bibliographic entry see Field 5D.
W77-07875

GRAVITY-MEASURING DEVICE FOR WATER AND MINERAL DETECTION,
For primary bibliographic entry see Field 7B.
W77-08010

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, TECHNICAL SESSION PRESENTATIONS, WATER RESOURCES, VOLUME I-D,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W77-08062

THE USE OF SKYLAB AND LANDSAT IN A GEOHYDROLOGICAL STUDY OF THE PALEOZOIC SECTION, WEST-CENTRAL BIGHORN MOUNTAINS, WYOMING,
Wyoming Univ., Laramie. Dept. of Geology.
For primary bibliographic entry see Field 7B.
W77-08063

URBAN LAND USE: REMOTE SENSING OF GROUNDBASIN PERMEABILITY,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
For primary bibliographic entry see Field 7B.
W77-08065

WASTE WATER RECLAMATION AT ST. CROIX, U.S. VIRGIN ISLANDS,
Florida Univ., Gainesville.
O. K. Buros.
PhD Thesis, 1975. 362 p.

Descriptors: *Water reuse, *Groundwater recharge, *Desalination, Waste water treatment, Water resources development, Treatment facilities, Tertiary treatment, Freshwater, Groundwater, Potable water.
Identifiers: St Croix(US Virgin Islands).

Groundwater recharge was compared to a desalination program to determine the better means of augmenting freshwater supplies for the island of St. Croix, U. S. Virgin Islands. Several expensive desalination plants have been constructed to produce potable water, but their expense motivated research into the use of waste water effluent for groundwater recharge. Waste water treatment plant and recharge facilities were constructed with a capacity of 0.5 mgd/day. In operation, it was possible to recharge an average of one million gallons/week. At one site, no significant adverse effects were found in groundwater extracted downstream of the project, although there was a substantial increase in groundwater. Major problems encountered were the lack of waste water for treatment and recharge, the mechanical failure of equipment, and the transfer to the main treatment plant of waste water with a high seawater content. The latter problem was the result of a 1974 flood and the problem was expected to last through 1975. The process costs are higher than those for recovery of existing groundwater, but lower than those for the desalination process. (Collins-FIRL)
W77-08086

4C. Effects On Water Of Man's Non-Water Activities

FLOODFLOW FORMULAS FOR URBANIZED AND NONURBANIZED AREAS OF CONNECTICUT,
Geological Survey, Hartford, Conn. Water Resources Div.
L. A. Weiss.
In: Watershed Management Symposium held by the ASCE Irrigation and Drainage Division, August 11-13. 1975, Logan, Utah, p 658-675, 1975. 12 fig, 2 tab, 4 ref, 2 append.

Descriptors: *Flood control, *Urban hydrology, *Rural areas, *Flood forecasting, *Regression analysis, Streamflow, Flow rates, Historic floods, Peak discharge, Land use, Planning, *Connecticut, *Urbanization.
Identifiers: *Log Pearson type III.

Data from 28 precipitation-gaging stations and 105 stream-gaging stations, which measure streamflow from drainage basins ranging in size from 1 to 1,500 sq miles are used to analyze flood magnitudes and flood frequencies in urbanized and nonurbanized areas of Connecticut. The precipitation data are used to analyze rainfall frequency for 1-, 4-, 6-, 8-, 12-, and 24-hour storm durations in the State. They also form the base for preliminary magnitude and frequency isopleth maps of the rainfall intensities used as input for a regression analysis of flood flows. Regression analyses rating the 2-year and 100-year flood-flow frequencies for nonurbanized areas to geometric parameters of the drainage basin and to rainfall magnitude and frequency are based on data for 98 stream-gaging stations. The regression equations for nonurbanized areas are applied to urbanized areas by means of an adjustment for lag time based on the percentage of drainage area that is storm sewered. (Woodard-USGS)
W77-07612

ENVIRONMENTAL GEOLOGIC ASPECTS OF PLANNING, CONSTRUCTING, AND REGULATING RECREATIONAL LAND DEVELOPMENTS,
Wisconsin Dept. of Administration, Madison. State Planning Office.
For primary bibliographic entry see Field 6G.
W77-07630

ENERGY DEVELOPMENT AND ITS EFFECT ON GROUND WATER,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5B.
W77-07691

EVALUATION OF SEDIMENT YIELDS DUE TO URBAN DEVELOPMENT,
Old Dominion Univ., Norfolk, Va. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W77-07705

NUTRIENT LIMITATION IN A SMALL OLIGOTROPHIC LAKE IN NEW HAMPSHIRE,
For primary bibliographic entry see Field 5C.
W77-07974

4D. Watershed Protection

MANUEL TECHNIQUE DU VILLAGE, (VILLAGE TECHNOLOGY HANDBOOK), (VOLS. 1 AND 2).
Volunteers in Technical Assistance, Mt. Rainier, Md.
For primary bibliographic entry see Field 3F.
W77-07628

AN ANALYSIS OF ALTERNATIVE FLOOD MANAGEMENT PLANS IN UPSTREAM WATERSHEDS. CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY, PHASE 2,
Soil Conservation Service, Durham, N.H.
For primary bibliographic entry see Field 6F.
W77-07632

THE REPRESENTATION OF A SHORT PERIOD OF EXPERIMENTAL CATCHMENT DATA BY A LINEAR STOCHASTIC DIFFERENCE EQUATION,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2 .
W77-07646

FREQUENCY ANALYSIS OF WATER BALANCE COMPONENTS IN RELATION TO CLIMATIC FACTORS,
Ebasco Services, Inc., New York.
For primary bibliographic entry see Field 2A.
W77-07668

FLOOD FREQUENCY STUDIES OF RIVERS IN THE FEDERAL REPUBLIC OF GERMANY,
Technische Universitaet, Brunswick (West Germany). Leichtweiss Inst. for Water Research.
For primary bibliographic entry see Field 2E.
W77-07670

STATISTICAL ANALYSIS APPLIED TO THE STUDY OF THE COMPONENTS OF A FLOOD WAVE,
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2E.
W77-07674

OPTIMAL SPATIAL INTERPOLATION AND ITS ERRORS IN THE CASE OF VARIOUS DISTANCES BETWEEN OBSERVATION POINTS OR WATERSHED CENTRES,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
G. A. Alexeev.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 305-314, 1974. 6 ref.

Descriptors: *Watersheds(Basins), *Network design, *Model studies, Mathematical models, Networks, Stations, Gaging stations, Instrumentation, Spatial distribution, Correlation analysis, Statistics, Statistical methods, Hydrology, Meteorology, Foreign research, Foreign countries.
Identifiers: *USSR, Observation points distance, Interpolation, Errors.

Objective methods (criteria) were proposed for the determination of optimal distances between observation points, proceeding from the permissible maximum mean square errors of the optimal space interpolation between every three adjacent observational points. A theoretical substantiation of the proposed criteria and formulas was given on the basis of methods of multiple correlation, proceeding from the homogeneous space correlation function of the hydrometeorological element considered. (See also W77-06708) (Sims-ISWS)
W77-07677

EVALUATION OF SEDIMENT YIELDS DUE TO URBAN DEVELOPMENT,
Old Dominion Univ., Norfolk, Va. Dept. of Civil Engineering.
C. Y. Kuo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 212, Price codes: A03 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 98, September 1976. 28 p, 1 tab, 15 fig, 11 ref. D-009-VA.

Descriptors: Runoff, *Sediment yields, *Virginia, *Urban runoff, Storm runoff, Construction, Erosion control, Hydrographs, Measurement, Erosion rates, Equations, *Soil erosion, Evaluation.
Identifiers: Runoff hydrographs, *Dilution factor(Sediments), *Universal Soil Loss Equation.

This research project sought to determine sediment yields in the Cedar Hill area, Virginia Beach, Virginia. Using a modified Universal Soil Loss Equation, soil-erosion rates were estimated at construction, semi-construction, and well-developed sites in this area. Sediment yields then were measured at the three sites and at a downstream monitoring station and compared with the estimates. Dilution factors also were studied as a function of rainfall intensities, and are believed to correlate with the characteristics of the area undergoing construction. The dilution factor was defined as the ratio of suspended-sediment concentration on the site compared to that for an off-site specific downstream station at the peak hours of runoff hydrographs. The dilution factor was found to increase as rainfall intensity decreased, and on-site soil erosion rates varied according to the stage of construction.
W77-07705

GULLY WALL STABILITY IN LOESS-DERIVED ALLUVIUM,
Agricultural Research Service, Columbia, Mo.
J. M. Bradford, and R. F. Piest.
Soil Science Society of America Journal, Vol. 41, No. 1, p 115-122, January-February 1977. 7 fig, 3 tab, 13 ref.

Descriptors: Soil mechanics, *Soil strength, *Gully erosion, Loess, Erosion, Tensiometers, Piezometers, Slope stability, Groundwater, Sedimentation, On-site investigations, Water pollution.
Identifiers: *Soil morphology, *Gully wall stability, Loess-derived alluvium, Triggering mechanisms, Gully slumping, Gully walls, Gully slopes.

A field study was made on an instrumented vertical slope to investigate the triggering mechanisms that initiate gully wall failure in loess-derived alluvium. The relevance of hydrology, soil morphology, and soil mechanics to an understanding of gully slumping was examined. Conventional limit equilibrium slope stability methods were of little value in predicting failure volumes or in understanding the failure mechanics. The geometry and time of failure were greatly influenced by the structural features of loess-derived alluvium and by the dependence of the shear strength on the pore water pressure within the soil. (Roberts-ISWS)
W77-07764

EVALUATION OF POTENTIAL USE OF VEGETATION FOR EROSION ABATEMENT ALONG THE GREAT LAKES SHORELINE,
Dames and Moore, Cincinnati, Ohio.
V. L. Hall, and J. D. Ludwig.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A014 137, Price codes: A03 in paper copy, A01 in microfiche. Army Corps of Engineers, Coastal Engineering Research Center, Ft. Belvoir, Va., Miscellaneous Paper No 7-75, June 1975. 35 p, 11 fig, 5 tab, 22 ref.

Descriptors: *Great Lakes, *Vegetation effects, *Shoreline cover, Coastal structures, Dewatering, Erosion control, Erosion, Vegetation, Shores, Beach erosion, Waves(Water).
Identifiers: Shoreline changes, Hydrophytes, Resloping.

This study identified plants with potential, either alone or in combination with structures, to alter the erosion rate along shores of the Great Lakes. Information was obtained from literature, personal interviews, and field survey. Shoreline plants were identified and evaluated. Thirty-three terrestrial species were found that effectively decrease surface erosion resulting from wind and runoff. No emergent or submergent plants were found to control erosion. While several emergent species may have special use in low-energy areas, the Great Lakes shores in the United States are generally not conducive to establishment of aquatic plants. Shores subject to wave erosion require structures or beach nourishment to attenuate wave energy. After the wave force is reduced by engineering techniques, vegetation will aid in controlling surface erosion. Subsurface seepage and soil slumping, which cause landslides and bank recession, can be prevented by dewatering glacial till; recession of sandy shores with steep banks can be controlled by bank resloping. The study concluded that plants alone are not suitable for use as erosion controllers along most shores of the Great Lakes because of severe wave action. (Lee-ISWS)
W77-07788

PENN STATE URBAN RUNOFF MODEL--USER'S MANUAL,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
G. Aron, and D. F. Lakatos.
Available from the National Technical Information Service, Springfield VA 22161 as PB-267 312, Price codes: A04 in paper copy, A01 in microfiche. Research Publication 96, December 1976. 69 p, 4 tab, 5 fig, 8 ref, 4 app end. Institute for Research on Land and Water Resources, University Park, PA. OWRT B-076-PA(1). 14-0001-5108.

Descriptors: *Planning, *Computer models, *Storm runoff, *Storm water, Surface runoff, *Urbanization, Floods, *Urban drainage, Urban hydrology, Urban runoff, Management, Model studies, Water quality, Simulation analysis.
Identifiers: *Urban runoff model, Total watershed response, *Runoff quality, Subarea flow, Hydrologic budget models, *Penn State Urban Runoff Model.

Successful urban water resources management depends on the ability of urban planners and managers to predict accurately, in advance, the effects that increased urban development will have on stormwater runoff. The present inability to predict watershed response is a major factor leading to increased urban flooding, and a lowering of runoff quality due to the lack of proper control. The situations for which the use of the Penn State Urban Runoff Model is intended are less general than those of many current urban runoff models. The Penn State Runoff Model was developed as an alternative to the traditional Rational Method and other semi-empirical procedures for urban drainage design. It deals entirely with the quantity of stormwater runoff, and does not directly consider urban runoff quality. The objectives adopted for the development of the Penn State Urban Model Were: (1) to produce an urban runoff simulation model which would provide acceptable hydraulic accuracy while remaining at a level of sophistication compatible with minimum practice and data collection time, (2) to keep the model as simple and concise as possible to insure its convenient use, (3) to allow for the analysis of the timing of subarea flow contributions to peak rates at various points in a watershed. (Sink-Penn State).
W77-07797

MODELING NONPOINT POLLUTION FROM THE LAND SURFACE,
Hydrocomp Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5B.
W77-07818

WATERSHED MANAGEMENT AND WATER QUALITY,
Environmental Protection Agency, Boston, Mass. Water Supply Branch.
For primary bibliographic entry see Field 5G.
W77-07951

FLOOD HAZARD STUDIES IN CENTRAL TEXAS USING ORBITAL AND SUBORBITAL REMOTE SENSING IMAGERY,
Texas Univ., Austin. Dept. of Geological Sciences.
For primary bibliographic entry see Field 7B.
W77-08069

HYDROLOGIC LAND USE CLASSIFICATION OF THE PATUXENT RIVER WATERSHED USING REMOTELY SENSED DATA,
General Electric Co., Beltsville, Md.
For primary bibliographic entry see Field 7B.
W77-08073

REMOTE SENSING TECHNIQUES FOR PREDICTION OF WATERSHED RUNOFF,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 7B.
W77-08075

WATERSHED ORGANIZATIONS--IMPACT ON WATER QUALITY MANAGEMENT: AN ANALYSIS OF SELECTED MICHIGAN WATERSHED COUNCILS,
Michigan State Univ., East Lansing.

E. J. Hood.
PhD Thesis, 1976. 89 p.

Descriptors: *Watershed management, *Evaluation, *Watersheds(Basins), Rural areas, Urban areas, Legislation, Environmental control, Water quality control, Planning, Water management(Applied).
Identifiers: Michigan.

A case study approach was used to examine the effectiveness of Michigan watershed councils in watershed management and water quality control. The study was designed to reveal problems and make recommendations for more effective activities. It was revealed that effective water quality management planning was limited to advisory, planning and information-educational functions. Effectiveness of the councils depended on variations in enabling legislation; character of the watershed (urban or rural); level and type of participating membership; continuity in leadership; executive committee direction and perception; ability to seek financial and other aids from other groups; level of communication with constituents, state government, and other councils; and on whether the approach taken was a service or an issue approach. The weaknesses found were primarily due to statutory deficiencies, and to structural and operational difficulties of internal organization, orientation, and approach. These were not uniform but varied among the councils in type and degree. Recommendations were suggested to alleviate the problems associated with the above factors. (Collins-FIRL)
W77-08093

5. WATER QUALITY MANAGEMENT AND PROTECTION

ON THE RELATION OF THE DIATIOM FLORA AND WATER QUALITY IN THE UJI RIVER KYOTO, (IN JAPANESE),
Osaka Seikei Women's Jr. Coll. (Japan). Biology Lab.
T. Zoriki.
Jpn J Limnol 37(1), p 29-36, 1976.

Descriptors: Sampling, *Diatoms, Water quality, *Benthos, *Oligotrophy, *Mesotrophy, Rivers, Asia, Water pollution.
Identifiers: Cymbella-tumida, Cymbella-turgidulla, Cymbella-ventricosa, Fragilaria-crotonensis, Gomphonema-olivaceum, *Japan(Kyoto), Melosira-granulata, Melosira-granulata-var-angustissima, Melosira-italica, Melosira-solida, Navicula-cincta, Navivula-cryptocephala, Navicula-cryptocephala-var-exilis, N nitzschia-acicularis, Nitzschia-amphibia, Nitzschia-clausi, Nitzschia-frustulum, Synedra-acus, Synedra-radians, Synedra-rumpens-var-familiaris, Synedra-ulna, *Uji River(Japan).

Thirteen samples were collected at 4 stations in the Uji River, Kyoto (Japan), from May 1970-Nov. 1973. The species identified belong to 33 genera and 165 spp. in total as benthic diatoms. The relative frequencies of those diatoms which are 5% total 20. Those 20 diatoms can be classified according to the 3 grades of the 3 grades of water quality as follows: oligosaprobic Cymbella tumida, Fragilaria crotomensis, Melosira granulata, M. granulata var. angustissima, M. italica, M. solida and Nitzschia clausi; both alpha-oligo and beta-mesosaprobic, C. turgidulla, Navicula cincta, N. cryptocephala and N. cryptocephala var. exilis; alpha-oligo, beta- and alpha-mesosaprobic, C. ventricosa, Gomphonema olivaceum, Nitzschia acicularis and Synedra ulna; beta-mesosaprobic, N. amphibia, N. frustulum and S. radians; both beta- and alpha-mesosaprobic, S. rumpens var. familiaris; alpha-mesosaprobic, S. acus.--Copyright 1977, Biological Abstracts, Inc.
W77-08089

5A. Identification Of Pollutants

MERCURY IN WATER, A BIBLIOGRAPHY, VOLUME 3,
Office of Water Research and Technology. Washington, D. C.
Water Resources Scientific Information Center, Report OWRT/WRSIC 77-202, April 1977, 169 p.

Descriptors: *Mercury, *Bibliographies, *Pollutant identification, *Heavy metals, *Methylmercury, Path of pollutants, Toxicity, Waste water treatment, Analytical techniques.

This report, containing 214 abstracts, is another in a series of planned bibliographies in water resources produced from the information base compromising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the information base had 104,878 abstracts covering SWRA through February 1977(Volume 10, Number 4). Author and subject indexes are included.(See also W72-04440 and W75-8934.)
W77-07605

MUTAGENIC POTENTIAL OF PETROLEUM BYPRODUCTS IN CHESAPEAKE BAY WATERS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W77-07606

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES, VOLUME 4, (ANALYTICAL METHODS FOR SEWAGE SLUDGE ANALYSIS),
Toronto Univ. (Ontario). Inst. of Environmental Sciences.
J. C. Van Loon.
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 51, Environmental Protection Service, Environment Canada, Ottawa, Canada, 1976, 33 p., 5 fig., 6 tab, 7 ref. 72-5-3.

Descriptors: *Heavy metals, *Agricultural chemicals, *Sewage sludge, Methodology, Analysis, Chromatography, Cadmium, Lead, Mercury, Zinc, Pollutant identification.
Identifiers: *Atomic adsorption studies, Mercury method, Hydride technique, Tin, Silver, Vanadium.

Existing and newly developed analytical methods for sewage sludge analysis are reviewed. It had been stressed earlier that knowledge of the form of metals in waste and environmental samples is of great importance. As a result of this the development of simple equipment and analytical method to initiate metal speciation has been stressed. Procedures developed earlier and used provisionally have been studied in depth. The mercury method is now acceptable as recorded. The As/Se procedure has been modified as a result of further investigation. Nonflame atomic absortion methods have been developed for silver and vanadium. It is demonstrated that using atomic absorption spectroscopy as a detector does not guarantee a quick solution to metal speciation problems. Sludges can be dry-shed at 450 C without fear of loss of cadmium, lead or appreciable amounts of zinc. When aluminum is to be determined, dry-ashing should not be used. Data also make it clear that incineration at temperatures usually employed will release large amounts of arsenic, cadmium, lead, mercury and zinc. A number of sewage sludges were analyzed, and the results are tabulated. (See also W76-07676; W76-04244 and W74-08397) (WATDOC)
W77-07614

INTERLABORATORY QUALITY CONTROL STUDIES NOS. 12 AND 13, ALUMINUM, CADMIUM, CHROMIUM, COBALT, COPPER, LEAD, IRON, MANGANESE, NICKEL AND ZINC,
Canada Centre for Inland Waters, Burlington (Ontario).
J. M. Carron, and K. I. Aspila.
Report Series No. 44, 1976, Ottawa, Canada, 20 p., 11 tab, 1 ref., 3 append.

Descriptors: *Water sampling, *Quality control, Cadmium, Chromium, Cobalt, Copper, Lead, Iron, Manganese, Aluminum, Nickel, Zinc, Analysis, Metals, *Pollutant identification.
Identifiers: Natural water, Fortified natural water, Synthetic water, Atomic absorption spectrophotometry.

The studies involve the analysis of aluminum, cadmium, chromium, cobalt, copper, lead, iron, manganese, nickel and zinc in natural and synthetic water samples. All metals were at concentrations similar to those found in natural waters (1-50 mg metal/1). Twelve water samples were analyzed for this combined report, including natural, fortified natural and synthetic samples. Combination of such samples provided percent recovery of trace metals from (1) synthetic standards, (2) samples fortified by participants and (3) samples fortified, but unknown, to participants. Twenty-six laboratories provided data for this combined study. Five different methodologies were used, and results for each have been summarized and in some cases discussed. Mean values, standard deviations and percent recoveries are provided for all samples and for each method. Much of the data provided by participants were indicated as less than a designated value. Treatment of such data for computational purposes is discussed. Overall, the data provided by participants normally analyzing natural lake and river waters at low level metal concentrations (0.1-50 mg/l) were quite acceptable. (WATDOC)
W77-07616

DETERMINATION OF MORESTAN IN WATER, SOIL, AND CUCUMBERS BY THIN-LAYER CHROMATOGRAPHY, (IN RUSSIAN),
Vserossiiskii Nauchno-Issledovatelskii Institut Zashchity Rastenii, Ramon (USSR). Lab. of Toxicology.
V. S. Shustrov, and A. A. Krasnykh.
Vopr Pitan 3, p 79, 1976.

Descriptors: *Pollutant identification, *Cucumbers, *Pesticide residues, *Chromatography, Soil analysis, Water analysis.
Identifiers: *Morestan, Thin layer chromatography.

The method for determining microquantities of Morestan in water, soil and cucumbers is based on the extraction of the pesticide from the sample using chloroform or carbon tetrachloride, distillation of the solvent and silica gel TLC. The sensitivity of the method is 5 micro-8 in a sample. In tests to verify the accuracy of the method, 10, 20, 40 and 50 micro-g of Morestan were added to water, soil and cucumber pulp. The percentage of residue determined was 85-100 of the quantity added.--Copyright 1977, Biological Abstracts, Inc.
W77-07688

ANALYZING NITRATES IN WELL WATER,
W. W. Whitlock, Jr.
Water and Sewage Works, Vol. 124, No. 3, p 63, March, 1977. 1 fig.

Descriptors: *Nitrates, *Water analysis, *Sampling, Water pollution sources, Water pollution effects, Farm wastes, *Pollutant identification, Water wells, *Maryland.
Identifiers: *Harford County(Maryland), Wissahickon Schist Formation.

A routine free water sampling program in Harford County, Maryland, has uncovered scattered case of severe nitrate contamination of ground water, due to the manure concentrations in barnyards and feedlots in some parts of the county. Nitrates have a hazardous effect specifically for infants between 6 and 18 months old (methemoglobinemia) which reduces the oxygen transport capability of the blood and can result in brain damage or death. Whenever nitrate levels greater than 10 ppm are observed in samples, local procedure requires notification of the resident, sampling of adjacent wells if possible, periodic follow-up at varying intervals, and sampling of water beneath undeveloped lots before issuing building permits. Extensive, frequent surveys will be necessary to verify contamination fluctuation trends and to determine possible relationships to weather, soil content, ground water movement, etc. (Eberle-NWWA)
W77-07690

SNAKE RIVER, 1973 DISSOLVED GAS STUDIES.
Parametrix, Inc., Seattle, Wash.
Submitted to Idaho Power Company, Boise, Idaho. Final Report, August 1974, 58 p, 7 tab., 17 fig., 10 ref., 2 append.

Descriptors: *Nitrogen, Gases, On-site investigations, *Dam sites, Saturation, *Supersaturation, *Water temperature, *Reservoirs, *Seasonal discharge(Water), Freshwater fish, Bass, Invertebrates, *Monitoring, *Idaho, *Oregon, Pollutant identification.
Identifiers: *Dissolved gas monitoring, *Snake River, *Nitrogen partial pressures, Brownlee Reservoir, Water temperature increase, *Oxbow Dam, *Hell's Canyon Dam, Oxbow Powerhouse, Vacuum Breakers, *Salmon River, Innaba River.

The dissolved gas monitoring of the upper region of the Snake River showed nitrogen partial pressures remained near or below saturation during 1973. In this area a maximum of 106% was measured below Twin Falls. Nitrogen partial pressures (saturations) remained near saturation from March through May in Brownlee Reservoir, but rose to as high as 110% of saturation in July, August, and September. The rise in the nitrogen partial pressure was due to an increase in water temperature that more than compensated for a decrease in actual nitrogen concentrations. In both Oxbow and Hell's Canyon Reservoirs the nitrogen partial presssure and nitrogen concentration decreased slightly in the upstream shallow portions of the reservoirs. The nitrogen levels remained constant in the downstream portions of the reservoirs. Nitrogen partial pressures at the Oxbow Bridge location were up to 120% saturation in August and September. Downstream from Hell's Canyon Dam the nitrogen partial pressures, in general, remained below 110% of saturation, although they were somewhat higher immediately below the dam in June and July. In September the partial pressures were above 110% in most of the river below the dam. The Salmon River was as high as 116% of saturation in July, and the Innaba River up to 112% in September. (Katz)
W77-07710

DISSOLVED GAS DATA REPORT, 1975-1976,
Army Engineer District, Portland, Oreg. North Pacific Div.
January, 1977. 64 p, 26 fig., 5 ref., 64 p, 2 append.

Descriptors: *Columbia River, Saturation, *Supersaturation, *Oxygen, *Nitrogen, Argon, On-Site investigation, On-Site data collections, Monitoring, Evaluation, Water temperature, Depth, *Dam, Dam sites, *Bonneville Dam, *Spillways.
Identifiers: *Snake River, *Columbia River Basin, *Percent saturation, *Spillway deflector.

The data regarding the dissolved gas content on the Snake and Lower Columbia Rivers for 1975 and 1976 are reported. The effectiveness of the spillway deflectors is discussed. The deflectors at McNary, Little Goose, Lower Monumental and Lower Granite Dams have helped reduce the dissolved gases below these projects to a tolerable level. The deflector at Bonneville Dam did not reduce the gas levels as expected. (Katz)
W77-07718

DISSOLVED GAS SUPERSATURATION IN THE SALMON RIVER, 1972-74,
Parametrix, Inc., Bellevue, Wash. Environmental Services Section.
Prepared for Idaho Power Company, Boise, Idaho September, 1974, 27 p., 12 fig, append.

Descriptors: *Idaho, *Supersaturation, *Saturation, *Gases, *Oxygen, *Nitrogen, Water quality, *Water temperature, On-Site investigation, Flow rates, High flow, Low flow, Sampling, Seasonal, *Monitoring, Pollutant identification.
Identifiers: *Dissolved gas, *Nitrogen, Partial pressure, *Salmon river, Dissolved nitrogen, High flow period, Low flow period, *Snake River.

Dissolved gas levels in the Salmon River, Idaho, were monitored during selected periods between September, 1972 and June, 1974. This monitoring took place during a wide variety of flow and temperature conditions. Nitrogen partial pressures were found to exceed saturation in the lower portion of the Salmon River during both high and low flow periods. Nitrogen supersaturation as high as 121% was measured in the downstream portion of the river. Supersaturation was the result of both increases in the amount of dissolved gas and increases in water temperatures as the water moved downstream. Increases in the amount of dissolved nitrogen were of most importance during high flow periods, whereas temperature increases were primarily responsible for supersaturation during low flow periods. (Katz)
W77-07719

GAS-BUBBLE DISEASE: A REVIEW IN RELATION TO MODERN ENERGY PRODUCTION,
Rhode Island Univ., Kingston. Marine Pathology Lab.
For primary bibliographic entry see Field 5C.
W77-07721

VERTICAL MIXING MECHANISMS AND THEIR EFFECTS ON PRIMARY PRODUCTION OF PHYTOPLANKTON,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5C.
W77-07733

RESULTS OF R/V YAQUINA CRUISE YALOC-74, LEG 3: SEABED DISPOSAL PROGRAM, NORTH PACIFIC STUDY AREA MPG-2, 33 DEGREES 20'N, 151 DEGREES 00'W, NOV. 30 - DEC. 21, 1974,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5E.
W77-07739

MONITORING DISSOLVED HYDROCARBONS AS A FUNCTION OF THE TIDAL CYCLE (NEW YORK HARBOR),
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W77-07740

EFFECTS OF SAMPLE HANDLING ON THE COMPOSITION OF MARINE SEDIMENTARY PORE WATER,
Lehigh Univ., Bethlehem, Pa. Center for Marine and Environmental Studies.
M. H. Hulbert, and M. P. Brindle.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A016 730, Price codes: A02 in paper copy, A01 in microfiche. Reprinted from: Geological Society of America Bulletin, Vol 86, No 1, p 109-110, January 1975. 1 tab, 12 ref. NSF-GA-37079; ONR-N00014-67-A-0370-005.

Descriptors: *Gulf of Mexico, *Sediments, *Pore water, Laboratory tests, *Pollutant identification, Sampling.
Identifiers: *Interstitial water, Storage conditions.

Three sediment samples from the Gulf of Mexico abyssal plain were subjected to five representative handling and storage procedures before the pore water was expressed and analyzed for Na+, K+, Mg2+, and Ca2+. The observed alterations in major cation concentrations during storage did not appear to be entirely related to temperature. Samples stored at in situ temperatures unexpectedly displayed greater changes than those which were stored at room temperature and subsequently rechilled. (Sinha-OEIS)
W77-07742

UTILIZATION OF MIXED HYDROCARBON SUBSTRATE BY PETROLEUM-DEGRADING MICROORGANISMS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-07749

PETROLEUM OIL DETECTION BUOY SYSTEM,
Spectrogram Corp., North Haven, Conn.
H. R. Gram.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A016 461, Price codes: A03 in paper copy, A01 in microfiche. U.S. Coast Guard Office of Research and Development, Final Report No. CG-D-39-75, March 31, 1975. 30 p, 5 fig, 1 tab, 1 ref, 1 photo.

Descriptors: *Oil pollution, Water pollution control, *Buoys, Flurescence, *Pollutant identification.
Identifiers: *Oil detection.

Extended capability floating buoy designed to detect petroleum oils ranging in composition from crude to kerosene has been developed and performance tested. This buoy is powered by a land based low voltage direct current power supply at nominally 12 volts. The average total power requirements for the buoy are less than 0.75 watts. The detection system employs fluuorescent techniques whereby the oils floating on the water surface are excited by short wavelength ultraviolet radiation and produce, by fluorescence emission, radiation in the near ultraviolet and blue end of the visible spectrum. The fluorescent radiation is selectively detected to produce an alarm condition. Improvements have been made to the mechanical packaging to facilitate deployment and field service. (Sinha-OEIS)
W77-07750

A METHOD FOR DETERMINING OIL IN WATER,
Naval Research Lab., Washington, D.C.
A. Stamulis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A007 871, Price codes: A02 in paper copy, A01 in microfiche. Memorandum Report 2741, March 1974. 18 p, 1 fig, 3 tab, 10 ref.

Descriptors: *Oil pollution, *Water pollution sources, Organic compounds, Chromatography, Dye dispersion, Monitoring, *Pollutant identification, *Oil wastes, Analytical techniques.

A preliminary study has been made on a dye technique for determining the concentration of small amounts of oil in water. The mixing action of a blender results in the formation of a large number of oil droplets in water from one original oil drop. The subsequent addition of a suitable amount of oil-soluble dye to the system with additional blending action results in a homogeneous colored solution. Hence, low concentrations of oil in water can be visually determined. Under laboratory conditions, using tap water as the continuous phase, test 'oils' such as crudes, esters, paraffins and silicones gave positive results. However, protective colloid action in some cases masked the color test. The converse of the principle, i.e., the determination of water-in-oil, is also possible using a water soluble dye. At the present time the method is subjective and qualitative in nature. In the future it is contemplated that the method can be made quantitative with an arbitrary standard oil (No. 6 or Bunker C) and with the proper instrument of choice. (Sinha-OEIS)
W77-07756

ESTABLISHING SOIL ELECTRICAL CONDUCTIVITY-SALINITY CALIBRATIONS USING FOUR-ELECTRODE CELLS CONTAINING UNDISTURBED SOIL CORES,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 2G.
W77-07776

WATER SAMPLING FROM UNPUMPED WELLS WITH STATIC WATER LEVELS DEEPER THAN 10 METRES,
Ministry of Works and Development, Christchurch (New Zealand). Water and Soil Div.
G. N. Martin.
Journal of Hydrology (New Zealand), Vol 15, No 1, p 41-45, 1976. 1 fig, 1 ref.

Descriptors: *Sampling, *Equipment, *Water wells, Pumps, Pumping, Wells, Test wells, Groundwater, Subsurface waters, Water quality, Water sampling, Instrumentation, On-site investigations, Water pollution, Pollutant identification.
Identifiers: *Sampling pumps, Groundwater sampling.

One of the problems encountered in groundwater quality surveys is that of obtaining samples from wells not equipped with pumps and where the static water level is at a depth greater than that which permits sampling by simple suction techniques. This problem is particularly acute when special sampling and observation bores are drilled for investigation purposes alone. In a recent investigation of groundwater quality in the aquifers of New Zealand's Canterbury Plains, this sampling problem was encountered. Owing to the nature of the investigations, the following requirements had to be met by the sampling apparatus: (1) maximum diameter less than 65 mm, (2) hand or battery operated, (3) portable, (4) fully autoclavable (for sampling for bacteriological purposes), (5) free of metal (for sampling for trace amounts of metals, (6) capable of operating to depths of at least 30 m, and (7) simple to operate and of low cost. These criteria were met satisfactorily by the final pump design. (Sims-ISWS)
W77-07787

DEVELOPMENT OF THE TURBIDITY MAXIMUM IN RAPPAHANNOCK ESTUARY; SUMMARY,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W77-07789

WATER QUALITY STATUS AND TRENDS IN MINNESOTA--INDICES FOR WATER SUPPLY AND GROUND WATER POLLUTION,
Minnesota Univ., Minneapolis. Water Resources Research Center.
C. P. Straub, V. M. Goppers, and A. DuChene.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 331, Price codes: A10 in paper copy, A01 in microfiche. Completion Report, October 1976, 192 p, 32 fig, 25 tab, 12 ref, 3 append. OWRT A-029-MINN(2).

Descriptors: *Water quality standards, *Minnesota, *Water supply, *Water pollution sources, *Groundwater, *Public health, *Potable water, Data collections, Aquifers, Computer programs, *Water analysis, *Chemical analysis, Calcium carbonate, Alkalinity, Calcium, Hydrogen ion concentration, Chlorides, Sulfates, Iron, Manganese, Fluorides, Nitrogen, Sodium, Potassium, *Pollutant identification.

The status of water quality in Minnesota was examined in relation to the chemical data available on public water supplies based upon sample analyses by the Minnesota Department of Health, reported in 1971 and upgraded in 1972. Information presented included an up-to-date summary of facts covering ownership, pumpage, source, installation, treatment, storage, chemical quality for public water supplies in the State of Minnesota. The chemical analysis data included: date of sample, total hardness (as CaCO3), alkalinity (as CaCO3), calcium (as CaCO3), pH, pH of stability, iron (as Fe), manganese (as Mn), chlorides (as Cl), sulfate (as SO4), fluorides (as F), nitrate nitrogen (as N), sodium (as Na), potassium (as K), and total solids. It was necessary to develop a system for comparing existing quality with some accepted standards or criteria. Comparisons permitted an indication of the number of supplies and the populations they served that met various selected concentrations. Quality comparisons are indicated for hardness (as CaCO3), iron, manganese, chlorides, sulfates, nitrates, sodium, and filterable residue (total solids). Attempts were made to use some of the analytical data to identify specific auifers supplying water and these results are reported, as are data obtained in the application of a simplified additive approach for calculating a water quality index for each supply. A computer program was developed for subsequent retrieval of the chemical analysis data available and the physical and other data characterizing each public water supply including treatment. Techniques developed for characterizing specific organic contaminants in water are described.
W77-07794

EXTRACTION AND SEPARATION OF POLYCHLORINATED BIPHENYLS FROM PESTICIDE MONITORING SAMPLES,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
J. M. Heller.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A011 242, Price codes: A02 in paper copy, A01 in microfiche. Entomological Special Study No. 44-042-74/75, 15 April 1975, 9 p., 2 append.

Descriptors: *Polychlorinated biphenyls, Pollutant identification, Laboratory tests, Methodology, *Analytical techniques, *Pesticides, *Insecticides, *Chlorinated hydrocarbon pesticides, *Monitoring, Entomology, *Aroclors, Chemical analysis, Chemical wastes, Sampling.
Identifiers: *Percent insecticide recovery.

A new method was tested for the removal of polychlorinated biphenyls (PCB's) from biological samples. These industrial chemicals are ubiquitous in biological samples such as fish and bird adipose tissue. Based on retention characteristics they can be easily misidentified as organochlorine pesticides. The PCB's are partially or completely recovered from a Florisil(Trade Name) column using the multiresidue methodology for organochlorine pesticides. A silic acid column was spiked with a solution of 4 PCB's and 11 insecticides. Performance of the method was judged by percent recovery of pesticides along with their complete separation from the PCB's and p,p-DDE. The method performed well with respect to the above mentioned criteria and has been incorporated into the Department of the Army Pesticide Monitoring Program for the routine separation of PCB's from pesticides in biological samples. (Katz)
W77-07826

EVALUATION OF ERYTHROCYTE DELTA AMINO LEVULINIC ACID DEHYDRATASE AS A SHORT-TERM INDICATOR IN FISH OF A HARMFUL EXPOSURE TO LEAD,
Canada Centre for Inland Waters, Burington (Ontario).
For primary bibliographic entry see Field 5C.
W77-07837

EFFECTS OF THERMAL SHOCKS ON DRIFTING AQUATIC INSECTS: A LABORATORY SIMULATION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Va. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07839

PROTECTIVE EFFECT OF CHLORIDE ON NITRITE TOXICITY TO COHO SALMON (ONCORHYNCHUS KISUTCH),
Rhode Island Univ., Kingston. Dept. of Animal Science.
For primary bibliographic entry see Field 5C.
W77-07840

EFFECTS OF INORGANIC COMPLEXING ON THE TOXICITY OF COPPER TO DAPHNIA MAGNA,
Environmental Research Lab., Duluth, Minn.
For primary bibliographic entry see Field 5C.
W77-07842

EGG HATCHABILITY AND TOLERANCE OF BROOK TROUT (SALVELINUS FONTINALIS) FRY AT LOW PH,
Cornell Univ., Ithaca, N. Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W77-07844

A STUDY ON THE STRENGTH OF SEWAGE,
For primary bibliographic entry see Field 5B.
W77-07853

GAS DETECTORS DETERMINE HEALTH HAZARDS IN SEWAGE TREATMENT.
Water and Sewage Works, Vol 124, No 3, p 60, March, 1977.

Descriptors: *Monitoring, *Hydrogen sulfide, *Gases, *Hazards, *Sewers, Pumping plants, Maintenance, Personnel, Safety, Toxicity, Sewage treatment, Pollutant identification.
Identifiers: Los Angeles City Sewer Maintenance Department(CA).

The Los Angeles City Sewer Maintenance Department has acquired portable combination H2S and combustible gas detectors. These gases have become known safety problems in sewage and water treatment. The detectors consist of a sensor, alarms, a charger, a three and one-half inch meter, and an optional miniature sample pump. The units weigh five and one-half pounds. The instruments are very durable and easily calibrated. Detectors are preset for audible alarm at 30-35 ppm H2S and 20% LEL for combustible gases. They are placed

at three points at any entry to a pumping station. The sensor is directed to the above-ground wet well vent to monitor gas concentration in the concrete-enclosed rooms below, and operates at slightly above ambient temperature. The instrument is worn for all work in the underground pump room. The detector is placed on a metal grid walkway above the waste water flow in the wet well when the area is cleaned. H2S is the one highly toxic gas which cannot be detected by smell at low concentrations of 100-150 ppm. Concentrations at 700 ppm can cause instant unconsciousness and death. The other gas combinations in the area of sewer maintenance are all explosive. The Los Angeles maintenance group requires that workmen immediately leave the area at first warning. (Collins-FIRL)
W77-07880

AUTOMATIC ANALYSIS CONTRIBUTES TO WASTE WATER TREATMENT EFFICIENCY,
Instrumentation Technology, Vol. 24, No. 2, p 10, February, 1977.

Descriptors: *Instrumentation, *Measurement, *Treatment facilities, Aeration, Nitrification, Denitrification, Nitrogen, Biochemical oxygen demand, Suspended solids, Groundwater recharge, Water wells, *Waste water treatment, Chlorination, Disinfection.
Identifiers: Suffolk County(NY).

Suffolk County, New York, is meeting municipal standards and more efficiently operating a waste water treatment plant with automatic measurement of mixed liquor suspended solids (MLSS). Complete treatment is provided before groundwater recharge. Groundwater wells provide all drinking water for the area. A nitrogen level of less than 10 milligrams/liter was required by the county environmental control agency. The plant operates in two stages: extended aeration/nitrification and suspended growth denitrification. The design capcity allows for 288,000 gpd, but the present operation rate is 50,000 gpd. The analyzer chosen consists of a sensing probe on the downflow side in the center of the aeration tank and a remote digital readout, in ppm, in the control building. Readouts are checked against MLSS gravimetric tests in the plant laboratory. Treatment goals included 85% BOD removal, 90% suspended solids removal, and continuous chlorination for disinfection. (Collins-FIRL)
W77-07909

THE ACTIVATED SLUDGE PROCESS WITHOUT PRELIMINARY PURIFICATION. RESULTS OF PILOT EXPERIMENTS IN THE PURIFICATION PLANT KARLSRUHE (DAS BELEBUNGSVERFAHREN OHNE VORREINIGUNG. ERGEBNISSE DER VERSUCHE IM HALBTECHNISCHEN MASSSTAB IM KLAERWERK KARLSRUHE),
For primary bibliographic entry see Field 5D.
W77-07927

EASIER IDENTIFICATION WITH MPN PROCEDURE,
Nampa Waste Water Treatment Plant, Idaho.
A. Dornfest, C. Howard, and V. Williams.
Deeds and Data, p 4, November, 1976. 2 tab, 2 ref.

Descriptors: *Analytical techniques, *Water quality control, *Bioindicators, Analysis, Coliforms, E coli, Bacteria, Color, Laboratory tests, Waste water treatment, Chemical reactions, *Pollutant identification.
Identifiers: Brom cresol purple, Lauryl tryptose.

The Nampa Waste Water Treatment Plant laboratory has used the MPN technique for determining fecal coliform bacteria in chlorinated secondary effluent since 1975. Problems were encountered in classifying tubes as positive or negative following the incubation period on occasions when few bubbles are present. The use of indicators to establish more definite tube results was investigated because fecal coliform bacteria produce acid in addition to gas when fermented in lactose. Brom cresol purple/1 EC (0.0125 grams) was added to tubes sterilized by autoclaving for 15 minutes at 121C and duplicate inoculations from positive lauryl tryptose tubes were transferred to regular EC and the indicating EC. Thirty-four samples were run on dilutions of 0.01 mil to 1.0 milliliter/tube. At the end of incubation, there were 25 negative and 9 positive samples. Identical results were obtained in EC and indicating EC in all cases. Positive results changed the indicating EC from a dark purple to a yellowish green. Borderline positives changed to lavender, providing an observable determinant in addition to gas production. Small amounts of brom cresol purple indicator produced easily readable positive and borderline positive results. Tests were also conducted with EC indicators and lauryl tryptose presumptive fecal coliform tubes. These used duplicate series of nine tubes using 1.0 milliliters, 0.1 milliliters and 0.01 milliliters of sample. Results of five consecutive days showed identical numbers of fecal coliforms determined with or without brom cresol purple indicator. Interference was not caused by adding brom cresol purple to lauryl tryptose broth for more easily readable test results. (Collins-FIRL)
W77-07928

BIOLOGICAL REGENERATION OF AMMONIUM-SATURATED CLINOPTILOLITE. I. INITIAL OBSERVATIONS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-07942

BIOLOGICAL REGENERATION OF AMMONIUM-SATURATED CLINOPTILOLITE. II. MECHANISM OF REGENERATION AND INFLUENCE OF SALT CONCENTRATION,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-07943

A RAPID VOLUMETRIC METHOD OF DETERMINING FLUORINE IN WATER, (IN RUSSIAN),
Kiev Sanitary-Epidemiology Station (USSR).
A. T. Ivanova, B. M. Duchinskii, and O. I. Kovalenko.
Gig Sanit 6, p 57-59, 1976.

Descriptors: *Fluorine, *Pollutant identification, *Volumetric analysis, Analytical techniques, Indicators, Methodology, Water analysis.

A volumetric method of determining F levels in water is described. The method is based on the capacity of F to form a colorless complex with Zr which is more stable than the complex of Zr and the organic dye (sodium alizarin sulfonate) used as an indicator. The method can be used to determine the F in such resistant ions as SiF(2-)6 and BF4-.--Copyright 1977, Biological Abstracts, Inc.
W77-07950

THE DETERMINATION OF NITRATES IN WATER, (IN RUSSIAN),
B. I. Fradkin.
Gig Sanit 6, p 94-95, 1976.

Descriptors: *Nitrates, *Pollutant identification, Nitrites, Photometry, Analytical techniques, Chemical analysis, Water analysis.

For the determination of nitrate levels in water, a method of nitrate reduction to nitrites and subsequent determination by Griess's reagent is described. The compounds are then analyzed photometrically. The method has a sensitivity of 0.035 mg nitrate N/ml and requires only 30 min for completion of the analysis.--Copyright 1977, Biological Abstracts, Inc.
W77-07966

MICROBIAL ATP STUDIES,
For primary bibliographic entry see Field 5C.
W77-07978

ELECTRON TRANSPORT ANALYSIS AS AN INDICATOR OF BIOLOGICAL OXIDATION IN FRESHWATER SEDIMENTS,
For primary bibliographic entry see Field 5C.
W77-07992

PLANKTONIC MICROBIAL HETEROTROPHY: ITS SIGNIFICANCE TO COMMUNITY BIOMASS PRODUCTION,
For primary bibliographic entry see Field 5C.
W77-07993

CHANGES IN THE PROPERTIES OF E. COLI UNDER THE INFLUENCE OF WATER ENVIRONMENTS,
I. Daubner.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 2650-2657, 1975. 10 fig., 7 ref.

Descriptors: *Water pollution sources, *E. coli, *Physiological ecology, *Environmental effects, *Plant morphology, *Plant physiology, Pathogenic bacteria, Bioindicators, Biochemistry, Solid wastes, Pollutant identification.

The morphological and physiological integrity of pathogenic bacteria used as pollution indicators must be static if they are to be detectable and their effectiveness as a diagnostic tool not be impaired. However, it has been noted that different water qualities affect the morphology and physiology of these bacteria; therefore an investigation was made of the extent of the biological changes in Escherichia coli as affected by different solutions. Five to twenty hours after transferring E. coli to water, marked changes occurred. An initial observation showed shrinking of the cell and reduction of cytoplasmic content in distilled and surface water, or damage to the cell in a mineral medium. The formation of granules (possible ribosomal proteins) and separation of the cell wall from the cytoplasmatic membrane were also observed. Respiration and dehydrogenase activity of the cells immediately decreased and corresponded with the mineral content of the water. Many changes were also observed in the biochemical activity of the cells, such as utilization of citrate as a sole carbon source, sucrose-splitting, hydrogen sulfate formation, gelatin-liquefying, and the negative methyl-red-test results. Fermentation of glucose at 37C and 43C, and formation of indol and Voges-Proskauer reaction was unchanged. (Auen-Wisconsin)
W77-07997

STUDY OF FREE LIVING AMOEBAE IN THE WATERS OF STRABOURG: PRELIMINARY REPORT, (IN FRENCH),
Strasbourg Univ. (France). Inst. of Parasitology.
B. Molet, C. Derr-Harf, J. E. Schreiber, and M. Kremer.
Ann Parasitol Hum Comp 51(4), p 401-406, 1976.

Descriptors: *Potable water, *Water supply, Ponds, Swimming pools, Water pollution, *Pollutant identification, Isolation, Public health.
Identifiers: Acanthamoeba-Castellanii, Acanthamoeba-Polyphaga, *Amoebae, France, Hartmannella-Vermiformis, Naegleria-Fowleri, Naegleria-Sp, Platyamoeba-Stenopodi, Saccamoeba-Sp, *Strasbourg(FRance), Vahlkampfia-Sp.

Free living amoebae (75 strains) were isolated from public drinking water supplies, swimming pools and official swimming ponds in Strasbourg, France. Only 42 strains were know previously. No pathogenic strain of Naegleria fowleri was found. Acanthamoeba polyphaga, A. Castellanii, Hartmanella vermiformis, Naegleria sp., Nahlkampfia sp., Platyamoeba stenopodia and Saccamoeba sp., were found.--Copyright 1977, Biological Abstracts, Inc.
W77-08016

LIQUID SAMPLER,
For primary bibliographic entry see Field 7B.
W77-08024

HYDROCARBONS IN EASTERN CANADIAN MARINE WATERS DETERMINED BY FLUORESCENCE SPECTROSCOPY AND GAS-LIQUID CHROMATOGRAPHY,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
P. D. Keizer, D. C. Gordon, Jr., and J. Dale.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 3, p 347-353, March 1977. 6 fig, 1 tab, 14 ref.

Descriptors: *Canada, *Atlantic Ocean, *Oil, *Pollutant identification, *Chemical analysis, *Analytical techniques, *Oil pollution, Fuels, Oil industry, Water pollution, Water analysis, Chromatography, Gas chromatography, Fluorescence, Instrumentation, Organic compounds, Water pollution sources, Analysis.
Identifiers: *Bedford Basin(Canada), *Fluorescence spectroscopy, Alkanes, Marine environment.

In sea water off Atlantic Canada, sampling and analysis showed that concentrations of normal alkanes ranged from less than 20 ng/l to about 1 microgram/l at depths of 2 and 50 m. Estimated oil concentrations based on fluorescence analyses ranged from 0.2 to 9.3 microgram/l. The highest concentrations occurred in Bedford Basin; the similarity of fluorescence contour plots to petroleum products and the presence of unresolved envelopes in chromatograms suggest that a large portion of the hydrocarbons in the Basin are derived from oil. Hydrocarbons in other regions appear to be principally biogenic in origin. (Henley-ISWS)
W77-08060

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, TECHNICAL SESSION PRESENTATIONS, WATER RESOURCES, VOLUME I-D,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W77-08062

UTILIZATION OF LANDSAT DATA FOR WATER QUALITY SURVEYS IN THE CHOPTANK RIVER,
General Electric Co., Beltsville, Md.
J. M. Johnson, P. Cressy, and W. C. Dallam.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2325-2350, September 1975. 15 fig, 3 tab, 4 ref.

Descriptors: *Water quality, *Monitoring, *Maryland, *Rivers, *Remote sensing, Surveys, Satellites(Artificial), Water analysis, Analytical techniques, Data processing, Chlorophyll, Sediment load, Reflectance.
Identifiers: *LANDSAT, *Choptank River(Md), Spectral analysis.

Computer processing of LANDSAT-1 multispectral digital data demonstrated the applicability of remotely sensed data to water quality survey in the Choptank River, Maryland. Water classes derived by automated analysis correlate to river nuisance levels of chlorophyll a and sediment loading as defined by the Maryland Department of Water Resources and the Corps of Engineers. Results indicated that an increase in chlorophyll a concentration corresponds, relative to MSS 5, to decreases in 4 and increases in 6 relative to the trends with increasing sediment load. It appears that for the purpose of water quality analysis, under favorable atmospheric conditions, only MSS 4, 5, and 6 are necessary. (See also W77-08062) (Humphreys-ISWS)
W77-08072

ON THE RELATION OF THE DIATIOM FLORA AND WATER QUALITY IN THE UJI RIVER KYOTO, (IN JAPANESE),
Osaka Seikei Women's Jr. Coll. (Japan). Biology Lab.
For primary bibliographic entry see Field 5 .
W77-08089

5B. Sources Of Pollution

MERCURY IN WATER, A BIBLIOGRAPHY, VOLUME 3,
Office of Water Research and Technology. Washington, D. C.
For primary bibliographic entry see Field 5A.
W77-07605

MUTAGENIC POTENTIAL OF PETROLEUM BYPRODUCTS IN CHESAPEAKE BAY WATERS,
Maryland Univ., College Park. Dept. of Microbiology.
M. J. Voll, J. D. Isbister, L. I. Isaki, and M. D. McCommas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 020, Price codes: A03 in paper copy, A01 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No. 39, March 1977. 36 p, 1 fig, 13 tab, 19 ref. OWRT A-034-MD(1). 14-34-0001-6021.

Descriptors: Oil, *Biodegradation, *Chesapeake Bay, *Bacteria, Sediments, *Oil pollution, *Oil wastes, Byproducts, Sampling, Assay, Pollutant identification, *Maryland.
Identifiers: Mutagens, Colgate Creek(Md).

Chesapeake Bay water and sediment samples from an oil polluted area (Colgate Creek) and a relatively non-polluted area (Eastern Bay) were assayed by the Ames bacterial system for the presence of mutagenic substances. The samples examined were collected in October and November of 1975 and in March, May and June of 1976. Organic extracts and/or untreated samples were assayed. Results suggest but do not establish the presence of mutagenic substances in Colgate Creek water and sediment. Unfractionated oil biodegradation products produced by indigenous Colgate Creek water and sediment bacteria were also tested for mutagenicity. Colgate Creek water and sediment were inoculated into an inorganic salts medium containing one percent motor oil. Samples of the cultures were removed as a function of time of incubation and tested in the Ames bacterial system. Organic extracts or untreated samples were assayed. Mutagenic activity in the culture samples was not detected. It cannot, however, be concluded from the initial nature and limited scope of these studies that mutagenic oil biodegradation products are not produced.
W77-07606

CYCLING OF DISSOLVED ORGANIC PHOSPHORUS COMPOUNDS IN NATURAL WATERS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5C.
W77-07608

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES, VOLUME 4, (ANALYTICAL METHODS FOR SEWAGE SLUDGE ANALYSIS),
Toronto Univ. (Ontario). Inst. of Environmental Sciences.
For primary bibliographic entry see Field 5A.
W77-07614

EXAMINATION OF SEWAGE SLUDGE FOR ENTEROVIRUSES, VOLUME 2,
Ontario Ministry of Health, Toronto. Lab. Services Branch.
T. P. Subrahmanyan.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 52, Environmental Protection Service, Environment Canada, Ottawa, Canada, 35 p., 1 fig., 10 tab, 50 ref. 72-5-1.

Descriptors: *Viruses, *Pathogenic bacteria, *Sewage sludge, Soil contamination, Heavy metals, Environmental control, Sewage effluents, Agricultural runoff, *Monitoring, Hazards.
Identifiers: *Enteroviruses, Poliovirus, Urban sewage, Rural land, Detection.

Spreading of sewage sludge on agricultural or grassland in rural areas carries an inherent risk of polluting the environment with harmful viruses and heavy metals contained in the sewage. Monitoring of sludge for viruses is, therefore, one important aspect of sewage disposal; first, to determine the extent of the problem, and second to ascertain the efficiency of present treatment methods in virus removal. This report deals with the first phase of the program at the Enterovirus Laboratory, Ontario Ministry of Health, Laboratory Services Branch, relating to spreading urban sewage sludge on rural land in Ontario. During April 1973 - December 1975, a total of 1317 specimens, including 642 sewage specimens, 540 raw and digested sludge specimens and 135 specimens of water were investigated. Out of the 444 specimens tested in 1973, 40% of the sewage specimens (48/124) contained virus, although the collection period included several cold months during which enteroviruses were not detected in the community. Virus isolation rates in 1974 and 1975 were lower, which paralled the lower isolation rates from clinical cases as well. The virus isolates from sewage included several poliovirus isolates. Preliminary results indicate that at least one strain is definitely not derived from vaccine; a few others are intermediate in character, indicating that they too could be of nonvaccine origin. All the nonpolio enteroviruses found in this study are well-known human pathogens and, therefore, it is important to ensure that they are inactivated before sludge is spread on soil. (WATDOC)
W77-07615

ENERGY DEVELOPMENT AND ITS EFFECT ON GROUND WATER,
National Water Well Association, Worthington, Ohio.
T. E. Gass.
Water Well Journal, Vol. 31, No. 4, p 34-35, April, 1977.

Descriptors: *Energy, Oil wells, Oil wastes, Nuclear energy, Mine drainage, Pumps, *Water pollution, *Groundwater.
Identifiers: Geothermal energy, Solar energy, Groundwater heat pumps.

Development of energy sources, even 'clean' energy sources, can consume and contaminate

large quantities of water. Improperly abandoned oil wells and test holes provide avenues for pollutants from the surface or from aquifers containing unpotable water to potentially useful ground water sources, while disposal of brines which frequently accompany oil production presents grave contamination problems as well. Petroleum refining process also requires vast amounts of water. Existing designs for solar energy systems that are economically feasible for large-scale production utilize a great deal of water for steam generation and cooling, and would strain the resources of the arid locations where sunlight is most constant and intense. Undesirable gases and dissolved solids associated with geothermal energy systems create waste disposal problems and require precautions to protect shallow water-bearing strata. Side effects of coal and nuclear energy development are well known as persistent water supply hazards. Widespread awareness of such water use and contamination problems and the increased implementation of alternative energy sources such as ground water heat pumps are important steps in finding solutions. (Eberle-NWWA)
W77-07691

RISK OF DRINKING WATER CONTAMINATION IN RURAL TENNESSEE,
Tennessee Univ., Knoxville. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 5G.
W77-07701

SALTWATER-FRESHWATER INTERFACES IN THE '2,000-' AND '2,800-FOOT' SANDS IN THE CAPITAL AREA GROUND WATER CONSERVATION DISTRICT,
Louisiana Capital-Area Ground Water Conservation Commission, Baton Rouge.
For primary bibliographic entry see Field 4B.
W77-07703

DISSOLVED GAS SUPERSATURATION, GRAND COULEE DAM PROJECT, 1973,
Seattle Marine Labs., Seattle, Wash.
Prepared for Department of the Interior, Bureau of Reclamation, Boise, Idaho January, 1974. 82 p., 19 tab., 22 fig., 14 ref, 4 append.

Descriptors: *Columbia River, *Dams, Dam sites, *Grand Coulee Dam, On-Site investigations, *Nitrogen, *Supersaturation, Fish behavior, Water pollution effects, Water quality, Freshwater fish, Runoff, *Fish diseases, Sockeye salmon, Perch.
Identifiers: *Lake Roosevelt, *Banks Lake, *Upper Columbia River, *Gas bubble disease, *Chief Joseph Dam.

High nitrogen content (120%) was present in Columbia River waters entering Lake Roosevelt and the N2 content only decreased 2-3%. Below Grand Coulee dam, nitrogen content reached 148% saturation in June. Fish inhabiting Banks Lake, (N2 content of 115-120%), did not have signs of gas bubble disease, nor did fish residing below Grand Coulee Dam. (Katz)
W77-07722

ENZYME KINETICS--A REVIEW WITH EMPHASIS ON INHIBITION OF ENZYMES,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
J. Maguire.
Water Quality Branch, Scientific Series No. 47, 1974, 18 p., 12 fig., 61 ref.

Descriptors: *Enzymes, *Catalysts, *Hydrogen ion concentration, *Inhibition, Chemical reactions, Carbon dioxide, Amino acids, Biology, Proteins, Biochemistry, Reviews, *Cytological studies.
Identifiers: Enzymology, Chemical compounds, *Enzyme kinetics, Enzyme substrates, Molecules.

This review demonstrates the potential value of the application of the techniques of enzyme kinetics to environmental problems. Conclusions were: Whether enzymes in their natural state are in free solution or are insolubilized, many useful techniques may be employed to assess the effects of inhibitors, or changes in physical parameters, on enzyme-catalyzed reactions. Precise methods exist for determining whether a substance is an inhibitor of a particular enzyme reaction, how the substance inhibits the reaction, and how effective it is in relation to the substrate or other inhibitors. By varying other parameters such as PH it may be possible to deduce the site of binding of the inhibitor to the enzyme. With the knowledge of the mechanisms of enzyme action, specific effects of added chemicals on living organisms can be predicted. It may be possible, through judicious use of structure-activity relationships, to design compounds that are necessary as inhibitors of certain processes, but that are harmless to other systems. (WATDOC)
W77-07732

DEGRADATION OF PETROLEUM BY AN ALGA, PROTOTHECA ZOPFII,
Maryland Univ , College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-07737

MONITORING DISSOLVED HYDROCARBONS AS A FUNCTION OF THE TIDAL CYCLE (NEW YORK HARBOR),
Coast Guard Research and Development Center, Groton, Conn.
W. E. McGowan.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 882 in paper copy, A01 in microfiche. U.S. Coast Guard Office of Research and Development, Final Report No. CG-D-106-75, April 1975. 37 p, 12 fig, 2 tab, 5 ref, 4 append.

Descriptors: *New York, *Monitoring, *Tidal effects, *Water pollution sources, *Oil pollution, Pollutants, Environmental effects, Measurement, Pollutant identification.
Identifiers: Outer Continental Shelf, Hydrocarbons, *New York Harbor.

Measurements of dissolved hydrocarbon (C.-C4) as a function of the tidal cycle are reported. Measurements were made in New York Harbor from 19 September to 5 October 1973 in order to evaluate a dissolved hydrocarbon monitoring system and to gain information about the behavior of dissolved pollutants in a tidal cycle. The trends of the relative data illustrate both the change in hydrocarbon concentration over the tidal cycle (as much as 6X) and the day-to-day variation of the coordinated tidal data. These data indicate that efficient and meaningful monitoring of the dissolved pollutants can be accomplished best with an understanding of the tidal pattern of the pre-existing pollutants. Such background information is essential for the following: to determine a sampling window in the tidal cycle which will appropriately reflect the pollutant input relative to the pre-existing levels; to interpret the extent and time frame of the increase due to the pollution incident; and to interpret possible irregularities in the surveillance data obtained during the sampling window. (Sinha-OEIS)
W77-07740

VERIFICATION BY REMOTE SENSING OF AN OIL SLICK MOVEMENT PREDICTION MODEL,
Delaware Univ., Lewes. Marine Studies Complex.
V. Klemas, G. Davis, and H. Wang.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-12444, Price codes: A02 in paper copy, A01 in microfiche. Report to NASA, Goddard Space Flight Center, Greenbelt, Md., October 1975. 2 p. NAS5-20983.

Descriptors: *Oil pollution, *Remote sensing, *Water pollution sources, Monitoring, *Oil spills, Model studies.
Identifiers: *Prediction models, LANDSAT satellites.

LANDSAT, aircraft, ships and air-dropped current drogues have been deployed to determine current circulation and to track oil slick movement on four different dates in Delaware Bay. The results were used to verify a predictive model for oil slick movement and dispersion. The model predicts the behavior of oil slicks given their size, location, tidal stage (current), weather (wind) and nature of crude. Both LANDSAT satellites provided valuable data on gross circulation patterns and convergent coastal fronts which by capturing oil slicks significantly influence their movement and dispersion. (Sinha-OEIS)
W77-07745

PRELIMINARY PROJECTIONS OF OIL SPILL MOVEMENT FOR THREE POTENTIAL DEEPWATER PORT SITES IN THE GULF OF MEXICO,
Coast Guard Research and Development Center, Groton, Conn.
I. M. Lissauer, and J. P. Welsh.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024 331, Price codes: A03 in paper copy, A01 in microfiche. Final Report No. CG-D-19-75, December 1975. 36 p, 18 fig, 5 tab, 7 ref.

Descriptors: Water pollution sources, *Oil pollution, *Oil spills, *Gulf of Mexico, *Environmental effects, Sites, Wind velocity, Seasonal, *Path of pollutants.
Identifiers: *Deepwater ports, Trajectory, Prediction, Oil slicks.

Projections of the movement of oil slicks and their impact location along the shorelines of Texas, Louisiana, Mississippi, Alabama and Florida were determined from three potential deepwater port sites. Average monthly wind speeds and directions and average monthly current patterns were used for predicting the oil slick movement. Seasonal patterns of oil slick drift and probable areas of impact along the shoreline were indicated. (Sinha-OEIS)
W77-07753

BIOLOGICAL ASSESSMENT OF THE WATER QUALITY OF THE SMALL RIVERS SORA AND BYURYA (YENISEI BASIN), (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W77-07755

TAR BALL DISTRIBUTION IN THE WESTERN NORTH ATLANTIC,
Coast Guard Research and Development Center, Groton, Conn.
W. E. McGowan, W. A. Saner, and G. L. Hufford.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A006 821, Price codes: A03 in paper copy, A01 in microfiche. Final Report No. CG-D-52-75, July 1974. 30 p, 6 fig, 3 tab, 6 ref, append.

Descriptors: *Oil pollution, *Water pollution sources, *Waste disposal, Seepage, Monitoring, *Distribution patterns, *Path of pollutants, *Atlantic Ocean.
Identifiers: *Tar balls, *Western North Atlantic Ocean.

Surface waters of the Atlantic Ocean were quantitatively sampled for floating tar balls from December 1971 to September 1973. It was found that tar ball concentrations generally increase from the Labrador Sea at ocean station Bravo (nearly tar ball free) south to the Sargasso Sea at

ocean station Echo. This south to north decrease in tar pollution was not only noted for the four ocean station sampling areas, but was also observed along the eastern coast of the United States. Analysis of thirty-five tar ball samples for iron indicated high levels of Fe203. This implies previous association of the tar balls with iron or steel and suggests that man-made sources are partially responsible for tar ball pollution in addition to natural oil seeps. (Sinha-OEIS)
W77-07757

TRANSPORT OF REACTIVE SOLUTES THROUGH MULTILAYERED SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-07758

SOLUTE MOVEMENT IN A FIELD SOIL,
New Mexico State Univ., Las Cruces. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-07759

MODEL OF SALT FLOW IN SOIL WITH A SOURCE-SINK TERM,
Utah State Univ., Logan. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-07761

REPRESENTATIVE AND EXPERIMENTAL BASINS - WHERE NEXT,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2A.
W77-07781

LIMNOLOGIC-GEOLOGIC EXCURSION IN THE TERRITORY OF THE LOWER ERFT RIVER, (IN GERMAN),
Landesanstalt fuer Gewaesserkunde und Gewwesserschutz Nordrhein-Westfalen, Krefeld (West Germany).
G. Friedrich, and K. N. Thome.
Decheniana 129, p 268-272, 1976.

Descriptors: *Hydrogeology, *Coal mines, *Strip mines, Iron compounds, Algae, *Iron, Aquatic life, Diptera, Larvae, Isopods, Diatoms, Rivers, *Mine wastes, Water pollution.
Identifiers: Asellus-aquaticus, Asellus-coxalis, Bithunia-tentaculata, Cladophora-glomerata, Compsopogon-hookeri, Dendrocoelum-lacteum, Dugesia-tigrina, Heropbdella-octoculata, Limnephilid, Lymnaea-ovata, Oedogonium, Capillare, Oscillatoria-splendida, Physa-acuta, Physa-fontinalis, Planarea-lugubris, Potamogeton-natans, Potamogeton-pectinatus, Ranunculus-fluitans, Sparganium-erectum, Stigeoclonium-tenue, Ulothrix-tenerrima, West Germany(Erft River).

The geography and hydrology of the area of the excursion are described. There is much damage due to brown coal strip mining operations. Ground water was drained through a canal leading to the Erft River. The water in nearby springs is rich in Fe which repels plant life. The canal contains only a few blue algae (Oscillatoria splendida) and filamentous green algae (Ulothrix tenerrima) which tolerate high Fe concentrations. The Erft shore plant population includes Sparganium erectum, Potamogeton natans, P. pectinatus and Ranunculus fluitans. On flowering plants and stones, diatoms, various green algae (Cladophora glomerata, Stigeoclonium tenue, Oedogonium capillare) and the tropical red alga Compsopogon hookeri were found. The macrozoobenthos is composed mainly of snails (Bithynia tenaculata, Lumnaea ovata, Physa fontinalis, P. acuta and worms of North American origin (Dugesia tifrina, Dendrocoelum lacteum and Planaria lugubris). The Isopoda included Asellus coxalis and A. aquaticus. Leeches (Herpobdella octoculata) and insect larvae (Chironomids, Limnephilids) were also found.--Copyright 1977, Biological Abstracts, Inc.
W77-07799

DETERMINATION OF THE LEEWAY OF OIL SLICKS,
Virginia Inst. of Marine Science, Gloucester Point.
C. L. Smith.
U.S. Coast Guard Office of Research and Development Final Report No. CG-D-60-75, August 1974. 48 p, 11 fig, 5 tab, 33 ref, append. Also as: Virginia Institute of Marine Science Contribution No. 644. DOT-CG-33, 183A

Descriptors: *Water pollution sources, *Oil spills, *Oil pollution, Weather, Wind velocity, Forecasting, *Path of pollutants.
Identifiers: Oil slicks.

The leeway of oil slicks was determined as a function of wind velocity in its range 5-25 knots to enable more precise forecasting of the trajectory of oil spills, and thus aid effective containment and cleanup operations. Leeway was calculated by measurement of the separation of oil slicks from a dyed patch of surface water at sea, using time-sequenced nadir aerial photography. Five oil types, Nos. 2, 4, and 6 fuel oils, and light and heavy crude oils, were found to exhibit similar leeway as a function of wind speed. Oil spill volume had no measureable effect on leeway, and slicks moved in the direction of the wind. The leeway increases with sea state, and obeys a linear relationship with wind velocity in the wind range studies (Sinha-OEIS)
W77-07800

DEGRADATION OF SODIUM DODECYLSULFATE BY BACTERIA IN WASTE WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. of Colloidal Chemistry and Water.
S. S. Stavskaya, N. A. Yaroshenko, L. A. Taranova, and S. G. Yukhnenko.
Gidrobiol Zh 12(3), p 91-93, 1976.

Descriptors: *Bacteria, *Biodegradation, *Sulfates, Sodium, Surfactants, Water pollution control, Pollution abatement.
Identifiers: *Aerobacter-aerogenes, *Citrobacter-freundii, *Sodium dodecylsulfate.

To identify bacterial strains responsible for degrading surfactants and to determine the optimal conditions for this degradation, Citrobacter freundii and Aerobacter aerogenes, isolated from the waste waters of a detergent production plant, were studied. Degradation of the anionic synthetic surfactant sodium dodecylsulfate by a mixed culture of the bacteria was more efficient after shaking than under stationary conditions. C freundii was the species responsible for the degradation of the surfactant, and A. aerogenes evidently utilized the degradation products.--Copyright 1977, Biological Abstracts, Inc.
W77-07801

A REVIEW AND EVALUATION OF BASIC TECHNIQUES FOR PREDICTING THE BEHAVIOR OF SURFACE OIL SLICKS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
K. D. Stolzenbach, O. S. Madsen, E. E. Adams, A. M. Pollack, and C. K. Cooper.
Sea Grant Program Report No. MITSG-77-9, Index No. 77-308-Cfn, March 1977. 323 p.

Descriptors: *Water pollution sources, *Oil pollution, Advection, *Forecasting, *Oil spills, *Path of pollutants, Model studies, Bibliographies, *Reviews, Evaluation.
Identifiers: *Oil slicks, Wind driven currents, Wind fields.

When an oil spill occurs, protective measures to minimize impacts require a capability to forecast the short-term and long-term behavior of the spilled oil. The motivation presented in this report is the need for a detailed review of the basic analytical techniques available for making such predictive estimates. Because of its significance in determining the fate of oil slicks, the representation and determination of wind fields is discussed first. Then a treatment of the advection of oil slicks that is brought about by the combined action of currents and wind-waves is presented. Following this, the various physical phenomena that transform an oil slick as it is being advected is discussed. Finally a review and evaluation of existing models for oil slick behavior is presented. A comprehensive bibliography is included along with an appendix containing a detailed treatment of wind riven currents. (NOAA)
W77-07808

MODELING NONPOINT POLLUTION FROM THE LAND SURFACE,
Hydrocomp Inc., Palo Alto, Calif.
A. S. Donigian, Jr., and N. H. Crawford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 089, Price codes: A13 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-76-083, July 1976. 279 p., 42 tab., 52 fig., 82 ref.

Descriptors: North Carolina, Wisconsin, Washington, *Water pollution sources, Methodology, On-site investigations, *Model studies, *Simulation analysis, *Runoff, Runoff forecasting, Hydrology, Water quality, Snowmelt, *Land use, *Mathematical models, *Sediment discharge, *Path of pollutants.
Identifiers: Durham(NC), Madison(Wisc), Seattle(Wash), *Nonpoint pollution, Urban runoff, Pollutant contributions, *Sediment runoff.

Development and initial testing of a mathematical model to continuously simulate pollutant contributions to stream channels from nonpoint sources is presented. The Nonpoint Source Pollutant Loading (NPS) Model is comprised of subprograms to represent the hydrologic response of a watershed, including snow accumulation and melt, and the processes of pollutant accumulation, generation, and washoff from the land surface. The simulation of nonpoint pollutants from both pervious and impervious areas is based on sediment as a pollutant indicator. The calculated sediment washoff is multiplied by user-specified 'potency factors' that indicate the pollutant strength of the sediment for each pollutant simulated. Both urban and rural areas can be simulated. Initial testing of the NPS Model was performed on three urban watersheds in Durham, North Carolina; Madison, Wisconsin; and Seattle, Washington. The hydrologic simulation results were good while the simulation of nonpoint pollutants was fair to good. Sediment, BOD, and 55 were the major pollutants investigated. A detailed user manual is provided to assist potential users in application of the NPS Model. Parameter definitions and guidelines for parameter evaluation and calibration are included. Possible uses of the NPS Model for evaluation of nonpoint pollution problems are discussed. (Katz)
W77-07818

BENZENE SOURCES OF CONTAMINATION, AMBIENT LEVELS, AND FATE OF BENZENE IN THE ENVIRONMENT,
Syracuse Univ. Research Corp., N.Y. Life Sciences Div.
P. H. Howard, and P. R. Durkin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 139, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA560/5-75-005, Dec. 1974. 65 p., 15 tab., 3 fig., 11 ref.

Descriptors: *Organic compounds, *Public health, *Path of pollutants, Environmental effects,

*Degradation(Decomposition), Oil spills, Oil pollution, Oil industry, Industrial wastes, *Monitoring, Analytical methods, Microbiology, Microbial degradation, Water pollution effects.
Identifiers: *Benzene, *Automotive emissions, *Automotive wastes, Motor vehicle emission, *Environmental persistence, Ambient levels, Environmental transport, Ultra violet absorption, Spectra, Benzene derivatives, Microbiological decomposition.

Available information pertinent to an assessment of benzene contamination of the environment is reviewed and evaluated. Benzene losses from commercial (production and use) and non-commercial (automotive emissions and oil spills) sources were considered. It is estimated that of the total quantity that is released to the environment more than half results from motor vehicle emissions. Monitoring data somewhat support this contention. Available information on the environmental persistence of benzene suggests that it degrades slowly. (Katz).
W77-07819

RUM JUNGLE ENVIRONMENTAL STUDIES, SUMMARY REPORT,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
G. M. Watson.
Report AAEC/E366, Sept. 1975, 3 tab., 1 fig.

Descriptors: *Australia, *Mine wastes, *Mineral industry, Industrial wastes, Water pollution effects, Metals, Liquid wastes, *Radioactive waste disposal, *Radium, Radioisotopes, Seasonal, *Uranium radioisotopes, On-site investigations, Fishkill, Freshwater fish, Copper, Zinc, Manganese, Seasonal, *Water pollution sources, *Path of pollutants.
Identifiers: *Rum Jungle(Australia), Seasonal variations.

Sources of pollution were identified and their relative importance assessed. Observations were made on seasonal variations and differences were noted between the dispersion patterns of several metals of interest. The geographical extent of chemical and biological pollution was examined. Some understanding of the basic mechanisms involved in continuing pollution was obtained and an attempt was made to determine the fate of heavy metals. (Katz)
W77-07822

MERCURY IN THE BIOGEOCHEMICAL ENVIRONMENT,
Stanford Univ., Calif. Dept. of Applied Earth Sciences.
G. A. Parks, P. L. McCarty, and J. O. Leckie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 137, Price codes: A03 in paper copy, A01 in microfiche. Mercury Project, Stanford University, Report NSF-RA-E-74-020, October 1974, 81 p., 4 fig., 108 ref.

Descriptors: *Mercury, Water pollution effects, *Path of pollutants, *Transfer, *Transport depletion, Pollution abatement, Industrial wastes, Industrial water, Water pollution control, *Water pollution sources, Water pollution treatment, California, Hydrogen ion concentration, Acidic water, Aquatic environment.
Identifiers: *Pollution fixation, *Pollution control methods, *Pollution dispersal, *Biogeochemical environment, New Almaden, San Francisco Bay, Methylmercury.

The dispersal and effects of mercury in the environment is reported. The stages of the investigation reported on include: (1) determination of the types of sources and sinks and the location of probable important fluxes of mercury in areas chosen to include typical problem environments and (2) description and modelling of release, transport and fixation processes in typical environments. Opportunities for pollution control are identified and the design and feasibility analysis of pollution control methods are discussed. (Katz)
W77-07823

ULTRASTRUCTURAL STUDY OF LESIONS IN GILLS OF A MARINE SHRIMP EXPOSED TO CADMIUM,
Environmental Research Lab. Gulf Breeze, Fla.
For primary bibliographic entry see Field 5C.
W77-07845

AQUATIC INSECT DIVERSITY AND BIOMASS IN A STREAM MARGINALLY POLLUTED BY ACID STRIP MINE DRAINAGE,
Pennsylvania State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07846

A STUDY ON THE STRENGTH OF SEWAGE,
T. Stones.
Effluent and Water Treatment Journal, Vol 17, No 2, p 90-91, February, 1977. 3 tab, 11 ref.

Descriptors: *Sewage, Physical properties, Chemical properties, *Oxygen demand, Oxidation, Biochemical oxygen demand, Chemical oxygen demand, Industrial wastes, Domestic wastes, Chemical reactions, Analysis, Pollutant identification, Water pollution sources.
Identifiers: Sewage strength, *Carbonaceous oxygen demand, *Nitrogenous oxygen demand.

The strength, or oxidizable matter concentration of sewage was characterized on the basis of its oxygen demand. This oxidizable matter is composed chiefly of carbonaceous and nitrogenous compounds. The absolute strength of sewage was defined as the dissolved oxygen needed for complete biochemical oxidation of the organic matter. Complete oxidation occurs in two stages: oxidation of carbonaceous matter and of nitrogenous matter. The lengthy time needed for this process required that other criteria be adopted to make the strength determinations. Carbonaceous oxygen demand can be determined by the dichromate value (DV) or COD by measuring oxygen consumption from silver catalyzed dichromate. This varies with the nature of the sewage. Nitrogenous oxygen demand can be calculated from the unoxidized nitrogen present according to a stoicheometric relationship. A formula was given for the determination of total, carbonaceous, and nitrogenous oxygen demand. (Collins-FIRL)
W77-07853

NITRATES IN SOME SOIL-WATER SYSTEMS IN QUEBEC, (IN FRENCH),
E. Chamberland.
Can J Soil Sci 56(3), p 257-269, 1976.

Descriptors: *Nitrates, *Canada, Corn(Field), Climates, Soils, *Soil analysis, Soil chemistry, Nitrogen, Fertilization, *Path of pollutants, Water pollution.
Identifiers: *Quebec.

Soil and water table nitrate concentrations were followed in test plots and fields seeded to corn (Zea mays L) located in SW Quebec (Canada) during 1971-73. Soil samples were taken to a depth of 150 cm in 25 cm intervals. Although there were few sites where nitrate concentrations exceeding 10 ppm were found in mineral soils, they were as high as 70 ppm in organic soils. Nitrate accumulation observed in 1972 changed to a near disappearance in 1973. This effect was ascribed to changes in climatic conditions. N fertilization levels ranged 50-300 kg N/ha and reached a maximum of 600 kg N/ha over 2 yr. These had a significant influence on soil nitrate concentrations. The observed soil nitrate concentration did not exceed 40 ppm with the 200 kg N/ha rates in 1971. N fertilization did not contribute significantly to groundwater nitrate concentrations, and mean N levels (NO3+ NO2) were 4.5 mg/l in the spring, 12.7 in July and 0.8 in Sept. 1973. N levels greater than 10 mg/l were found only once in 2 soils. Soil nitrate concentrations were low because of the approximately 112 kg N/ha N levels as used by corn growers.--Copyright 1977, Biological Abstracts, Inc.
W77-07858

HYDROCHEMISTRY OF THE NIGULA SWAMP, (IN ESTONIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
For primary bibliographic entry see Field 2H.
W77-07859

EFFECTS OF TRACE ELEMENTS ON NITROGEN MINERALIZATION IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
C. N. Liang, and M. A. Tabatabai.
Environmental Pollution, Vol. 12, No. 2, p 141-147, February, 1977. 3 tab, 18 ref.

Descriptors: *Trace elements, *Metals, *Soil types, *Mineralogy, Sludge disposal, Organic matter, Toxicity, Chemical properties, Physical properties, Microorganisms, *Nitrogen.

Soil trace element content was studied to determine the effects on nitrogen mineralization. Soils studied were surface soils at depths of 0-15 centimeters with a pH range of 5.8-7.8; an organic matter content of 2.58-5.45% organic carbon; and textures of 23-45% clay, 39-54% silt, and 1-38% sand. Results were obtained after a 20-day incubation period. Nineteen trace elements were studied, showing Ag(I) and Hg(II) to be the most effective inhibitors, and Co(II), As(III), S(IV), and W(VI) to be the least effective inhibitors of nitrogen mineralization in the soils. Chemical and physical characteristics of the soils as well as the nature of nitrogen in them have a great effect on the inhibition of nitrogen mineralization by trace elements. The degree of effectiveness of the remaining elements varied. The toxicity of Ag(I), Hg(II), Cu(II), and Cd(III) might have been caused by an ionic reaction with sulphydryl groups of the enzyme systems of the microorganisms involved in nitrogen mineralization. No nitrite nitrogen was detected and this suggested that there was no inhibition of Nitrobacter under the conditions of the experiment. Small amounts of chloride and sulfate ions associated with trace elements were not likely to stiumlate or depress nitrogen mineralization in these experiments. It was concluded that the accumulation of trace elements in soils could cause a reduction of the nitrogen available to plants in soil oranic matter. (Collins-FIRL)
W77-07864

ORGANIC MATTER AND HEAVY METAL UPTAKE,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W77-07870

LAKES WILL TAKE THE POLLUTION LOAD OFF OLD FATHER TAME,
For primary bibliographic entry see Field 5G.
W77-07913

RELATIONSHIP BETWEEN BOD5 AND FATS, OILS AND GREASE,
Environmental Protection Agency, Springfield, Ill.
For primary bibliographic entry see Field 5G.
W77-07925

ISRAEL'S USE OF NONIONIC SURFACTANTS,
Technion - Israel Inst. of Tech., Haifa. Environmental Engineering Labs.
N. Narkis, and S. Henefeld-Furie.
Water and Sewage Works, Vol. 124, No. 3, p 69-71, March, 1977. 3 tab, 22 ref.

Descriptors: *Surfactants, *Foaming, *Water pollution sources, Detergents, Domestic wastes, Industrial wastes, Pulp and paper industry, Textiles, Pesticides, Chemical properties, Physical properties, *Waste water treatment, Toxicity, Water pollution control.
Identifiers: *Nonionic surfactants, *Israel.

The use of nonionic surfactants in Israel was discussed. About 2,300 tons of these materials are used annually in Israel. They are predominantly nonyl phenol and di-nonyl phenol ethoxylates and are poorly degradable during waste water treatment. Ten to thirty percent removals are usual. Important properties of these surface active agents are that they are neutral, Harmless to the skin, stable and effective in high concentrations of salts, suitable to high and low temperature applications, and are not affected by hardness or extreme pH levels. Their use as cleaners in households, and in textile, paper-making, metal, and pesticide industries has increased their presence in waste water. Detection of synthetic surfactants in water and waste water is based on the reaction of methylene blue with the anionic part of the molecule forming chloro form soluble salts. Conventional techniques cannot determine the presence of nonionic surfactants. They cause serious foaming problems and interfere with sewage treatment, as well as being toxic to fish. Research should be conducted to find effective means for their removal from waste water and sewage treatment effluents. (Collins-FIRL)
W77-07929

THREE CASE STUDIES ON THE APPLICATION OF THE STORM WATER MANAGEMENT MODEL,
Metcalf and Eddy, Inc., Boston, Mass.
J. P. Vittands.
In: Short Course Proceedings: Applications of Storm Water Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 280-332. 19 fig, 12 tab.

Descriptors: *Model studies, *Water management(Applied), Analysis, Evaluation, Overflow, Water pollution sources, Pollution abatement, Sewerage, Combined sewers, Planning, Cities, Ohio, Massachusetts.
Identifiers: *Storm Water Management Model, Cleveland(Oh), Middleton(Oh), Boston(Mass).

Three case studies are presented which employ the Storm Water Management Model. These involved sewer system modeling and improvements in Cleveland, Ohio; combined sewer overflow regulation in Middletown, Ohio; and combined sewer overflow regulation in metropolitan Boston, Massachusetts. For the purposes of the first study, only parameters for the quantification of pollutants needed to be added in order to use the model as an aid in determining alternative remedies for combined sewer overflows. The technique used was design by analysis with computer simulation employed to determine conditions in a sewer system during a storm. For the second study, dry-weather flows, wet-weather flows, and other data were combined to conduct a comprehensive engineering evaluation of pollution abatement relative to combined sewer overflows to the Great Miami River within Middletown. The model was used in the metropolitan Boston area to assess the combined sewer overflow problem and to determine possible means for pollution abatement during the planning process for sewer development during the next 80 years. About 24,000 acres of combined and separate sewered areas were modeled to quantify combined sewer overflow pollution in terms of quality of discharge and amount of pollutants represented by BOD, suspended solids, and coliform bacteria. (W77-07066) (Collins-FIRL)
W77-07955

MIGRATION OF 90SR WITH RUNOFF WATERS FROM SOILS, (IN RUSSIAN),
F. Y. Rovinskii, Z. L. Sinitsyna, and P. Y. Cherkhanov.
Pochvovedenie 8, p 52-55, 1976.

Descriptors: *Path of pollutants, *Strontium radioisotopes, Soils, Water pollution sources, Runoff, Sands, Clays.
Identifiers: Strontium-90.

By modeling under laboratory conditions, a contaminated soil layer from which 90Sr was leached with runoff slope waters was determined. A maximum coefficient of the 90Sr runoff was found for sand and clay.--Copyright 1977, Biological Abstracts, Inc.
W77-07971

EXPERIMENTAL STUDY OF THE ACTION OF PESTICIDES ON THE MICROFLORA OF BODIES OF WATER, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny, Rostov-na-Donu (USSR).
E. P. Aleshnya.
Gig Sanit 6, p 97-99, 1976.

Descriptors: *Pesticides, *E. coli, Bacteria, Microorganisms, Self purification, Water pollution, *Euteric bacteria.
Identifiers: Bacilli, *Chlorophos, *Enterococci, *Propanide, Saprophytic.

Propanide in a concentration of 200 mg/l river water had a bacteria effect on intestinal bacilli, fecal Escherichia coli and enterococci; a 20 mg/l concentration had a bactericidal effect on fecal E. coli and enterococci and a bacteriostatic effect on the intestinal baccilli. In concentrations of 5-500 mg/l river water, chlorophos had a stimulating effect on all 3 groups of microorganisms. After an initial stimulation of growth during high (500 mg/l) chlorophos concentrations, a sharp decrease in microorganisms was noted by the 9th day of the experiment, probably due to pH changes. The total number of saprophytic microflora increased under the effect of the studied pesticides, most often on the 2nd day, which may indicate a period of adaptation to the pesticides. Thus in certain concentrations, chlorophos and propanide disturbed bacterial processes of self-purification of water.--Copyright 1977, Biological Abstracts, Inc.
W77-07982

VISUAL OBSERVATIONS OF PHOSPHORUS MOVEMENT BETWEEN ALGAE, BACTERIA, AND ABIOTIC PARTICLES IN LAKE WATERS,
Department of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
For primary bibliographic entry see Field 5C.
W77-07983

LOW FREQUENCY TURBULENCE AND VERTICAL TEMPERATURE MICROSTRUCTURE IN LAKE TAHOE, CALIFORNIA-NEVADA,
For primary bibliographic entry see Field 2H.
W77-07984

PHOSPHORUS: CHANGES IN ECOSYSTEM METABOLISM FROM REDUCED LOADING,
For primary bibliographic entry see Field 5C.
W77-07989

THE EFFECT OF HIGHWAY DEICING SALT ON CHLORIDE BUDGETS AT LAKE GEORGE, NY,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
G. S. Lipka, and D. B. Aulenbach.
FWI Report 76-2, 1976. 17 p. 4 fig., 2 tab., 8 ref.

Descriptors: *Highway effects, *Deicers, *Highways, *Sodium chloride, Surface waters, Groundwater, Precipitation(Atmospheric), *New York, Seasonal, Highway icing.
Identifiers: *Lake George(NY).

A study was made of the impact of highway deicing salt on the water quality of Lake George, New York, and three stream basins, two adjacent to the southern end of the lake and one remote basin on the east shore. It was apparent that peaks in chloride delivery rates were associated with peak stormflows as the highest sustained delivery rates were noted in the late spring and early summer and the highest instantaneous deliveries were noted during snowmelt and highway runoff in late winter and early spring. Because Lake George itself showed no variation in chloride concentration with depth, there is no density gradient potential for inhibiting overturn and density imposed stratification is not expected with the present highway system. Although highway deicing salts apparently do have a significant effect on chloride budgets in streams, no adverse water quality impacts were found. However, a potential for groundwater contamination by deicing salt in areas of gentler slopes and poorer soil drainage does exist as a high percentage of deicing chlorides apparently enter the local groundwater; there also appeared to be a wintertime increase in chloride precipitation. (Auen-Wisconsin)
W77-08000

THE PROBLEM OF THE SANITARY PROTECTION OF THE WATERS OF PORTS AND COASTAL ZONES OF THE BLACK SEA BASIN, (IN RUSSIAN),
Black Sea-Azov Watershed Basin Sanitary Epidemiology Station, Odessa (USSR).
For primary bibliographic entry see Field 5G.
W77-08014

THE PROBLEM OF THE BEHAVIOR OF CHEMICAL POLLUTANTS IN THE ENVIRONMENT, (IN RUSSIAN),
P. Kol'Kovski.
Gig Sanit 6, p 73-77, 1976.

Descriptors: *Pollutants, *Chemical wastes, Industrial wastes, *Environment, *Path of pollutants, Water pollution effects, *Abiotic environment.
Identifiers: *Biotic environment.

The behavior of chemical pollutants in the environment and the effect of abiotic and biotic factors on this behavior are analyzed. A schematic representation of the mechanism of the migration of chemical pollutants in the environment is presented and discussed.--Copyright 1977, Biological Abstracts, Inc.
W77-08028

HYGIENIC CRITERIA OF THE COMPLEX ACTION OF CHEMICAL ENVIRONMENTAL POLLUTANTS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5G.
W77-08029

USE OF STATE ESTIMATION TECHNIQUES IN WATER RESOURCE SYSTEM MODELING, BY DENNIS P. LETTENMAIER AND STEPHEN J. BURGES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
A. Szollosi-Nagy.
Water Resources Bulletin, Vol. 13, No. 1, p 161-167, February 1977. 26 ref.

Descriptors: Water resources development, *Model studies, *Water quality, Measurement, Design, Estimating, Equations, Algorithms, Systems analysis, *Biochemical oxygen demand, *Filters, Filtration.
Identifiers: *State estimation, *Kalman filters, Linear systems, Divergence, Measurement matrix.

Discussed is Lettenmaier and Burges' paper (see W76-07143), an illustration of the potential use of State Estimation techniques in water resources modeling; the paper gives background theory for linear and extended Kalman Filters and describes application of the filter techniques to modeling BOD and oxygen deficit in a stream. From a general viewpoint, Szollosi-Nagy critizes that the paper does not fulfill its objectives: the article is no help to the novice, since it is filled with misleading explanations as well as with inconsistent notations. Secondly, the authors do not refer to a number of very relevant articles in this field, thereby failing to adequately suggest examples of applications of the technique to water resources problems. Next, Szollosi-Nagy presents a more detailed, highly critical, discussion with basically no praise. He feels that the authors do not precisely describe the general state estimation problem. Next, he comments on errors dealing with the measurement matrix. He believes that the authors should have shown how the recursive formulas of the linear kalman filter are obtained and how they can be interpreted from an engineering point of view, rather than giving elaborate details on the extended kalman filtering. The only merit the paper deserves, concludes Szollosi-Nagy, is that it is, to his knowledge, the first paper ever published in Water Resources Bulletin on state estimation techniques in water resources modeling. (Bell-Cornell)
W77-08035

INFLUENCE OF MUSSEL METABOLITES ON THE DYNAMICS OF NUTRIENTS IN THE COASTAL WATERS OF THE EASTERN MURMAN COAST, (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Institut (USSR).
For primary bibliographic entry see Field 5C.
W77-08043

APPLICATION OF THERMAL SCANNING TO THE STUDY OF TRANSVERSE MIXING IN RIVERS,
Wisconsin Univ., Madison.
J. W. Eheart.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, Houston, Texas, p 2317-2324, September 1975. 32 fig, 1 tab, 1 ref, 1 append.

Descriptors: *Remote sensing, *Model studies, *Rivers, *Mixing, Mathematical models, Water temperature, Thermal pollution, Dispersion, Analytical techniques, Water pollution, Biochemical oxygen demand, Application methods.
Identifiers: Heat transport, Mass transport.

It was considered desirable to study and to predict the two-dimensional movement of pollutants in the region just downstream of a pollutant discharge point. While many of the more common pollutants do not exhibit a spectral signature, it was shown that the temperature difference between the pollutant and the receiving water could be successfully exploited by applying a mathematical model of mass transport processes to heat transport and then testing and calibrating it with thermal scanning data. (See also W77-08062) (Humphreys-ISWS)
W77-08071

5C. Effects Of Pollution

CYCLING OF DISSOLVED ORGANIC PHOSPHORUS COMPOUNDS IN NATURAL WATERS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
H. E. Allen, T. D. Brisbin, and K. O. Thomsen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 105, Price codes: A03 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 120, March 1977, 20 p, 4 tab, 14 ref. OWRT A-078-ILL(1).

Descriptors: *Phosphorus compounds, *Cycling nutrients, *Organophosphorus compounds, Enzymes, Assay, Mineralogy.
Identifiers: *Soluble organic phosphorus, *Phosphorus cycle, Alkaline phosphatase, *Phytase, *Protease, Lipase, Phosphatase.

Characterization of soluble phosphorus by enzymatic assays was conducted to determine if protease and/or lipase in conjunction with phytase or alkaline phosphatase would promote the remineralization of organic phosphorus. Results are presented determining which enzymes are factors to be considered in the phosphorus cycle. It was determined that 88 micro-g/l of the initial total 175 micro-g/l organic phosphorus in the concentrated lake water sample was phytase hydrolyzable, and that 21 micro-g/l of the organic phosphorus was alkaline phosphatase hydrolyzable. The difference of 67 micro-g/l between phytase and alkaline phosphatase hydrolyzable material is due to phytic acid present in the concentrated lake water. Phytic acid represents 38 percent of the total organic phosphorus in the concentrated lake water. Protease released 58 micro-g/l orthophosphate from the organic phosphorus in the concentrated lake water. This release indicates that 38 percent of the organic phosphorus is protease hydrolyzable. Concentrated lake water incubated with protease, prior to phytase incubation, released 171 micro-g/l orthophosphate from the organic phosphorus, representing 98 percent of the total organic phosphorus material. An additional release of 35 micro-g/l orthophosphate was found when the sample was incubated with protease prior to incubation with phytase. Concentrated lake water incubated with protease prior to incubation with alkaline phosphatase released 97 micro-g/l orthophosphate from the organic phosphorus. An additional release of 18 micro-g/l orthophosphate was found when the sample was incubated by protease prior to alkaline phosphatase. The difference between the additional release by protease followed by phytase and protease followed by alkaline phosphatase is 17 micro-g/l, which is phytic acid or phytic acid-like material. These results indicate that organic phosphorus can be characterized by enzymatic assays. The enzymatic procedure determines both the phytase available and the initially phytase unavailable phytic acid component of the organic phosphorus pool. This methodology should permit better definitions of the components in both the rapidly and the slowing cycling organic phosphorus.
W77-07608

EXPERIMENTAL DATA FOR THE HYGIENIC STANDARDIZATION OF DIPHENYLAMINE AND DIPHENYLDIETHYLUREA IN WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5G.
W77-07700

DECOMPRESSION - INDUCED BUBBLE FORMATION IN SALMONIDS: COMPARISON TO GAS BUBBLE DISEASE,
Washington Univ., Seattle. Fisheries Research Inst.
D. L. Beyer, B. G. D'Aoust, and L. S. Smith.
Undersea Biomedical Research, Vol. 3(4), p 321-338, 1976. 3 tab., 9 fig., 19 ref.

Descriptors: *Fish diseases, Pathology, *Fish physiology, Fish behavior, Fish hatcheries, *Supersaturation, *Gases, *Salmonids, Bioassays, Laboratory tests, *Bubbles, Freshwater fish, *Depths, Pressure, Mortalities, Methodology, Juvenile fish.
Identifiers: *Decompression, *Gas bubble diseases, Inert gas, Elimination, Gas solubility, Coho salmon, *Bubble formation.

The relationship of gas bubble disease (GBD) in fish to decompression-induced bubble formation was investigated with salmonids. Acute bioassays were used to determine equilibration times for critical effects in fish decompressed from depths of 200fsw. Equilibration of critical tissues was complete in 60-90 min. Salmonids and air-breathers are sensitive to decompressions at similar levels of supersaturation if elimination of excess gas following decompression is unrestricted. However, if elimination is restricted, bubble formation and growth increase accordingly. Tests with mixtures of He-O2, Ar-O2, N2-O2 (80% inert gas; 20% O2) and pure oxygen demonstrated that gas solubility as well as supersaturation (P), pressure ratio (initial pressure: final pressure), and absolute pressure must be considered in setting tolerance limits for any decompression. Gases with higher solubility are more likely to produce bubbles upon decompression. Oxygen, however, does not follow this relationship until higher pressures are reached, probably owing to its function in metabolism and in binding with hemoglobin. Tissue responses observed in both GBD and decompressed fish involved similar pathological effects at acute exposures. The circulatory system was consistently affected by bubbles that occluded vessels and blocked flow through the heart. (Katz)
W77-07706

EFFECTS OF AIR-SUPERSATURATED WATER ON SURVIVAL OF PACIFIC AND STEELHEAD SMOLTS,
Corvallis Environmental Research Lab., Oreg. Western Fish Toxicology Station.
A. V. Nebeker, and J. R. Brett.
Transactions of the American Fisheries Society, Vol. 105(2), p. 338-342, 1976. 3 tab., 6 fig., 13 ref.

Descriptors: *Fish disease, *Anadromous fish, Juvenile fish, *Fish physiology, Pathology, *Supersaturation, *Sockeye salmon, Rainbow trout, Laboratory tests, *Columbia River, Bioassay, Mortality.
Identifiers: *Coho salmon, *Gas bubble disease, *Steelhead trout, *Emphysema, Steelhead smolts, Salmon smolts, *Subcutaneous emphysema, *Exopthalmia.

Coho (Oncorhynchus kisutch) and sockeye (O. nerka) salmon smolts and steelhead trout (Salmo gairdneri) smolts were exposed to several concentrations of air-supersaturated water in the laboratory from March through June, 1974, the normal fish migration period in the Columbia River and the time when the river water is usually supersaturated. Tests were conducted at 12 C in water 60 cm deep. Time to 20 percent death was determined and lethal threshold concentrations of 114.5 percent saturation for coho, 113.5 percent for sockeye, and 114.0 percent for steelhead were calculated. Ninety-six hour LC50 values were 120.5 percent for coho, 116.7 percent for sockeye, and 116.0 percent total gas percent saturation for steelhead. Thirty-day LC50 values were 116.2 percent for coho, 113.9 percent for sockeye, and 114.0 percent for steelhead. Severe emphysema (bubbles) occurred on fins, in the mouth, and on the head and opercles of the fish exposed to 120 percent and 115 percent saturation. Emphysema was not as severe at 110 percent but occurred in 60 percent of the coho, 20 percent of the sockeye, and 80 percent of the steelhead. (Katz)

W77-07707

EFFECTS OF GAS SUPERSATURATED COLUMBIA RIVER WATER ON THE SURVIVAL OF JUVENILE CHINOOK AND COHO SALMON,
National Marine Fisheries Service, Seattle, Wash.
T. H. Blahm, R. J. McConnell, and G. R. Snyder.
NOAA Technical Report NMFS SSRF-688, April, 1975, 22 p, 5 tab., 8 fig., 9 ref, 4 append.

Descriptors: *Supersaturation, *Chinook salmon, *Columbia River, Water pollution effects, *Nitrogen, Gases, Juvenile fish, Fish behavior, Fish physiology, Methodology, Bioassays, Aquaria, Laboratory equipment, *Hydrostatic pressure, Rainbow trout, Mortalities.
Identifiers: Coho salmon, Steelhead trout, *Gas bubble disease, Water depth, Depth distribution.

The deleterious effect of high concentrations of dissolved gas on valuable stocks of Columbia River salmon and trout has led pollution control agencies in the Pacific Northwest to consider establishing standards for the amount of dissolved gas in the water. Research has been done with salmonids to define the criteria upon which such standards should be based, but the majority of these studies were carried out in shallow tanks (less than 1 m deep) where supersaturated concentrations of gas had been artifically induced. This report discusses tests that were performed at a field laboratory on the Columbia River. Juvenile chinook Oncorhynchus tshawytscha, and coho, O. kisutch, salmon were tested in deep and shallow tanks with river water reflecting the prevailing (and fluctuating) concentrations of dissolved gases. Results indicated that the water depth in a deep (3 m) test tank enhanced the survival of test fish compared to shallow tanks (< 1 m). These tests support the hypothesis that test conditions in tanks 1 m deep are not representative of all river conditions that directly relate to mortality of juvenile salmon and trout in the Columbia River. (Katz)
W77-07708

HYDROCHEMICAL OBSERVATION OF THE GROUND WATER FOR TROUT CULTURE AROUND HINO-TOWN, TOKYO, (IN JAPANESE),
Y. Satomi.
Bulletin of Fresh-Water Fisheries Research, Laboratory Tokyo, Japan, Vol. 5, No. 1, 1955, p. 31-38, 4 tab., 3 fig., 22 ref.

Descriptors: *Trout, *Aquiculture, Water quality, *Hydrogen ion concentration, *Water temperature, Fish establishment, Fish farming, *Oxygen, *Fish hatchery, Gases, Nitrogen, Fish disease, *Carbon dioxide, *Alkalinity, Groundwater, *Supersaturation, *Springs.
Identifiers: Hino-Town, Tokyo, *Japan, *Nitrogen supersaturation.

In any of the waters tested the pH value and temperature were found to be normal, not unsuitable to fish raising. The dissolved nitrogen gas content, found to surpass 120% in most waters, is believed harmful to trout especially in the fry stage, but the percentage is lowered to 120% level when the water was fed to fish pond from the source exposing to air. The probable ill effect of supersaturated nitrogen gas (to gas disease) is not feared in this district because the trout farms here, due to the high water temperature, do not handle the trout fry. Oxygen content was sufficient if the water is aerated; carbon dioxide content was also bearable when the water is exposed to air. Alkalinity was higher with the depth of wells, and it was suggested that the deeper the well the better the water for the growth of fish. (Katz)
W77-07709

SNAKE RIVER, 1973 DISSOLVED GAS STUDIES.
Parametrix, Inc., Seattle, Wash.
For primary bibliographic entry see Field 5A.
W77-07710

DIE KUNSTLICHE AUFZUCHT VON CLUPEA HARENGUS L., (THE ARTIFICIAL PROPAGATION OF CLUPEA HARENGUS L.),
Biologische Anstalt Helgoland (West Germany).
H. Schach.
Helgolandischen Wissenschaftliche Meeresuchungen, (German) Vol. 1(3), 1939, p. 359-372, 1 tab., 3 fig., 22 ref.

Descriptors: *Marine fish, *Aquiculture, *Fish hatchery, *Bubbles, *Fish diseases, *Mortalities, Aquaria, Fish behavior, *Juvenile fish, *Gases, On-site investigation, Fish physiology, Fish behavior, Commercial fish, *Herring.
Identifiers: *Marine aquiculture, *Artificial propagation, *Gas bubble disease, Clupea harengus.

The likely cause of the gas bubbles in the gut of young herring larvae that result in mass mortalities is discussed. It is believed that the young fish snapped at and swallowed the fine air bubbles in the aquarium waters and were not able to discharge them back into the water. (Katz)
W77-07711

MECHANISM OF GASEOUS EXOPTHALMIA IN THE ATLANTIC COD, GADUS MORHUA L.,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
P. V. Dehadrai.
Journal of the Fisheries Research Board of Canada, Vol. 23(6), 1966, p. 909-914, 5 fig., 13 ref.

Descriptors: *Marine fish, Commercial fish, *Fish diseases, *Fish physiology, *Biochemistry, *Bubbles, *Aquaria, *Saturation, On-site investigation, Laboratory tests, Aquiculture.
Identifiers: *Gaseous exopthalmia, *Cod, Gadus morhua, *Gas bubbles, Gas secreting mechanism, Eye of cod, *Gas secretion, Choroid gland, Blood capillaries.

Gadus morhua L. in captivity often develop unilateral or bilateral exopthalmia, characterized by the accumulation of gas bubbles in the eye. Rete mirabile-like organization of capillaries in the choroid 'gland' in association with the glandular pseudobranch, which is a rich source of carbonic anhydrase in fishes, are involved in gas secretion in the eye of cod. Intraperitoneal injections of Diamox and pseudobranchectomy prevented exopthalmia in the fish. Presence of glycogen and carbonic anhydrase in the choroid gland in relation to gas secretion in the eye suggests a parallel with the process of gas secretion in the teleostean swimbladder. Gas secretion in the eye of cod resulting in exopthalmia would seem to be a malfunctioning of the choroid gland-pseudobranch complex in the fish triggered by unknown stimuli. (Katz)
W77-07712

PASSING FISH THROUGH HYDRAULIC TURBINES,
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 8I.
W77-07713

SOME EXPERIMENTS ON THE GAS-DISEASE IN FRESHWATER FISHES, (IN JAPANESE),
S. Egusa.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 15(1), 1948, p. 83-87, 5 tab., 1 fig., 15 ref.

Descriptors: *Fish disease, Freshwater fish, *Supersaturation, *Wells, *Nitrogen, *Artesian wells, Water quality, Fish physiology, *Water supply, Carp, Eels, Oxygen, Water temperature, *Laboratory tests.
Identifiers: *Gas bubble disease, *Goldfish, *Japan.

Some experiments as regards the so-called gas-disease were made with use of artesian well-water which contained nitrogen in various supersaturated conditions upon five fresh water species of fish. Effects of degree of supersaturation upon the viability, etc., were examined. Results of the experiments are shown. Further, it was shown that conditions of physiological and environmental factors seriously affected the progress of the disease. (Katz)
W77-07714

WATER QUALITY REQUIREMENTS OF FISHES AND EFFECTS OF TOXIC SUBSTANCES,
Oregon State Univ., Corvallis. Dept. of Fish and Game Management.
P. Doudoroff.
In: The Physiology of Fishes, M.E. Brown, ed. Volume II, Behavior, Academic Press, Inc., New York, 1957, p. 415-417.

Descriptors: *Oxygen, *Nitrogen, Gases, *Fish disease, *Supersaturation, *Fish physiology, Mortalities, Freshwater fish, *Water quality, *Reviews, Water pollution effects.
Identifiers: *Oxygen-nitrogen value, *Gas bubble disease.

Two to three times the normal air-saturation values of dissolved oxygen do not affect freshwater fish. Supersaturation of water with atmospheric gases (nitrogen and oxygen) can cause fatal gas bubble disease when the total pressure of the dissolved gases greatly exceeds the hydrostatic pressure. Body fluids of fish held in supersaturated water soon become supersaturated with atmospheric gas. The bubbling of pure nitrogen or oxygen through water cannot cause gas bubble disease. (Katz)
W77-07715

THE GAS BUBBLE DISEASE OF FISH, (DIE GASBLASEN KRANKHEIT BEI FISCHEN,
O. L. Engelhorn.
Zeitschrift fur Fischerei, Vol. 41(3), December 1943, p. 297-317, 1 fig., 34 ref.

Descriptors: *Fish diseases, *Fish physiology, Aquiculture, *Freshwater fish, Animal pathology, Water quality, *Phytoplankton, *Physiological ecology, *Mortalities, Laboratory tests, Gases, Oxygen, Nitrogen.
Identifiers: *Gas bubble disease, *Gas emboli, *Exopthalmia, Fish ponds.

The gas bubble disease in fish is due to the difference in gas tension of the surrounding water and the body of the fish. In nature abnormally high gas tensions are developed by the activities of the green phytoplankton. Gas bubble disease proceeds to mortalities when the emboli occlude the blood vessels. In trout hatcheries, rapid water exchange is recommended while in large carp ponds treatment is difficult but the carp can escape by sounding into the deeper waters. Analyses were made of the gas content of gas bubbles in the eyes and heart of affected fish. (Katz)
W77-07716

EIN FORELLEN BRUTSTERBEN UNTER EIGENARTIGEN BEGLEITERSCHEINUNGEN (A MORTALITY OF TROUT FRY CAUSED BY UNUSUAL CIRCUMSTANCES),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
L. Scheuring, and O. Heuschmann.
Zeitschrift fur Fischerei, Vol. 33(4), 1935, p. 707-716, 5 fig.

Descriptors: *Trout, *Juvenile fish, *Fish disease, Fish physiology, *Aquiculture, *Mortality, Saturation, *Supersaturation, Fish hatcheries, *On-Site investigations.
Identifiers: *Yolk sac fry, *Gas emboli, *Deformities, Gas bubble disease.

A mortality of trout fry is described. The disease is characterized by a gas bubble in the mouth which suspends the fish in a vertical position. Most of the fish were observed to have a peculiar deformity on the hyoid area of the mouth which creates the fatal gas bubble. Water quality was within normal limits. Other workers (Engelhorn) believe these fish exhibit signs of gas bubble disease and the deformity is due to the gas embolism. (Katz)
W77-07717

DISSOLVED GAS SUPERSATURATION IN THE SALMON RIVER, 1972-74,
Parametrix, Inc., Bellevue, Wash. Environmental Services Section.
For primary bibliographic entry see Field 5A.
W77-07719

AN ANALYSIS OF THE FEASIBILITY OF USING AIR AGITATION TO REDUCE GAS SATURATIONS IN SEA WATER AT PILGRIM NUCLEAR POWER STATION,
Yankee Atomic Electric Co., Westborough Mass. Environmental Sciences Group.
For primary bibliographic entry see Field 5G.
W77-07720

GAS-BUBBLE DISEASE: A REVIEW IN RELATION TO MODERN ENERGY PRODUCTION,
Rhode Island Univ., Kingston. Marine Pathology Lab.
R. E. Wolke, G. R. Bouck, and R.K. Stroud.
In: Fish and Energy Production: A Symposium, 1974, S. B. Saila, Editor, Heath Co., Mass, p. 240-265, 64 ref.

Descriptors: Fish disease, *Fish physiology, Pathology, *Reviews, *Supersaturation, *Power plants, On-Site investigations, Aquaria, *Hydroelectric power, Water temperature, *Nuclear power plants, Gases, *Solubility, Pollutant identification, Measurement.
Identifiers: *Gas emboli, *Pathological process, *Gas bubble disease, Exopthalmia.

The literature is reviewed and gas-bubble disease (GBD) is considered in light of recent findings. The process is defined and the environmental parameters necessary for its development examined. The role of power plants in its pathogenesis is also considered. Special emphasis is placed on the description of gross and histopathological lesions as well as newer methods for field diagnosis employing gross lesions and rapid techniques for the in situ measurement of dissolved gas total pressure. (Katz)
W77-07721

DISSOLVED GAS SUPERSATURATION, GRAND COULEE DAM PROJECT, 1973,
Seattle Marine Labs., Seattle, Wash.
For primary bibliographic entry see Field 5B.
W77-07722

MOBILE FISH CAGE AND DEPTH DISTRIBUTION STUDIES, COLUMBIA AND SNAKE RIVERS,
Seattle Marine Labs., Seattle, Wash.
Prepared for Utility Cooperative, c/o Idaho Power Co., Boise, Idaho, February, 1974. 39 p, 7 tab., 7 fig., 4 ref.

Descriptors: *Columbia River, *On-Site investigations, *Water quality, Chinook salmon, Rainbow trout, *Nitrogen, Gases, *Mortalities, *Bioassay, Fish Behavior, *Fish migration, Anadromous fish, Fishing gear, Distribution.
Identifiers: *Depth distribution, *Columbia-Snake Confluence, Gill nets, *Fish cages.

A mobile fish cage was developed to study mortalities of downstream migrant juvenile salmonids in the Columbia River during the periods of dissolved gas supersaturation. Mortalities were the same in all of the various compartments. Dissolved nitrogen content of the river did not get above 111% saturation. A second study to determine the distribution of migrating salmonids showed that most fish captured were in the upper three meters which is the critical zone. (Katz)
W77-07723

PRELIMINARY STUDIES OF MENHADEN AND THEIR MASS MORTALITIES IN LONG ISLAND AND NEW JERSEY WATERS,
New Jersey Agricultural Experiment Station, New Brunswick.
J. R. Westman, and R. F. Nigrelli.
New York Fish and Game Journal, Vol. 2(2), July, 1955, p. 142-153, 3 tab., 7 fig., 9 ref.

Descriptors: *Commercial fish, Marine fisheries, *Mortality, *Fish diseases, *Animal pathology, New York, Fish behavior, Parasitism, On-Site investigation, Fish, Growth, New Jersey.
Identifiers: *Menhaden, *Gas emboli, *Annual mortality, *New York Bight, Exopthalmia, *New York harbor.

An annual, heavy mortality of menhaden in the waters adjacent to New York Harbor occurs in late May and June when millions of fish die and litter the beaches. Dying fish, called 'Spinners' are characterized by a loss of coordinated movements and exopthalmia of one or both eyes. Hemorrahages caused by gas emboli were noted in the capillaries of the gills, eyes, and optic lobes of the brain. Menhaden along the Atlantic coast of North America are susceptible to a variety of parasites, which, especially those found on the gills, may contribute to the mass mortalities observed. (Katz)
W77-07724

NOTES ON THE EXPOSURE OF SEVERAL SPECIES OF FISH TO SUDDEN CHANGES IN THE HYDROGEN ION CONCENTRATION OF THE WATER AND TO AN ATMOSPHERE OF PURE OXYGEN,
Bureau of Fisheries Lab., Fairport, Iowa.
A. H. Wiebe.
Transactions of the American Fisheries Society, Vol 61, 1931, p 216-224. 1 tab.

Descriptors: *Bioassays, *Hydrogen ion concentration, *Oxygen, *Supersaturation, Laboratory tests, Water quality, Freshwater fish, Warmwater fish, *Bass, *Sunfishes, Juvenile fish, *Fish disease, *Hydrostatic pressure.
Identifiers: Bluegill sunfish.

Several species of fish have been subjected to higher concentrations of dissolved oxygen when an atmosphere of pure oxygen was maintained over the surface of the water and also with a super-stratum of pure oxygen under pressure. Several species of fish have been subjected to sudden transfers from low O2 to high O2 and the reverse (5.6 ppm to 40.33 ppm and from 41.0 ppm to 7.3 ppm). The results show (a) that different sizes of several species of fish tolerate large and sudden changes in the concentration of O2 in either direction, (b) that these fish can live in water containing a large excess of dissolved oxygen with a super-stratum of pure oxygen over the surface, (c) that several species of fish can stand pressure of 10 to 13 lbs for a period of 24 hours and pressures from 15 to 19 lbs for shorter periods. (Longer periods not investigated.) The increase in dissolved oxygen is followed by a slowing down of the respiratory movements. No instances of exopthalmus, opaqueness of the lens, and of the accumulation of gas bubbles were observed. No fish were observed to lose their equilibrium except in the pressure experiment where depression occurred too rapidly. (Katz)
W77-07725

GAS DISEASE IN FISHES - A REVIEW,
Toronto Univ. (Ontario). Dept. of Zoology.
H. H. Harvey.
In: Chemistry and Physics of Aqueous Gas Solutions, The Electrochemical Society in Princeton, New Jersey, 1975. p 450-485, 126 ref.

Descriptors: *Fish diseases, *Fish physiology, Pathology, *Gases, *Solubility, Equilibrium, *Supersaturation, Freshwater fishes, Nitrogen, Oxygen, Argon, Rainbow trout, Wells, Springs, *Water temperature, Hydroelectric power, Dams, *Reviews, *Bibliographies.

Gases dissolve in water as a function of partial pressures and solubilities. In lakes and streams, air-equilibration occurs only at the water surface. Conditions such as heating at depth by insolation, and entrainment of air and its solution under pressure at the bases of falls, result in gaseous supersaturation. Under these conditions the body fluids of fishes may become supersaturated, resulting in gas-bubble formation in tissues and blood vessels of fish. This may be chronic at low, or rapidly lethal at high, levels of supersaturation. (Katz)
W77-07727

EXPERIMENTAL STUDY OF ACUTE TOXICITY OF SALTS OF COBALT, ANTIMONY, STRONTIUM AND SILVER CRUSTACEANS AND THEIR LARVAE AND IN SOME TELEOSTS, (IN FRENCH),
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Departement de Protectione; and CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Laboritoire de Radioecologie Continental.
J. C. Amiard.
Rev Int Oceanogr Med 43, p 79-95, 1976.

Descriptors: *Toxicity, Salts, Cobalt, *Metals, Antimony, Strontium, *Teleosts, Crustaceans, Water pollution effects, Larvae.
Identifiers: Blennius-pholis, Carcinus-maenas, Maja-squinado, Palaemon-serratus, pleuronectes-platessa, Silver.

Among the 4 salts of metals or metalloids studied, Ag is the most toxic relative to all species used, followed by Sb, Co and Sr. Some correlations are established between the degree of toxicity and certain physioco-chemical properties of ions. The crustacean (carcinus maenas, Palaemon serratus) and teleost (Pleuronectes platessa, Blennius pholis) adult specimens present almost identical sensitivities relative to all pollutants. Crustacean larvae (C. maenas, P. serratus, Homarus vulgaris, Maja squinado) are much more sensitive than the adults to pollutant action. Among the larvae, the smallest react to the weakest concentrations. Acute toxicity tests are insufficient and should be complemented by sublethal tests using alterations of the fundamental physiological functions.—Copyright 1977, Biological Abstracts, Inc.
W77-07728

SUMMARY OF GAS SUPERSATURATION RESEARCH AT WESTERN FISH TOXICOLOGY STATION (EPA), CORVALLIS, OREGON, 1972-1974.
Corvallis Environmental Research Lab., Oreg. Western Fish Toxicology Station.
1974, 22 p.

Descriptors: *Supersaturation, *Fish diseases, *Salmon, Rainbow trout, Pathology, *Fish physiology, *Oxygen, *Carbon dioxide, Juvenile fish, Fish behavior, Water quality, *Chinook salmon, *Methodology, Laboratory equipment, Laboratory tests, Sockeye salmon, Invertebrates, Benthos, Freshwater fish.
Identifiers: *Gas bubble disease, *Steelhead trout.

Abstracts of 13 studies carried out at the EPA laboratory in Corvallis, Oregon, regarding the biological effects of gas supersaturation on salmonids are given. These studies include methodology, pathology of fish exposed to supersaturated water, the acute lethality of supersaturation to salmonids, oxygen and carbon dioxide as factors affecting fish survival in gas supersaturated waters, lethal and sublethal effects of gas-supersaturated water in aquatic invertebrates and effect of depth compensation on toxicity of gas supersaturated water to juvenile steelhead trout. (Katz)
W77-07729

COMPARATIVE STUDY OF CLADOCERA FROM THE 1ST METER OF SEA WATER, COLLECTED IN A POLLUTED ZONE AND IN ANOTHER RELATIVELY CLEAN ZONE, (IN FRENCH),
Athens Univ. (Greece). Zoological Lab. and Museum.
M. Moraitou-Apostolopoulou, and V. Kiortsis.
Rev Int Oceanogr Med 43, p 37-46, 1976.

Descriptors: *Crustaceans, Water pollution, Sea water, Distribution, Sewage disposal, Seasonal, Coasts, Marine animals.
Identifiers: Evadne-normani, Evadne-spinifera, Evadne-tergestina, Greece, Penilia-avirostris, Podon-interbedius, Podon-polyhemoides, *Saronicos Gulf(Greece).

A comparative study of the most superficial (0-100 cm layer) cladocerans was made, to assess the influence of marine pollution on their occurrence and distribution. Two collecting stations were established in the coastal waters of Saronicos gulf, near Athens (Greece). One was in a polluted area near the main sewage outfall, the other in an area of purer waters. Statistically significant differences in water temperature and in the occurrence and abundance of various cladoceran species were observed between the 2 stations. In addition to their usual vertical microdistribution and seasonal variation, a preference of some of the species (Evadne spinifera) for clear vs. polluted water (E. tergestina and Podon polyphymoides) was noted. The ecological characteristics of the 6 spp. examined were analyzed in comparison with recently published data on this group. (The other 3 spp. are E. nordmani, P. intermedius and Penilia avirostris.)--Copyright 1977, Biological Abstracts, Inc.
W77-07730

OIL SPILL AT DECEPTION BAY, HUDSON STRAIT,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5G.
W77-07731

ENZYME KINETICS--A REVIEW WITH EMPHASIS ON INHIBITION OF ENZYMES,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5B.
W77-07732

VERTICAL MIXING MECHANISMS AND THEIR EFFECTS ON PRIMARY PRODUCTION OF PHYTOPLANKTON,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
P. G. Harris.
Canada Center for Inland Water Scientific Series No. 33, 1973, 17 p., 16 fig., 32 ref., 3 tab.

Descriptors: *Phytoplankton, *Hysteresis, *Photosynthesis, Chlorophyll, Turbidity, Lake Ontario, Waves(Water), Wind velocity, Mixing, *Primary productivity, Cytological studies, Water pollution effects, Lakes, Canada, Sampling.
Identifiers: Lake surfaces, Wave damping, Downwelling, Energy exchanges.

The significance or otherwise of this hysteresis effect in the field, was examined. In operation in the field any method of moving cells vertically in the water column might lead to hysteresis effects. The study looked for evidence that Lanzmuir cells existed and that streaking was associated with roll vortices in the surface water layers. In Lake Ontario, surface streaking occurs at wind speeds in excess of 3.5 m/sec. There is a downwelling of water beneath the streak, the velocity of which is correlated with the wind speed over the surface. Observations of the sinking metal drogue indicated not only a vertical component to the downwelling but also a lateral motion away from the streak at depths of a few metres. Chlorophyll measurements have shown that mixing occurs at wind speeds in excess of 3.5 - 4.0 m/sec. and that the mixing effect can on occasion be detected at 5 m despite river plume interference. The photosynthesis data showed that in July the hysteresis effect was small and that its contribution to production estimates was unlikily to be significant in the Langmuir circulations. However the effect of vertical motions at other times of the year could be highly significant due to large hysteresis effects and deep mixing. Mixing has been shown to be important in July in that it ensured that the cells were exposed to high light at the surface for brief periods only. Long exposure to light (even as low as 40% full sun) were shown to lead to a steady decrease in the rate of photosynthesis. Considering that vertical mixing was demonstrated on all occasions when the wind speed exceed 3.5-4.0 m/sec. and considering that 14C bottles appear to reproduce only static water production profiles, then the use of 14C bottles must be questioned. (WATDOC)
W77-07733

THE STUDY OF THE BENTHOS COMMUNITY AROUND THE MOUTH OF THE PORT OF TAGONOURA IN SURUGA BAY, (IN JAPANESE),
M. Kosaka, M. Ogura, T. Akaogi, and K. Mori.
J. Fac. Mar Sci Technol Tokai Univ 9, p 53-64, 1976.

Descriptors: *Benthos, *Bays, *Bottom sediments, Waste disposal, Harbors, Asia, *Biomass, Mollusks, Water pollution, *Organic wastes, *Pulp wastes, Annelids, Arthropoda, *Industrial wastes.
Identifiers: Capitella-Capitata-Japonica, Japan, Stauronereis-Caecus, Suruga, Tagonoura, *Port of Tagonoura (Japan).

On Feb. 25, 1971, a benthos survey was carried out with the Smith-McIntyre sampler (1/10 m2) at 20 stations on the bottom around the mouth of the Port of Tagonoura (Japan) where the water and bottom sediments were polluted by the discharge of waste products from the pulp industry. The relations between the benthos community structure and pollution, and between the composition of taxonomic groups and pollution were studied. The ignition loss in bottom mud was <10%, except in front of the port. No azoic area was found in the area surveyed. Mean biomass of total macrobenthos was 26.4 g/m2. Mean biomass and the biomass percentage of each taxonomic group were Annelida 14.8 g/m2, 55.9%; Mollusca 5.6 g/m2, 21.2%; Arthropoda 6.0 g/m2, 22.7%. The indicator species of organic pollution, e.g., Capitella capitata japonica and Stauronereis caecus (Polychaeta) almost covered the central part of the survey area. Conditions of organic pollution in the survey area were almost the same or better than in 1958.--Copyright 1977, Biological Abstracts, Inc.
W77-07735

EFFECT OF SOUTH LOUISIANA CRUDE OIL AND NO. 2 FUEL OIL ON GROWTH OF HETEROTROPHIC MICROORGANISMS, INCLUDING PROTEOLYTIC, LIPOLYTIC, CHITINOLYTIC AND CELLULOYTIC BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, P. A. Seesman, and R. R. Colwell.
Available from the National Technical Information Service, Springfield VA 22161 as ADA016 327 Price codes: A02 in paper copy, A01 in microfiche. Reprinted from: Environmental Pollution, Vol 9, p 13-33, 1975. 16 fig, 2 tab, 47 ref. ONR-N00014-67-A-0239-0027.

Descriptors: *Chesapeake Bay, *Oil pollution, *Microorganisms, *Bacteria, Toxicity, Fossil fuels, Water pollution effects, Estuaries, Nutrients, *Oil wastes, Bays.
Identifiers: *Crude oil, Fuel oil.

Muddy Creek, a sub-estuary of the Rhode River in Chesapeake Bay, was examined to determine the susceptibility of the autochthonous microorganisms to South Louisiana crude oil and No. 2 fuel oil. Muddy Creek sediment was found to be free of contaminating oil. Crude and fuel oil induced little noticeable effect on the yeast and fungi populations, whereas the crude oil was found to support growth of bacteria and the fuel oil to limit such bacterial growth. Normalising the values with reference to the control cultures revealed that both the crude and fuel oils were toxic for the bacteria. The crude oil showed greater toxicity. (Sinha-OEIS)
W77-07736

DEGRADATION OF PETROLEUM BY AN ALGA, PROTOTHECA ZOPFII,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, R. R. Colwell, and L. Petrakis.
Available from the National Technical Information Service, Springfield VA 22161 as AD-A016 326, Price codes: A02 in paper copy, A01 in microfiche. Reprinted from: Applied Microbiology, Vol 30, No 1, p 79-81, July 1975. 3 tab, 7 ref. ONR-N00014-67-0237-0027.

Descriptors: *Algae, *Oil pollution, *Biodegradtion, Bacteria, Water pollution, Organic compounds, *Oil wastes.
Identifiers: *Prototheca zopfii.

Prototheca zopfii is an achlorophyllous alga which degrades oil. It has been found to degrade 10 and 40% of a motor oil and crude oil, respectively, when tested under appropriate conditions. Degradation of the crude oil observed in this study compares well with the amount of degradation accomplished by bacteria. P. zopfii was found to degrade a greater percentage of the aromatic hydrocarbons in motor oil than of the saturated hydrocarbons and a greater percentage of saturated hydrocarbons in crude oil than of aromatic hydrocarbons. Resins and asphaltenes were produced during degradation of motor oil, whereas these fractions in crude oil were degraded. P. zopfii did not demonstrate preferential utilization of lower homologues of cycloalkanes and aromatics as has been observed bacteria. (Sinha-OEIS)
W77-07737

CHARACTERISTICS OF THE AREAS IN WHICH FAST CURRENT OIL CONTROL IS NEEDED,
Coast Guard, Washington, D.C. Pollution Prevention Projects Branch.
For primary bibliographic entry see Field 5G.
W77-07741

THE INVERTEBRATE FAUNA OF THE BROEL AND ITS TRIBUTARY BROOKS, (IN GERMAN),
B. Roeser.
Decheniana 129, p 107-130, 1976.

Descriptors: *Invertebrates, Water quality, Water pollution, Streams, Systematics.
Identifiers: Ephemeroptera, Plecoptera, Trichoptera, *West Germany.

The brooks Broel, Waldbroel and 17 tributaries were investigated in autumn 1973 and in early spring 1974 with special regard to the macroinvertebrates. The fauna of 9 springs was also examined in the winter of 1973-1974. The area of investigation is located in SW Suederbergland (West Germany, Nordrhein-Westfalen). Nearly 30,000 organisms (114 spp. or higher taxa) were collected, predominantly Ephemeroptera, Plecoptera and Trichoptera. The water quality was evaluated on the basis of the invertebrate fauna.–Copyright 1977, Biological Abstracts, Inc.
W77-07746

UTILIZATION OF MIXED HYDROCARBON SUBSTRATE BY PETROLEUM-DEGRADING MICROORGANISMS,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, H. F. Austin, and R. R. Colwell.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A016 324, Price codes: A02 in paper copy, A01 in microfiche. Reprinted from: Journal of General and Applied Microbiology, Vol 21, p 27-39, 1975. 3 fig, 8 tab, 12 ref. ONR-N00014-67-A-0239-0027.

Descriptors: *Chesapeake Bay, *Biodegradation, *Oil pollution, *Microorganisms, Water pollution, *Yeasts, *Fungi, *Bacteria, Organic compounds, Bays.

The first comparative study of petroleum-degrading yeasts, fungi, and bacteria, and their ability to degrade a mixed hydrocarbon substrate is described. The mixed hydrocarbon substrate employed contained aliphatic, alicyclic, aromatic, and polynuclear aromatic hydrocarbons. Most of the bacteria and all of the yeasts and fungi were isolated from Chesapeake Bay. Normal alkanes were found to be less susceptible to degradation by bacteria and yeasts as the carbon chain length of the hydrocarbon increased from 10 to 20. Results obtained for some of the fungi showed that there was little correlation between chain length of normal alkane and susceptibility to biodegradation. Cumeme, naphthalene, phenanthrene, pristane, 1,2-benzanthracene, perylene, and pyrene were found to be degraded by microorganisms. The patterns observed for hydrocarbon utilization were similar for the bacteria, yeasts, and fungi. However, the utilization of hydrocarbons by individual isolates varied significantly. (Sinha-OEIS)
W77-07749

IMPACTS OF OFFSHORE OIL ON NORTH EAST SCOTLAND,
Massachusetts Inst. of Tech. Cambridge.
J. Hutton.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-75-11026, Price codes: A03 in paper copy, A01 in microfiche. Report No. MITSG 75-15, Index No. 75-915-Wdm, June 1, 1975. From a lecture presented by the MIT Sea Grant Program on 28 April 1975, by John Hutton, North East Scotland Development Authority. 33 p, 1 fig.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, *Resources development, *Environmental effects.
Identifiers: Outer Continental Shelf, *Scotland, *Environmental impact.

Exploration for and production of oil and natural gas from the North Sea has already had an important impact on economic and social life in North East Scotland. The industry's potential for the economy of both the United Kingdom and the region is considerable. The paper outlines the role of the regional development and promotion agency, the North East Scotland Development Authority (NESDA), in offshore oil, and examines some of the benefits and problems generated by this new industry for the region which includes the City of Aberdeen and the Counties of Aberdeen, Banff, Kincardine, Moray, and Nairn. (Sinha-OEIS)
W77-07752

PRELIMINARY PROJECTIONS OF OIL SPILL MOVEMENT FOR THREE POTENTIAL DEEP-WATER PORT SITES IN THE GULF OF MEXICO,
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W77-07753

HETEROTROPHIC NITRIFICATION IN SOILS AND AQUATIC ENVIRONMENTS, (IN RUSSIAN),
V. Verstrete.
Izv Akad Nauk SSR Ser Biol 4, p 541-558, 1975.

Descriptors: *Nitrification, *Soils, Microorganisms, *Aquatic fungi, *Bacteria, *Nitrogen compounds, Nitrates, Nitrites, Oxidation.
Identifiers: *Actinomycetes, *Heterotrophic microorganisms.

Until recently it was thought that NH3 oxidation to NO3 and NO2 could be caused only by chemoautotrophic microorganisms. Many heterotrophic microorganisms (fungi, bacteria, actinomycetes) are able to oxidize reduced N compounds (NH3, amine N, oxime N, hydroxylamine etc). This is followed by the formation of N02, N03, hydroxylamine, hydroxam compounds, aminooxides etc. Heterotrophic nitrification takes place in laboratories and under natural conditions.--Copyright 1977, Biological Abstracts, Inc.
W77-07754

BIOLOGICAL ASSESSMENT OF THE WATER QUALITY OF THE SMALL RIVERS SORA AND BYURYA (YENISEI BASIN), (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Hydrobiology.
Z. G. Gol'd.
Biol Nauki (Mosc) 19 (3), p 40-45, 1976.

Descriptors: *Phytoplankton, *Zooplankton, *Benthos, Rivers, Water pollution, Industrial wastes, Domestic wastes, Farm wastes, *Self purification, Oligotrophy, Mesotrophy.
Identifiers: *Yenisei Basin(Siberia-USSR).

Possible changes in phyto- and zooplankton and benthos composition of the Rivers Sora and Byurya (Siberia, USSR) due to pollution with industrial, agricultural and domestic wastes were studied. Species diversity increased with distance from the area where wastewaters entered the rivers; the mass development of some species occurred in polluted sections. According to dominant indicator organisms, the upper reaches of the Sora and Byurya belong to the ologosaprobic zone, the wastewater discharge canal and middle section of the River Sora to the -mesosaprobic zone, the mouth of the Sora to the a-B-mesosaprobic zone, and the middle section and mouth of the Byurya to the B-mesosaprobic zone. The self-purification processes in the River Byurya terminate with the B-mesosaprobic zone and the river does not return to the initial oligosaprobic condition.–Copyright 1977, Biological Abstracts, Inc.
W77-07755

INVENTORY OF BENTHIC ORGANISMS AND PLANKTON AT MOKAPU, OAHU,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2L.
W77-07798

LIMNOLOGIC-GEOLOGIC EXCURSION IN THE TERRITORY OF THE LOWER ERFT RIVER, (IN GERMAN),
Landesanstalt fuer Gewaesserkunde und Gewwesserschutz Nordrhein-Westfalen, Krefeld (West Germany).
For primary bibliographic entry see Field 5B.
W77-07799

RESIDUES OF EMULSIFIED XYLENE IN AQUATIC WEED CONTROL AND THEIR IMPACT ON RAINBOW TROUT, SALMO GAIRDNERI,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W77-07805

STUDIES OF THE BENTHIC ENVIRONMENT OF TWIN LAKES.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
Report REC-ERC-76-42, October 1976, 47 p. Coordinated by James F. La Bounty.

Descriptors: *Benthic fauna, Diptera, Clams, *Bacteria, Anaerobic bacteria, Anaerobic conditions, E coli, Iron bacteria, Sulfate reducing bacteria, Deposition, Glacial deposits, Lacustrine deposits, *Sedimentation rates, Sampling, Pumped storage, Environment, Environmental effects, Heavy metals, Water pollution, *Limnology, Lakes, Reservoirs, Mud, Bibliographies, *Colorado.
Identifiers: Mt Elbert Pumped-Storage Plt(CO), *Twin Lakes(CO).

Three papers discuss ecological aspects of the benthic environment of Twin Lakes, Colo. The first paper discusses the general limnological aspects of Twin Lakes and specific biological aspects of their profundal benthic environment. The second paper includes sedimentation rates, sediment composition, and biological history of recent sediment of Twin Lakes. The third paper reports results of a study of coliform bacteria of the water and iron and sulfur bacteria of the bottom mud of Twin Lakes. This report covers one aspect of an overall study which is being made to evaluate what effects the operation of the Mt. Elbert Pumped-Storage Powerplant has on the ecology of a montane lake. Based on these studies, the lower lake was found to have a benthic fauna similar to other oligotrophic lakes of North America, while at times, the upper lake is nearly depopulated. Analyses of sediment indicate that since the turn of the century, heavy metals and nutrient input have significantly increased. (Bur Reclam)
W77-07806

THE ARGO MERCHANT OIL SPILL. A PRELIMINARY SCIENTIFIC REPORT,
National Oceanic and Atmospheric Administration, Washington, D. C. Center for Experiment Design and Data Analysis.
Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. NOAA Special Report, March 1977. 323 p, 18 ref. Peter L. Grose and James S. Mattson (eds.).

Descriptors: *Oil pollution, *Oil spills, *Water pollution effects, Weather, Environmental effects, Resources development, *Massachusetts, Atlantic Ocean.
Identifiers: Fuel oil, *Argo Merchant oil spill.

This report presents the available results from the investigations carried out to date by the many groups involved in the initial assessment of the distribution of the ARGO MERCHANT oil spill and its impact. For the many Federal, State, and private activities requiring information about the oil spill and its consequences the report is intended

to provide a unified summary of the studies that are being or have been carried out, the types and distribution of data, and such analyses and results as are now available. The outcome of the ARGO MERCHANT oil spill appears to have been fortunate in several respects: (1) the winds were almost continuously offshore, preventing the oil from coming on the beaches; (2) the density of the oil was low enough so that it did not sink and contaminate the bottom; and (3) the spill occurred in the winter, when biological activity, productivity, and fishing activities are relatively low. At another time, the effects of a similar oil spill might have been much more serious. (NOAA)
W77-07807

BENZENE SOURCES OF CONTAMINATION, AMBIENT LEVELS, AND FATE OF BENZENE IN THE ENVIRONMENT,
Syracuse Univ. Research Corp., N.Y. Life Sciences Div.
For primary bibliographic entry see Field 5B.
W77-07819

EFFECTS OF POLLUTANTS ON EGGS, EMBRYOS AND LARVAE OF AMPHIBIAN SPECIES,
California Univ., Irvine.
G. Greenhouse.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 403, Price codes: A03 in paper copy, A01 in microfiche. Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, Report AMRL-TR-76-31, April 1976. 24 p., 14 tab., 10 fig., 12 ref.

Descriptors: Bioassay, *Organic compounds, *Water pollution effects, *Frogs, *Amphibians, Toxicity, Embryonic growth stage, Methodology, Water pollution, *Toads.
Identifiers: *Leopard frog, Rana pipiens, *South African Claw Toad, Xenopus laevis, *Hydrazine, *Methylhydrazine, *Dimethylhydrazine, Phenylnapthylamine, Octyl-phenyl-naphthylamine, Dioctyldiphenylamine, Teratology.

The effects of exposure to pollutants on the development of Rana pipiens and Xenopus laevis embryos and larvae are described. Compounds evaluated include N-phenyl-alpha- naphthylamine, octyl-phenyl-alpha-naphthylame, dioctyldiphenylamine, hydrazine sulfate, methylhydrazine, unsymmetrical dimethylhydrazine, and symmetrical dimethylhydrazine. Experiments focused on determination of lethal, teratogenic, and no effect levels of exposure. Techniques for exposing amphibian embryos and larvae to pollutants are also discussed. (Katz)
W77-07820

TOXICITY TO AQUATIC ORGANISM AND CHEMISTRY OF NINE SELECTED WATERBORNE POLLUTANTS FROM MUNITIONS MANUFACTURE- A LITERATURE EVALUATION,
Army Medical Bioengineering Research and Development Lab. Fort Detrick, Md.
D. Burrows, and J. C. Dacre.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A010 660, Price codes: A05 in paper copy, A01 in microfiche. Army Medical Research and Development Command, Washington, D.C. Report TR 7503, May 1975. 97 p., 19 tab., 1 fig., 315 ref, append.

Descriptors: *Toxicity, *Reviews, *Bibliographies, Animal populations, *Water quality, Water pollution effects, Aquatic animals, *Industrial wastes, Metals, Explosives, Lead, *Nitrogen compounds, Organic compounds, Potassium compounds, Phosphorus compounds, Strontium, Waste water pollution, Phytoplankton, Freshwater fish, *Phytotoxicity.
Identifiers: *Dinitrotoluene, Lead styphnate, *Munitions, Nitroguanidine, Pentaerythritoltetranitrate, Picric acids, Potassium perchlorate, Red phosphorus, Strontium salts, Tetracene, Tetryl, Trinitroresorcinol, *Literature review.

The literature regarding the toxicity to aquatic organisms and the related chemistry of nine military-relevant compounds was evaluated and reviewed. The selected compounds, munitions manufacturing products of potential concern as water-borne pollutants, are dinitrotoluene, tetryl and picric acid, trinitroguanidine, tetracene, potassium perchlorate, red phosphorus and strontium salts. Based on the available toxicity data, recommendations were made for further investigations to be conducted on the first seven of the listed compounds. No further toxicity studies have been proposed for red phosphorus and the strontium compounds. The required further work includes the determination of the 96-hour TLm using both native freshwater and marine target species; the conduct of complete chronic bioassay testing over the life-cycle of the same organisms used in the acute tests; the determination of the rates and products of microbial degradation, especially in the wastewaters; and complete wastewater analysis to estimate the concentrations of the pollutants and their photolysis and/or degradation products. (Katz)
W77-07821

RUM JUNGLE ENVIRONMENTAL STUDIES, SUMMARY REPORT,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
For primary bibliographic entry see Field 5B.
W77-07822

MERCURY IN THE BIOGEOCHEMICAL ENVIRONMENT,
Stanford Univ., Calif. Dept. of Applied Earth Sciences.
For primary bibliographic entry see Field 5B.
W77-07823

THE EFFECT OF ORGANOPHOSPHORUS INSECTICIDES ON NERVE AGENT DETECTOR TICKETS,
Edgewood Arsenal, Aberdeen Proving Ground, Md.
A. Goodman, G. Smith, and R. M. Gamson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A010 312, Price codes: A02 in paper copy, A01 in microfiche. Technical Report, ED-TR-75008, May 1975, 13 p., 3 tab., 10 ref.

Descriptors: *Pesticides, *Phosphorus compounds, *Phosphothioate pesticides, Enzymes, *Insecticides, Bioassay, Laboratory tests, Methodology, Analytical techniques, Solubility, Public health.
Identifiers: *Enzyme detection test, *Organophosphorus pesticides, *Response time, *Inhibition rates, Horse serum cholinesterase, Nerve agent detector tickets, *TEPP, *Naled, *Mevinphos, *Ethion, *Dioxathion, *Parathion, *Diazinon, *Demeton, *Meta-systox, *Trithion, *Trichlorofon, *EPN, *Guthion, *Malathion, *Methyl parathion, *Disulfation, *Imidan, *Dimethoate.

Experiments are described with a variety of commercial organophosphorus pesticides to determine their effects on the enzyme detection test used in the M15A2/M18A2 types of kits. Studies were made by direct application of the undiluted pesticide to the ticket to obtain an indication of the minimum quantity needed to inhibit the enzyme. Also, an investigation was made of aqueous solutions of the pesticides to obtain the same type of information. A wide range of response times was found indicative of different inhibition rates of horse serum cholinesterase by the different pesticides. (Katz)
W77-07824

EFFECTS OF MIREX AND METHOXYCHLOR ON STRIPED MULLET, MUGIL CEPHALUS L.,
Oceanic Inst., Waimanalo, Hawaii.
J. H. Lee, C. E. Nash, and J. R. Sylvester.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 635, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA-660/3-75-015, May 1975, 18 p., 10 tab., 29 ref.

Descriptors: *Insecticides, Pesticides, *Chlorinated hydrocarbon pesticides, *Bioassay, Mortality, Laboratory tests, *Toxicity, Water pollution effects, Marine fish, Juvenile fish, *Mullets, Fish eggs, *Pesticide residues, *Path of pollutants.
Identifiers: *Mirex, *Methoxychlor, Dynamic bioassay, *Striped mullet, Mugil cephalus, *Tissue concentration, *Tissue accumulation.

The effects of two chlorinated insecticides, mirex and methoxychlor, on striped mullet, Mugil cephalus L., were studied. Test concentrations of both insecticides used were 0.01, 0.1, 1.0 and 10.0 ppm in dynamic bioassay. Young juveniles were more susceptible to mirex exposure than older juveniles or adults. No mortalities occurred in older juveniles and adults exposed to mirex for 96 hours. For young juveniles, mortalities were highest in concentrations of 0.1 and 1.0 ppm and were less in concentrations of 0.01 and 10.0 ppm. Significant amounts of mirex residues were accumulated in the body tissues of the test fish; concentrations increased with increased environmental concentrations. Methoxychlor was more toxic to mullet than mirex. Mortalities were greater than 90 percent over a 96-hour period for all life stages studied at concentrations of 0.1, 1.0 and 10.0 ppm. Mortality at a concentration of 0.01 was 5.1 percent or less for 96 hours. Relative to mirex, small amounts of methoxychlor residues accumulated in the tissues of the test fish. Results of the experiments on eggs and larvae were inconclusive. Egg survival was slightly better in mirex than in methoxychlor over a 96-hour period. Larval survival was generally better in mirex than methoxychlor. (Katz)
W77-07825

INVESTIGATION OF ACID MINE DRAINAGE EFFECTS ON RESERVOIR FISHERY POPULATIONS,
West Virginia Univ., Morgantown.
A. Benson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 703, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/2-76-107, April 1976. 135 p, 35 tab, 13 fig, 17 ref.

Descriptors: *West Virginia, *Hydrogen ion concentration, Lakes, *Water quality, *Acid mine water, *Coal mine wastes, Coal mines, Limnology, Iced lakes, *Hydrology, Hydrologic cycle, Water temperature, Thermocline, Thermal stratification, *Chemical stratification, Water chemistry, *Freshwater fishes, Fish populations.
Identifiers: *Tygart Lake(WV), Transparency, *Sandy Creek(WV), Spring warming cycle, Autumn cooling cycle, Winter thermal minimum.

A limnological, water quality and quantity and lake fluctuation, transparency, and ice cover study was made of the Tygart Lake, West Virginia, and its tributaries. The watershed of this lake has been extensively mined for coal and acid mine drainage (AMD) is discharged throughout the area. The significant sources of AMD were found to be the Tygart River and Sandy Creek. Net changes in lake depth were 14-16 meters, and the maximum change was 22 meters. Transparency depth ranged from 0.1 m in December to 7.5 m in the summer. The major factors related to the development of acidity gradients in Tygart Lake were found to be

(1) hydrological characteristics including inflow, outflow, and the operational interaction between the inflow and outflow resulting in storage or drawdown, (2) thermal relationships including the spring warming cycle, thermal stratification during the summer, the autumnal cooling cycle, and the winter thermal minimum and (3) water chemistry including the existing chemical stratification or its lack at the beginning of a seasonal period and the chemical quality of inflow. (Katz)
W77-07827

EFFECT OF AIR POLLUTION ON PINUS STROBUS L. AND GENETIC RESISTANCE - A LITERATURE REVIEW,
Pennsylvania State Univ., University Park.
H. D. Gerhold.
Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-002, January 1977. 36 p, 1 tab, 82 ref.

Descriptors: *Pine trees, *Conifers, Coniferous trees, *Coniferous forests, Air pollution, *Air pollution effects, Toxicity, *Phytotoxicity, Breeding, Ozone, Gases, *Reviews, Bioindicators, Monitoring.
Identifiers: *Eastern white pine, Pinus strobus, *Genetic resistance, *Literature reviews, *Phytotoxic gases, Plant gas emission, Air quality standards.

Effects of the main phytotoxic gases that injure eastern white pine (Pinus strobus L.) and the possibilities of breeding resistant trees are discussed in a comprehensive literature review. The main purpose of the report is to summarize knowledge which may be used in providing protection to a valuable species. Implicitly related topics are reviewed briefly, including sorption and emission of gases by plants, air quality standards, bioindicators for monitoring air quality, and silvicultural measures for protecting trees against injuries. (Katz)
W77-07829

PHYSIOLOGICAL RESPONSE OF THE CUNNER, TAUTOGOLABRUS ADSPERSUS, TO CADMIUM.
National Marine Fisheries Service, Seattle, Wash.
Available from Superintendent of Documents, USGPO, Wash, D.C. 20402 as C55.13:NMFS SSRF-681. NOAA Technical Report NMFS SSRF-681, October 1974. 35 p.

Descriptors: *Metals, *Cadmium, *Water pollution effects, *Physiology, Fishes, Stress, Sea water, Respiration, Bacteria, Immunization, Osmoregulation.
Identifiers: *New York bight, Tautogolabrus adspersus, Renal failure, *Cunners.

Six articles are brought together in this report on the response of the cunner to cadmium. The cunner was exposed to six concentrations of cadmium, as cadmium chloride, for 96 hr. At the end of this exposure period, tests of blood serum osmolality and gill tissue oxygen consumption were performed. High levels of this metal resulted in abnormally high serum osmolality, and an exposure as low as 3 ppm reduced the normal rate of oxygen consumption. The histopathological effects of acute exposure of the cunner to cadmium were manifested in the kidney, intestine, poietic tissue, epidermis and gill. The results implicate renal failure as the probable cause of death subsequent to acute exposure to cadmium. Clearance of intracardially injected bacteria from the blood of cunners exposed to 12 ppm cadmium was examined. The rate of bacterial uptake in the cells of the liver and spleen was increased, but the bacterial death rate within these cells was decreased. The activity of two liver enzymes changed significantly with exposure to cadmium. Chemical analyses were made for uptake and clearance of cadmium from exposed cunners. In the uptake study, cadmium residues averaged 8.5 times higher in liver than in gills. In the clearance study, substantial productions in cadmium residues were found in the gills and blood of fish held in clean seawater for 6 wk after exposure to cadmium, as compared to fish sacrificed immediately after exposure. (See W77-07831 thru W77-07836) (NOAA)
W77-07830

PHYSIOLOGICAL RESPONSE OF THE CUNNER, TAUTOGOLABRUS ADSPERSUS, TO CADMIUM. I. INTRODUCTION AND EXPERIMENTAL DESIGN,
National Marine Fisheries Service, Milford, Conn.
A. Calabrese, R. S. Collier, and J. E. Miller.
In: NOAA Technical Report NMFS SSRF-681, Oct 1974. p 1-3, 11 ref.

Descriptors: *Marine fish, Bioassays, *Toxicity, Mortality, Laboratory tests, *Cadmium, *Heavy metals, Water pollution effects, Review, Aquaria, Fish physiology, Physiological ecology.
Identifiers: *Cunners, Tautogolabrus adspersus, *TLm(Median Tolerance Level), Physiological response.

The cunner was exposed to six levels of Cadmium for 96 hrs. Mortality data were obtained which indicated that cunners can tolerate high concentrations of Cadmium for at least 96 hrs. (See also W77-07830) (Katz)
W77-07831

PHYSIOLOGICAL RESPONSE OF THE CUNNER, TAUTOGOLABRUS ADSPERSUS, TO CADMIUM. II. UPTAKE OF CADMIUM BY ORGANS AND TISSUES,
National Marine Fisheries Service, Milford, Conn.
R. A. Greig, A. E. Adams, and B. A. Nelson.
In: NOAA Technical Report, NMFS SSRF-681 Oct 1974. p 5-9, 2 tab, 2 fig, 9 ref.

Descriptors: *Cadmium, *Heavy metals, *Fish physiology, Marine fish, Bioassay, Laboratory tests, Water pollution effects, *Path of pollutants, Biochemistry, Chemical analysis, *Toxicity, *Pathology.
Identifiers: *Cunners, Tautogolabrus adspersus, Cadmium, Chloride, Cadmium uptake, Tissue uptake, *Cadmium clearance, Artificial seawater, Cadmium residues, Gills, Liver, Blood, Muscles, Fish blood, Liver concentrations, Serum.

Cadmium uptake and clearance data were obtained on cunners, Tautogolabrus adspersus, exposed to various concentrations of this metal in artificial seawater. In the uptake study, cunners were exposed to 0, 3, 6, 12, 24, and 48 ppm cadmium in seawater for 4 days. Cadmium residues averaged 8.2 times higher in livers than in gills. At the 48 ppm cadmium exposure level, the livers averaged 195 ppm, as compared to 33.5 ppm for gills (wet weight values). In the clearance study, cunners were exposed to 24 ppm cadmium in seawater for 4 days, after which time half of the fish were placed in clean flowing seawater for 1 mo and half were sacrificed immediately to determine initial cadmium residue concentrations. Gill, liver, blood, muscle, and carcass samples were analyzed. Substantial reductions in cadmium residues were found in the gills and blood of fish held in clean seawater, as compared to samples from fish sacrificed immediately after exposure to cadmium. Liver samples produced variable results: livers of fish held in clean seawater for 1 mo contained 62-155 ppm cadmium for four fish and 5-11 ppm for three fish, as compared to 30-117 ppm for livers from eight fish sacrificed immediately after exposure to cadmium. Muscle and carcass samples from the 'cleared' fish showed very little reduction in cadmium levels. (See also W77-07830) (Katz)
W77-07832

PHYSIOLOGICAL RESPONSE OF THE CUNNER, TAUTOGOLABRUS ADSPERSUS, TO CADMIUM. III. CHANGES IN OSMOREGULATION AND OXYGEN CONSUMPTION,
National Marine Fisheries Service, Milford, Conn.
F. P. Thurberg, and M. A. Dawson.
In: NOAA Technical Report, NMFS SSRF-681, Oct 1974. p 11-13, 1 fig, 18 ref.

Descriptors: *Cadmium, *Heavy metal, *Fish physiology, Marine fish, Laboratory tests, Water pollution effects, Path of pollutants, Biochemistry, *Oxygen metabolism, Respiration, *Oxygen requirements, *Bioassay.
Identifiers: *Cunners, Tautogolabrus adspersus, *Cadmium chloride, Blood serum osmolality, *Gill tissue oxygen consumption, *Oxygen consumption, Tissue damage.

The cunner, Tautogolabrus adspersus, was exposed to various concentrations of cadmium, as cadmium chloride (CdC12.2 1/2 H2O), for 96 hr. At the end of this exposure period tests of blood serum osmolality and gill tissue oxygen consumption were performed. High levels (48 ppm) of this metal resulted in an abnormally high serum osmolality and an exposure as low as 3 ppm reduced the normal rate of oxygen consumption. Both of these parameters may be related to observed tissue damage. (See also W77-07830) (Katz)
W77-07833

PHYSIOLOGICAL RESPONSE OF THE CUNNER, TAUTOGOLABRUS ADSPERSUS, TO CADMIUM. IV. EFFECTS ON THE IMMUE SYSTEM,
National Marine FIsheries Service, Milford, Conn.
R. A. Robohm, and M. F. Nitkowski.
In: NOAA, Technical Report NMFS, SSRF-681, Oct 1974. p 19-20, 1 tab, 1 fig, 20 ref.

Descriptors: *Cadmium, *Heavy metals, *Fish physiology, Marine fish, Laboratory tests, Water pollution effects, *Path of pollutants, Biochemistry, *Fish diseases, Microbiology, Methodology, Public health, Toxicity.
Identifiers: *Cunners, Tautogolabrus adspersus, *Cadmium chloride, *Immue system, *Bacterial clearance, *Antibody production, Antibody response, Short-term exposure.

Two elements of the immune system in cunners, Tautogolabrus adspersus, were examined after 96-hr exposure to cadmium: (1) clearance of intracardially injected bacteria from the bloodstream and (2) ability to produce antibody against intraperitoneally injected sheep red blood cells (SRBC). Exposure to 12 ppm cadmium increased the rates of bacterial uptake in phagocytes of the liver and spleen but significantly decreased the rates of bacterial killing within these cells. Exposure of fish at 3 to 24 ppm cadmium failed to influence antibody production against SRBC. These results indicate that cadmium affects one aspect of cellular immunity but not humoral immunity in cunners. This effect may increase susceptibility to infection. (See also W77-07830) (Katz)
W77-07834

PHYSIOLOGICAL RESPONSE OF THE CUNNER, TAUTOGOLABRUS ADSPERSUS, TO CADMIUM. V. OBSERVATIONS ON THE BIOCHEMISTRY,
National Marine Fisheries Service, Milford, Conn.
E. Gould, and J. J. Karolus.
In: NOAA Technical Report, NMFS, SSRF-681, Oct 1974. p 21-25, 3 tab, 1 fig, 16 ref.

Descriptors: *Cadmium, *Heavy metals, *Fish physiology, Marine fish, Laboratory tests, Water pollution effects, *Path of pollutants, Methodology, *Biochemistry, *Proteins, *Enzymes.
Identifiers: *Cunners, Tautogolabrus adspersus, *Cadmium chloride, Aspartate aminotransferase activity, Livers, *Metal-complexing proteins, Nicotinamide-adenine dinucleotide reductase activity.

In the liver of cunner, Tautogolabrus adspersus, exposed to 3 ppm and to 24 ppm Cd for 96 hr, aspartate aminotransferase activity was 71% and 59%, respectively, of the activity in livers of control fish. In the livers of cunners exposed to 24 ppm Cd, nicotinamide-adenine dinucleotide reductase activity required 20 mM Mg for activation of the same order that 2 mM Mg produced in control livers. Although individual variation precludes generalization here, what may be a metal-complexing group of proteins in the serum of cadmium-exposed cunner warrants further electrophoretic study. (See also W77-07830) (Katz)
W77-07835

PHYSIOLOGICAL RESPONSE OF THE CUNNER, TAUTOGOLABRUS ADSPERSUS, TO CADMIUM. VI. HISTOPATHOLOGY,
National Marine Fisheries Service, Milford, Conn.
M. W. Newman, and S. A. MacLean.
In: NOAA Technical Report, NMFS, SSRF-681, Oct 1974. p 27-33, 8 fig, 20 ref.

Descriptors: *Cadmium, *Heavy metals, Fish physiology, *Fish diseases, Marine fish, Laboratory tests, Water pollution effects, *Path of pollutants, Methodology, Pathology.
Identifiers: *Cunners, Tautogolabrus adspersus, *Cadmium chloride, *Histopathology, Kidney, Intestine, *Hemopoietic tissue, Epidermis, Gill, Renal failure, Necrosis, Blood components.

The histopathological effects of acute exposure of cunner, Tautogolabrus adspersus, to water containing cadmium chloride were manifested in the kidney, intestine, hempopoietic tissue, epidermis, and gill. Few significant changes were noted in fish exposed to concentrations less than 48 pp, for 96 hr. The results implicate renal failure as the probable cause of death after acute exposure to cadmium. (See also W77-07830) (Katz)
W77-07836

EVALUATION OF ERYTHROCYTE DELTA AMINO LEVULINIC ACID DEHYDRATASE AS A SHORT-TERM INDICATOR IN FISH OF A HARMFUL EXPOSURE TO LEAD,
Canada Centre for Inland Waters, Burington (Ontario).
P. V. Hodson, B. R. Blunt, D. J. Spry, and K. Austen.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 501-508, 1977. 7 fig., 18 ref.

Descriptors: *Lead, *Heavy metals, Water pollution effects, Biochemistry, *Fish physiology, Laboratory tests, Path of pollutants, Fresh-water fish, *Rainbow trout, *Brook trout, *Sunfishes, Methodology, *Cadmium, *Copper, *Zinc, *Mercury, *Bioindicators, Pollutant identification.
Identifiers: Goldfish, Pumpkinseed sunfish, Erythrocyte delta-amino levulinic acid dehydratase activity, *Sub-lethal effects, *Blood lead concentration.

The activity of erythrocyte (delta)-amino levulinic acid dehydratase (ALA-D) of fish is easily measured under a variety of experimental conditions. Exposure of rainbow trout (Salmo gairdneri), brook trout (Salvelinus fontinalis), goldfish (Carassius auratus), and pumpkinseeds (Lepomis gibbosus) to lead consistently inhibited ALA-D within 2 wks at concentrations as low as 10, 90, 470, and 90 micrograms/liter, respectively. In rainbow and brook trout these concentrations were closely related to the published minimum effective concentrations causing sublethal harm. There was a significant linear relationship between ALA-D activity and log of lead in water, and between blood lead and lead in water. Near lethal exposures to cadmium, copper, zinc, and mercury did not significantly inhibit ALA-D activity. Recovery of ALA-D activity of rainbow trout after transfer from 120 micrograms/liter lead to clean water occurred in 8 wk. This enzyme provides fast, consistent, specific, and sensitive estimates of lead concentrations causing sublethal harm to fish and may help to relate sources of lead to degree of exposure of fish populations in the field. (Katz)
W77-07837

REDUCTIONS IN BIOMASS AND DIVERSITY RESULTING FROM EXPOSURE TO MERCURY IN ARTIFICIAL STREAMS,
Savannah River Ecology, Aiken, S.C.
C. F. Sigmon, H. J. Kania, and R. J. Beyers.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 493-500, 1977. 4 fig., 2 tab., 23 ref.

Descriptors: *Mercury, *Metals, Water pollution effects, Path of pollutants, *Aquatic algae, Aquatic environment, Aquatic populations, *Aquatic productivity, Bioassay, Laboratory tests, Algae, Algicides, Food chain, Food pyramids, Aquatic insects, *Primary productivity, *Periphyton.
Identifiers: *Artificial streams, Diversity.

Mercury levels similar to those in natural waters contaminated with mercury (0.1 and 1.0 micrograms/liter) caused significant reduction in algal numbers, standing stock, and diversity. Reductions in diversity resulted from a decrease in the evenness of distribution of numbers among species and a decline in the numbers of species. Although the algal community was affected by mercury ions, the magnitude of change was small at the mercury levels tested and the number of species affected were few. The decline in algal standing crop could indirectly affect other food chain members that possess physiological resistance to the mercury. There was no evidence of direct or indirect impact on the herbivorous or carnivorous midges. The impact on primary procedures was not sufficient to be transferred to consumer trophic levels. (Katz)
W77-07838

EFFECTS OF THERMAL SHOCKS ON DRIFTING AQUATIC INSECTS: A LABORATORY SIMULATION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Va. Dept. of Biology.
F. F. Sherberger, E. F. Benfield, K. L. Dickson, and J. Cairns, Jr.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 529-536, 1977. 4 tab., 14 ref.

Descriptors: *Bioassay, *Laboratory tests, Methodology, *Mayflies, Aquatic insects, *Aquatic drift, Aquatic populations, Water temperature, *Thermal pollution, *Thermal stress, Thermal water, Water temperature, Mortalities, Animal behavior, Predation, *Stoneflies.
Identifiers: *Thermal shock, Acclimation, *Upper lethal temperatures, *Isonvchia, *Hydropsyche, Phototaxis, Rheotaxis.

Effects of temperature shocks from thermal plumes on drifting Isonychia (Ephemeroptera: Baetidae) and Hydropsyche (Trichoptera: Hydropsychidae) larvae were examined in a laboratory simulation. Groups of both insects were collected at various seasons and acclimated in the laboratory at temperatures comparable to those in the field. Groups were exposed to thermal shocks of varying duration and observed for periods of 10 days afterward. Consistent statistically significant differences in mortality between treatment and control groups were not evident until shock temperatures neared the respective upper lethal limits for the two insects. While consistent treatment related differences in molting frequency in Isonychia were not obtained, changes in the patterns of molting were observed. Behavioral tests with Isonychia indicated no discernable treatment effects on rheotaxis, phototaxis, and substrate orientation. No discernable effects of treatment on susceptibility to predation of Isonychia by Cottus carolinae were observed. (Katz)
W77-07839

PROTECTIVE EFFECT OF CHLORIDE ON NITRITE TOXICITY TO COHO SALMON (ONCORHYNCHUS KISUTCH),
Rhode Island Univ., Kingston. Dept. of Animal Science.
S. J. Perrone, and T. L. Meade.
Journal of the Fisheries Research Board of Canada, Vol 34, p 486-492, 1977. 7 tab, 15 ref.

Descriptors: *Salmon, *Bioassay, *Toxicity, Mortality, Laboratory tests, Fish physiology, Biochemistry.
Identifiers: *Coho salmon, Yearling coho salmon, *Flow-through bioassay, *Methemoglobin.

Tolerance of coho salmon (Oncorhynchus kisutch) to nitrite was increased when the concentration of chloride ion in the environment was high. The results of flow-through bioassays revealed that no mortality occurred when yearling coho salmon were subjected to nitrite-nitrogen (NO2-N) of 29.8 mg/l and chloride (C1-) of 261.3 mg/l for 48 h. When yearling coho salmon were exposed to 3.8 mg/l NO2-N and 2.5 mg/l C1- for 12 h, the resultant mortality was 58.3%. Possibly, chloride competes with nitrite for transport across the gills and integumental tissues, thereby interfering with the onset of nitrite-induced methemoglobinemia. (Katz)
W77-07840

APPARATUS FOR PROLONGED MAINTENANCE OF SPECIFIC GAS CONCENTRATION IN THE WATER OF EXPERIMENTAL AQUARIA,
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 7B.
W77-07841

EFFECTS OF INORGANIC COMPLEXING ON THE TOXICITY OF COPPER TO DAPHNIA MAGNA,
Environmental Research Lab., Duluth, Minn.
R. W. Andrew, K. E. Biesinger, and G. E. Glass.
Water Research, Vol 11, p 309-315, 1977. 3 tab, 2 fig, 30 ref.

Descriptors: *Copper, *Heavy metals, *Toxicity, Mortality, *Bioassay, Crustaceans, *Daphnia, Laboratory tests, Carbonates, Bicarbonates, *Phosphates, Phosphorus compounds, Copper compounds, Methodology, Lake Superior, Hardness(Water).
Identifiers: Mortality rates, Survival times, *Cupric ion, *Copper hydroxy ion, *Daphnia magna, Copper carbonate, Dissolved copper, Total copper concentration.

Effects of carbonate-bicarbonate, orthophosphate, and pyrophosphate on the toxicity of copper (II) to Daphnia magna were studied at constant pH and total hardness. Mortality rates and reciprocal survival times were directly correlated with cupric (Cu2+) and copper hydroxy (Cu(OH)n) ion activities as determined by equilibrium calculations. Toxicity was negatively correlated to activities of soluble copper carbonate (CuCO3) and other complexes, and was found to be independent of dissolved copper or total copper concentrations. (Katz)
W77-07842

EFFECTS OF CHLORINE AND CHLORAMINE ON UPTAKE OF INORGANIC NITROGEN BY PHYTOPLANKTON,
Oklahoma State Univ. Stillwater. School of Biological Sciences.
D. Toetz, L. Varga, and M. Pierce.
Water Research, Vol 11, p 253-258, 1977. 5 tab, 1 fig, 22 ref.

Descriptors: *Chlorine, *Phytoplankton, *Primary productivity, Nitrogen compounds, Nitrogen cycle, *Nitrogen fixation, *Nitrates, *Ammonia,

Plant physiology, Plant growth, Plant populations, Enzymes, Absorption.
Identifiers: *Chloramine, Cell membranes.

Chlorine (Cl2) and chloramine had a debilitating effect on the ability of phytoplankton to take up nitrate and ammonia. Chlorine at an initial concentrationof 0.028 mg/l depressed uptake of nitrate by 50%. Uptake of nitrate and ammonia in the presence of 0.1 mg C12/1 or 0.1 mg chloramine/1 did not follow Michaelis-Menten kinetics as did the respective controls. Small quantities of Cl2 or chloramine may destroy or inactivate enzymes in the cell membrane that are responsible for uptake of nitrate. (Katz)
W77-07843

EGG HATCHABILITY AND TOLERANCE OF BROOK TROUT (SALVELINUS FONTINALIS) FRY AT LOW PH,
Cornell Univ., Ithaca, N. Y. Dept. of Natural Resources.
J. R. Trojnar.
Journal of the Fisheries Research Board of Canada, Vol 34, p 574-579, 1977. 3 tab, 1 fig, 19 ref.

Descriptors: *Brook trout, *Fish eggs, Juvenile fish, *Bioassay, *Reproduction, Laboratory tests, *Hydrogen ion concentration, Mortality, Water quality, Methodology, Fish hatcheries, Aquiculture, *Fish physiology.

Hatchability of brook trout (Salvelinus fontinalis) eggs incubated at pH 4.6, 5.0, 5.6, and 8.0 ranged from 76 to 91%. Differential mortality was experienced when subsequent swim-up fry were exposed to a different pH indicating an acclimation effect. This suggests that brook trout fry incubated at lower, but sublethal, pH levels are less likely to experience acid-induced mortality upon emergence than those incubated in spring upwellings. (Katz)
W77-07844

ULTRASTRUCTURAL STUDY OF LESIONS IN GILLS OF A MARINE SHRIMP EXPOSED TO CADMIUM,
Environmental Research Lab. Gulf Breeze, Fla.
J. A. Couch.
Journal of Invertebrate Pathology, Vol. 29, p. 267-288, 1977. 22 fig., 11 ref.

Descriptors: *Cadmium, Animal diseases, *Animal pathology, Animal physiology, *Water pollution effects, *Metals, Bioassay, Laboratory tests, *Shrimp, Marine animals, Marine fisheries, Commercial shellfish, *Path of pollutants, *Environmental effects.
Identifiers: *Pink shrimp, Penaeus duorarum, *Cadmium chloride, Electron microscopy, *Gills, Cell death, Pathologic black gills.

Pathologic black gills of pink shrimp, Penaeus duorarum, exposed to 763 micrograms/liter of cadmium chloride for 15 days were studied with transmission electron microscopy and were compared with normal gills of control pink shrimp. Local as well as extensive areas of cell death and necrosis were found in the distal gill filaments of black gills from cadmium-exposed shrimp. It is proposed that necrosis of specialized epithelial cells in black gill filaments and contiguous nonblack gill tissue could cause osmoregulatory, detoxifying, and respiratory dysfunction in crustacea, particularly in individuals undergoing environmental stress such as salinity fluctuation. (Katz)
W77-07845

AQUATIC INSECT DIVERSITY AND BIOMASS IN A STREAM MARGINALLY POLLUTED BY ACID STRIP MINE DRAINAGE,
Pennsylvania State Univ., University Park. Dept. of Biology.
S. M. Tomkiewicz, Jr., and W. A. Dunson.
Water Research, Vol. 11, p. 397-402, 1977. 3 fig., 2 tab., 15 ref.

Descriptors: *Acid streams, *Acid mine water, *Populations, *Aquatic insects, *Biomass, *Acidic water, *Environmental effects, *Biological communities, Water pollution effects, Water pollution sources, Mine acids, Hydrogen ion concentration, Diptera, Invertebrates, Caddisflies, Sampling, On-site investigations.
Identifiers: *Species diversity, Sialis, Ptilostomis, Plecoptera, Upper Three Runs(Penn).

Upper Three Runs receives a point source of acid mine drainage from a small acid feeder stream and the pH of the main stream falls from above 6 to about 4.5. Over the 1.2 km study section below the introduction of acid drainage the pH rises to 5.0. This moderate degree of mine acid pollution has severely affected aquatic insect populations. The acid feeder (pH near 3.2) was inhabited only by a chironomid, a megalopteran (Sialis) and the caddisfly Ptilostomis. The drainage of the acid feeder into the stream caused a drop in the Shannon-Weiner diversity index from 3.10 to 1.95 and a drop in biomass from 6.5 to 2.2 grams per square meter. At two stations further downstream the biomass reached 1.2 grams per square meter. The number of taxa declined from 30 at the control station to 13 at the lowest site. Some Diptera and Plecoptera showed an increase in numbers as stream pH increased to about 5.0. (Katz)
W77-07846

INFLUENCE OF SOLVENTS ON THE PESTICIDE INHIBITION OF ATPASE ACTIVITIES IN FISH AND INSECT TISSUE HOMOGENATES,
Mississippi State Univ., Mississippi State. Dept. of Biochemistry.
D. Desaiah, and R. B. Koch.
Bulletin of Environmental Contamination and Toxicology, Vol. 17(1), p. 74-81, 1977. 3 tab., 9 ref.

Descriptors: *DDT, *Catfish, Fish physiology, *Enzymes, Biochemistry, *Chlorinated hydrocarbon pesticides, *Laboratory tests, *Methodology, Alcohols, Inhibition.
Identifiers: *Toxaphene, Plictran, *Benzene, *Cyclohexane, Hexane, *Ethanol, Pentane, Cyclopentane, ATPase, Brain tissue, Cockroach.

A number of solvents were tested to determine their effects on the inhibition of ATPase activities from catfish brain and cockroach muscle by DDT, toxaphene, and plictran. Solvents tested were ethanol, cyclohexane, hexane, benzene, pentane and cyclopentane. The solvents used for dissolving the pesticide had a great influence on the inhibitory action of the pesticides. Ethanol is the solvent of choice. (Katz)
W77-07847

EFFECT OF SALINITY ON THE FRESHWATER SHRIMP DIKEROGAMMARUS HAEMOBAPHES (EICHWALD) FROM THE MOUTH OF THE DNEPR,
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
S. A. Ponomareva.
Hydrobiological Journal, Vol. 11, No. 6, p. 67-69, 1975.

Descriptors: Animal physiology, *Salinity, *Shrimp, *Fish food organisms, Environmental effects, *Estuarine environment, *Osmotic pressure, *Adaptation, Estuaries, Laboratory tests, Crustaceans, Invertebrates, Lagoons, Rivers, Water pollution effects, Regulation.
Identifiers: *Dikerogammarus, *Osmoregulation, *Dnepr River(USSR).

Regulation of river flow in the northwestern Black Sea area has caused a gradual increase in salinity in the lagoons and estuarine regions of the rivers. The effect of increasing salinity on the shrimp Dikerogammarus haemobaphes, an important fish food in the lower Dnepr, was tested in the laboratory by exposing the shrimp to salinities from 0.35 to 30 PPT. When the salinity is 12 to 15 PPT, the animals survive for slightly more than a month. The process of osmoregulation takes place rapidly with osmotic pressure of cavitary fluid stabilized after 24 to 48 hrs. The high tolerance of D. haemobaphes to fluctuations in salinity up to 9 to 11 PPT is possibly the result of their ability to regulate the osmotic process.
W77-07848

A SECOND LOOK AT WATER REUSE,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-07908

REDUCTION IN SEWAGE CONTAMINATION IN SYDNEY ROCK OYSTERS,
New South Wales Univ., Kensington (Australia). School of Food Technology.
For primary bibliographic entry see Field 5G.
W77-07946

PHYTOPLANKTON PRODUCTION IN LAKE MEMPHREMAGOG, QUEBEC (CANADA)–VERMONT (U.S.A.),
P. E. ROss, and J. Kalff.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 760-769, 1975. 5 fig, 4 tab, 17 ref.

Descriptors: *Primary productivity, *Phytoplankton, *Estimating, *Lake basins, Lakes, Seasonal, Diurnal, Variability, Chlorophyll, *Vermont, *Canada.
Identifiers: *Lake Memphremagog(Quebec-Ve).

As part of an integrated ecosystem study of Lake Memphremagog, a 40 km long narrow glacial lake astride the Vermont-Quebec border which exhibits an axial nutrient gradient, investigations were made of seasonal patterns of phytoplankton primary production, efficiency of production and production per unit standing crop in the lake's three basins. The lake morphometry and bathymetry facilitates investigation of the three-way relationship because behavior of the phytoplankton was investigated in two or more distinct sections of the same lake and much of the variation due to climate, geology and chemistry is eliminated. Analyses of study results from the three lake basins showed that surface and cubic values for primary production, chlorophyll concentration and production efficiency all decreased from south to north, reflecting a gradient of decreasing nutrient supply. However, production measurements with oxygen and carbon-14 methods described by previous research yielded very different results. A method was developed for correcting daily production, estimated from short-term incubations with the aid of the daily light curve, to real daily production. Specific production, activity production, activity coefficients, and specific efficiency were similar in all three basins, indicating that the production on a per unit basis is similar throughout the lake. (Harris-Wisconsin)
W77-07962

PHYSICAL, CHEMICAL, AND BIOLOGICAL FACTORS IN THE INITIATION AND DESTRUCTION OF BIOGENIC MEROMIXIS IN A SOFT-WATER LAKE,
D. A. Culver.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 776-783, 1975. 3 fig, 4 tab, 10 ref.
AEC AT-(45-1)-2225-T23.

Descriptors: *Meromixis, *Water circulation, *Primary productivity, Inflow, *Lake morphometry, Lakes, Eutrophication, Silting, Nutrients, *Thermal stratification, *Washington.
Identifiers: *Hall Lake(Wash), *Downwelling currents, *Biogenic meromixis, Soft water lakes.

In lakes characterized by biogenic meromixis, in contrast to crenogenic and ectogenic meromictic lakes, the role of thermal phenomena, silt-laden inflow, morphometry and algal productivity must be considered along with chemical stratification to understand the circulation patterns. The present study utilized data from Hall Lake, a small, oval, soft-water lake in the Puget Sound area near Seattle, Washington. The data indicate that chemical resistance to mixing of the monimolimnion is less important than the magnitude of downwelling currents from the surface. In Hall Lake, silty inflows can destroy meromixis, but the effect of nutrient loading on algal productivity, and thus transparency and summer heat income, can decrease autumnal circulation enough to prevent complete overturn. The amount of circulation is directly related to the proportion of the lake which is heated above 4C, and hence it is very sensitive to the transparency of the water, which is in turn affected by algal abundance, in turn controlled by nutrient income. The accumulation of materials in the deep water is important in restricting winter circulation, but both passive sinking and the inflow of silt-laden water can destroy the stratification, probably due to the sensitivity of the dissolved materials to the input of oxygen and to the small density differences involved. (Harris-Wisconsin)
W77-07963

WHOLE-LAKE EUTROPHICATION EXPERIMENTS WITH PHOSPHORUS, NITROGEN AND CARBON.
D. W. Schindler.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 3221-3231, 1975. 8 fig., 1 tab., 32 ref.

Descriptors: *Eutrophication, *Lakes, *Phosphorus, *Carbon, *Nitrogen, *Cycling nutrients, Sediments, Water quality control, Nutrients, Management, Nutrient removal.
Identifiers: Lake restoration, Phosphorus cycle.

Several whole-lake experiments with additions of phosphorus, nitrogen, and carbon are described along with their implicatons for the management of eutrophication. Results indicate that the claim that control of carbon and other nutrients as well as phosphorus is necessary for effective eutrophication abatement is false. Carbon dioxide from the atmosphere supplied the carbon necessary to support increased production and algal blooms brought about by nitrogen and phosphorus additions, with the amount of carbon retained by the experimental lakes being closely related to the phosphorus control of the lakes. Termination of phosphorus input caused algal species composition to return to pretreatment levels within two years despite the continued addition of carbon and other nutrients. Examination of the phosphorus cycle indicated that hypolimnetic microplankton and sediments remove phosphorus with great efficiency, suggesting that the injection of phosphorus-rich effluents below the thermocline would prevent major algal blooms. Sediments were shown to effectively sequester phosphorus from the lake water and in cases where the depth of sediment mixing was much greater than the depth of sediment laid down each year, sediment phosphorus concentration did not rapidly change in response to changed loading regimes. (Luedtke-Wisconsin)
W77-07965

A CARBON BUDGET FOR LAKE ONTARIO,
A. Robertson, and B. J. Eadie.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 291-299, 1975. 3 fig., 3 tab., 14 ref.

Descriptors: *Carbon cycle, *Lake Ontario, Calcium carbonate, Inflow, Discharge(Water), Sedimentation, Primary productivity, Equations, Equilibrium, Estimating, Canada, Great Lakes, Cycling nutrients.
Identifiers: *Carbon budget, Inorganic carbon, Organic carbon.

In the first carbon budget calculated for a large lake, separate data was utilized for eight Lake Ontario hydrochemical and other parameters: (1) inorganic carbon in the inflowing rivers; (2) organic carbon in the inflowing rivers; (3) net carbon fixed by primary production; (4) inorganic carbon in the outflow water; (5) organic carbon in the outflow water; (6) net exchange of carbon between the atmosphere and the inorganic carbon pool in the lake; (7) net calcium carbonate precipitation-dissolution; and (8) net sedimentary deposition-decomposition of organic matter. Monthly comparisons showed relatively stable inorganic and organic river inputs throughout the year, with peaks in primary productivity carbon fixation from the fourth-sixth study months. On the output side of the balance, inorganic river outflow, calcium carbonate, and river organic outflow were generally stable all 12 months. Sedimentary deposition and decomposition increased slightly in the middle study months, while gas carbon exchange decreased to a comparatively small fraction during the third to ninth study months. Overall input-output comparisons show a net input in the spring and summer and a net output in fall and winter. Primary production causes the input to peak in the warmer months and output is associated with mixing of supersaturated hypolimnetic waters into the upper layers in winter, releasing carbon dioxide to the atmosphere. (Harris-Wisconsin)
W77-07967

DIEL PHOSPHATE FLUX IN LAKE WASHINGTON, U.S.A.,
J. E. Richey, A. H. Devol, and M. A. Perkins.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 222-228, 1975. 5 fig., 1 tab., 20 ref.

Descriptors: *Diel migration, *Phosphates, *Cycling nutrients, Estimating, Primary productivity, Biomass, Trophic level, Phytoplankton, Absorption, Respiration, Zooplankton, *Washington, Lakes.
Identifiers: *Phosphate flux, *Lake Washington(Wash).

An investigation attempted to assess diel phosphate fluxes in Lake Washington (Wash.) during a late-bloom period, repeatedly measuring mechanisms that determine the rate of change of the phosphate pool over depth during a day-night cycle. Phosphate was measured with the ascorbic acid-molybdenum blue method. Plankton and zooplankton respiration rates were estimated through electron transport system assay. Primary production was estimated by carbon-14 bicarbonate uptake and plankton biomass from ATP concentrations. Samples were taken from selected depths every three hours from 7 am May 22 to 4 pm May 23, 1974. Uptake measurements indicated that during the 36-hour period, only the phosphate and particularate pools were important in the flux. Maximum phosphate demand on the phytoplankton community was estimated by applying a carbon:phosphorus ratio of 105:1 to the maximum production rates observed. On May 22 phosphorus demand was .28 micrograms P/1/hr. A similar calculation for the second day yielded a maximum phosphate demand of 0.13 micrograms P/1. These estimates account for only 19-33% of the observed phosphate flux. This observation, coupled with the presence of significant night phosphate uptake and a poor correlation of both respiration and phosphate uptake with primary production, indicated that bacterial respiration may have been supplying the energy for a significant fraction of phosphate uptake in Lake Washington at that time. (Harris-Wisconsin)
W77-07968

HYDROPHYTE BIOMASS AND COMMUNITY STRUCTURE IN A SMALL OLIGOTROPHIC NEW HAMPSHIRE LAKE,
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 1004-1012, 1975. 5 fig., 1 tab., 33 ref.

Descriptors: *Biomass, *Aquatic plants, *New Hampshire, Ecological distribution, Distribution, On-site investigations, Productivity, Varieties, Habitats, Growth rates, Lakes, Eutrophication, *Oligotrophy.
Identifiers: *Hydrophytes, *Aquatic macrophytes, *Mirror Lake(NH).

A report summarizes hydrophyte biomass in Mirror Lake (New Hampshire) and discusses the probable hydrophyte contribution to the primary production of the 15-ha. oligotrophic lake. Mirror Lake vegetation, predominantly submersed, lacks emergent species. In shallow water diminutive species of isoetid farms predominate, forming dense multispecific mats and clumps. Although the species distributions forms a vegetational continuum, three not-wholly arbitrary zones can be delimited. A shallow zone (2-2 m) has a relatively high biomass, about 15 g dry weight per square meter, contributed mostly by the mat species (71%). The significant contribution (21%) by floating-leaved species is notable in view of their infrequency (less than 1% of the bottom between 2-2 meters is colonized by them). Biomass of the mat vegetation may locally exceed 140 g sq m while that of the water lilies may reach 400 g sq m. An intermediate zone is marked by the rapid disappearance at about 2 m of the common shallow-water species, and by the biomass peaks at 2-2.5 m of Utricularia purpurea and Isoetes tuckermani. Total biomass declines to low values (about 1.5 g dry weight sq m) at the base of this zone. A deep zone (5-7.2 m) is marked by the frequent appearance on boulders and cobbles of Fontinalis sp. and Batrachospermum sp., and on gyttja of Potamogeton berchtoldi, Drepanocladus fluitans, Fontinalis sp., and Nitella flexilis. Biomass increases between 6.5 and 7 m due to N. flexilis stands which locally exceed 40 g dry weight sq m. (Harris-Wisconsin)
W77-07969

PHOSPHORUS REGENERATION BY NATURAL POPULATIONS OF LIMNETIC ZOOPLANKTON,
R. H. Peters.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 273-279, 1975. 3 fig, 1 tab, 13 ref.

Descriptors: *Phosphorus, *Cycling nutrients, *Zooplankton, *Tracers, *Canada, Digestion, Lakes, Analytical techniques, Phosphorus radioisotopes, Daphnia, Crustaceans, *Lake Ontario, Bays, Great Lakes.
Identifiers: *Phosphorus excretion, *Bay of Quinte(Lake Ontario).

Experimentally-determined rates of phosphorus excretion for Cladocera and Copepoda from different lakes were compared with limits of phosphorus excretion rates derived from a model developed in earlier research. The validity of the experimentally-determined rates were tested by comparison with phosphorus ingestion rates. Total community excretion was estimated from community grazing rates and, in one case, from the population weight and number. Experiments were conducted in late August-early September, 1971 and 1972 in two lakes in the Experimental Lakes Area of the Fisheries Research Board of Canada and in the Bay of Quinte in Lake Ontario. Zooplankton uptake of phosphorus from the lake water was analyzed using two variations of molybdenum blue reaction. Phosphorus content of the zooplankton was also measured for specific activity determination. Phosphorus ingestion rates were determined from the accumulation of radioactivity by zooplankton feeding in-situ on phosphorus-labelled Rhodotorula cells for 5 minutes. After

sorting of the labelled animals, weight and species-specific phosphorus ingestion rates were calculated, taking into account animal radioactivity counts, radioactivity of the feeding suspension and animal dry weight. Radioactivity of the total zooplankton can be used to calculate the community grazing weight for each stratum, in meter intervals. The measured excretion rates showed high variation among measured values, but were generally within the limits predicted from the model established in the earlier research. (Harris-Wisconsin)
W77-07972

TEMPORAL AND SPATIAL PATTERNS OF DINOFLAGELLATE BLOOMS IN LAKE KINNERET, ISRAEL (1969-1974),
U. Pollingher, and T. Berman.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 1370-1382, 1975. 9 fig, 3 tab, 21 ref.

Descriptors: *Pyrrophyta, *Dinoflagellates, *Seasonal, *Distribution, *Eutrophication, *Inhibition, Phytoplankton, Growth rates, Biomass, *Spatial distribution, *Temporal distribution, Distribution patterns, Lakes, Algae.
Identifiers: *Lake Kinnerest(Israel), *Peridinium cinctum.

An outstanding feature of the cyclic growth pattern of algae in Lake Kinneret (Israel) is the annually-recurrant bloom of the dinoflagellate, Peridinium cinctum fa. westii, which lasts from about January until June. During this time, Peridinium dominates the phytoplankton assemblage and constitutes more than 90% of the total algal bloom. The present research identifies some characteristics of the Peridinium cells and details concerning temporal and spatial development of the bloom from 1969-74. It was noted that similar bloom patterns occur in dry years or in those with normal rainfall. It is suspected that an extended run of dry years would eventually lead to lower algal standing crops. Extreme horizontal and vertical patchiness is a regular feature of dinoflagellate blooms. It is assumed that the vertical migrations of the Peridinium are advantageous in permitting the algae to optimize light and nutrient conditions, but details of the organism's reactions to light intensities and varying nutrient concentrations are not known. Other ongoing studies on Peridinium, both in the lake and in laboratory cultures, are aimed at the following questions: (1) whether the Peridinium cysts play an active part in initiating the bloom or whether this only starts from swimming vegetative cells in the water; (2) the kind of mechanisms that trigger the excystation and encystation processes. (Harris-Wisconsin)
W77-07973

NUTRIENT LIMITATION IN A SMALL OLIGOTROPHIC LAKE IN NEW HAMPSHIRE,
D. Z. Gerhart.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 1013-1022, 1975. 5 fig, 3 tab, 24 ref.

Descriptors: *Limiting factors, *Nutrient requirements, *Biomass, *Primay productivity, Nitrogen, *Phosphorus, *Bioassay, Projections, Analytical techniques, Cycling nutrients, Eutrophication, *New Hampshire, On-site tests, On-site investigations, Lumbering, Forest watersheds, Lakes, *Oligotrophy.
Identifiers: Nutrient limitation, Deforestation, *Mirror Lake(NH).

In a series of experiments to determine whether disturbances from nearby road building and housing construction might accelerate eutrophication in Mirror Lake (New Hampshire), carbon-14 bioassays, enrichments of chemostat cultures of the natural phytoplankton community, and in-situ enrichments of large (1700-liter) polyethylene enclosures were employed in studies of nutrient limitation in the 15 ha oligotrophic lake. The present research deals with biomass changes in chemostat and polyethylene enclosures. In one of four chemostat bioassays, enrichment by nitrogen plus phosphorus of samples of Mirror Lake phytoplankton resulted in a 40% increase in carbon-14 uptake after only 10 hours, with production in the enriched chemostat nearly 5 times greater than that of the control sample by the third day. In experiments with polyethylene column enrichments, only nitrogen and phosphorus in combination stimulated growth. The experiments show that both nitrogen and phosphorus are required to stimulate photoplankton growth in Mirror Lake and that stimulation occurs with these nutrients both at very high and very low concentrations. Using an analogous watershed as a model, it is seen that nitrate loadings to the lake from nearby deforestation would not by itself provide a dangerous level of nutrient input; but if phosphorus loading from sewage or other sources were to appreciably increase at the same time, there could be a substantial increase in algal production and standing crop. (Harris-Wisconsin)
W77-07974

INFLUENCE OF SUSPENDED SEDIMENT ON THE TEMPERATURES OF SURFACE WATERS OF RESERVOIRS,
F. R. Schiebe, J. C. Ritchie, and J. R. McHenry.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, Part I, p 133-136, 1975. 2 tab, 2 ref.

Descriptors: *Suspended load, *Water temperature, *Turbidity, *Solar radiation, *Reflectance, Sediment load, Suspended solids, Aquatic environment, Reservoirs, *Mississippi, Sedimentation rates, Agricultural runoff.

Comparative studies on two small northern Mississippi reservoirs shows that suspended particles in the surface water may scatter solar radiation, with the resultant energy loss reducing surface temperatures and overall heat content levels of the entire impoundment. Even slight shifts in temperature can cause significant alterations in the aquatic ecosystem and thus affect water quality, speciation and numbers of fish available for harvest from agricultural reservoirs. The two reservoirs selected for measurement, with respective watershed areas of 82.1 hectares and 86.3 hectares, are adjacent to each other but have contrasting concentrations of suspended sediments; the watershed of one is primarily cultivated land while the other is mostly forested. Measurements of temperature profile, incident and reflected solar radiation, Secchi depth and concentrations of suspended sediments in the surface waters were made for one year in 1973-74. Equilibrium temperatures representing surface temperature of a body of water after a period of time for any given set of meteorological parameters) were assumed to be identical for the reservoirs because of proximity, and a comparison of surface temperatures taken throughout the study period showed that the reservoir with the least turbidity contained the greatest amount of energy. (Harris-Wisconsin)
W77-07975

OXYGEN UPTAKE OF SEDIMENTS IN CASTLE LAKE, CALIFORNIA,
P. A. Neame.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 792-799, 1975. 6 fig, 2 tab, 11 ref. NSF 35371.

Descriptors: *Oxygen, *Adsorption, *Lake sediments, *Oxygen demand, *Benthos, *Sediment-water interfaces, Photosynthesis, Oxidation-reduction potential, Respiration, Oxygenation, *California, Lakes.
Identifiers: *Castle Lake(Calif).

Research was conducted to determine depth of penetration of oxygen into the sediments and to evaluate magnitudes of oxygen demand by various components of the Castle Lake, California, benthic community. Oxygen profiles were determined from sediment samples, and redox potential was measured; microbial, macrofaunal, and sediment oxygen uptake rates were determined as was benthic oxygen production. Analysis of the resultant measurements for diffusion and mass transport, photosynthetic oxygen production, microbial chemical and macrofaunal oxygen uptake show that macrofauna respiration accounts for only a small part of total oxygen uptake. Microbial and chemical oxygen uptake consume more than 95% of the oxygen diffusing into each layer of the sediment. Photosynthetic production of oxygen in the first sediment layer is much greater than diffusion into that layer from the overlying water. Molecular diffusion across the sediment-water interface is insufficient to maintain the observed oxygen profiles. It is hypothesized that mass transport may be important in moving into the sediments. Respiratory movements of the macrofauna would, therefore, seem to be more important than their respiratory uptake per se in determining the observed oxygen uptake rate of the Castle Lake sediments. (Harris-Wisconsin)
W77-07976

PLANKTONIC PRIMARY AND BACTERIAL PRODUCTIVITY IN SHALLOW WATERS WITHIN A LARGE PHRAGMITES COMMUNITY (NEUSIEDLERSEE, AUSTRIA),
M. Dokulil.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, Part II, p 1295-1304, 1975. 8 fig, 24 ref.

Descriptors: *Productivity, *Phytoplankton, *Bacteria, *Bulrushes, Foreign countries, Littoral, Ice cover, Biomass, Seasonal, *Primary productivity, Lakes.
Identifiers: *Neusiedlersee(Austria).

Primary production measurements taken in 1968-1969 in the Scirpis-Phragmites community of the Neusiedlersee (an Austrian lake) as related to total incoming radiation, are described. The low under-ice phytoplankton biomass increased just before ice break-up and decreased until mid-JUne, followed by a rapid peak in August, which was dominated by Crytomonas, forming 83% of the total biomass. Later in the year with decreasing biomass, diatoms predominated. Bacterial biomass was high in winter and early spring and decreased after ice break-up until the end of August; in autumn, bacteria numbers increased and tended to fluctuate around 3 mg C/cu m until the end of the year. Autotrophic production was related to the increase in the bulrush biomass; heterotrophic production was generally highest in winter and autumn. Dark-carbon uptake and bacterial biomass were highly correlated whereas neither dark-C14-uptake and phytoplankton biomass, nor photosynthesis and dark assimilation appeared to be significantly correlated; thus bacteria were responsible for most of the dark uptake. Bacteria production exceeded primary production more than 10 times in October 1968 and more than 45 times in October 1969. Autotrophic and heterotrophic production, phytoplankton dynamis, and energy flows are diagrammed and discussed. (Auen-Wisconsin)
W77-07977

MICROBIAL ATP STUDIES,
B. K. Burnison.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, Part I, p 286-290, 1975. 2 tab, 9 ref.

Descriptors: *Bacteria, *Measurement, *Biomass, *Analytical techniques, Carbon, Filtration, Separation techniques, Bioassay, Microbiology, Pollutant identification.
Identifiers: *Adenosine triphosphate, Nuclepore filters, Millipore filters.

Analysis for bacterial adenosine triphosphate (ATP) and subsequent calculation of bacterial biomass (microgram C/l) by substracting the phytoplankton carbon derived from total ATP measurements rests on the accuracy of particle size fractionation. The efficiency of size fractionation by Nuclepore filters, as opposed to Millipore filters, is substantiated by the described experimental procedures. Use of screens and Nuclepore filtration is an accurate technique to separate bacterial biomass from that of other aquatic life forms. It has been previously shown that a 10 micron nylon screen will separate bacterial and/or yeast populations from the remaining biomass depending on the size of predominant phytoplankton species. Microscopic examination of the filtrates should be made of the initial water sample to ensure that the bacterial count is not being significantly changed and there are no other life forms present. One disadvantage of Nuclepore filters is that they are unsuitable for filtering large volumes of particulate matter because the pores do plug up, but continuous washing or agitation may alleviate this problem. However, the extreme sensitivity of the ATP assay should negate the necessity of using large volumes. (Auen-Wisconsin)
W77-07978

POPULATION ECOLOGY AND PRODUCTION OF BENTHIC DETRITIVORES,
P. M. Jonasson.
Verhandlungen Internationale Vereinigung Limnolgie, Vol 19, Part II, p 1066-1072, 1975. 3 fig, 3 tab, 6 ref.

Descriptors: *Benthic fauna, *Productivity, *Life cycles, Food habits, Diptera, Tubificids, Growth rates, Foreign countries, Detritus, Lakes, Productivity.
Identifiers: *Detrivores, *Lake Esrom(Denmark), Chironomus anthracinus, Potanothrix hammoniensis.

Differences in the ecology and production of the surface feeding detrivore Chironous anthracinus and the subsurface feeding Potamothrix hammoniensis were studied in the temperate Lake Esrom, Denmark. Their metabolic activity seems mainly to depend on temperature and oxygen supply. C. anthracinus has a much higher metabolic rate than the subsurface feeder, which is especially remarkable at the lower oxygen concentrations, because its critical limit for oxygen uptake is slightly lower than for P. hammoniensis. The surface feeder lives nearer to recently-produced food, while the subsurface feeder utilizes bacteria and organic compounds which likely have passed through the intestine of the surface feeder. Thus C. anthracinus feeds on high energy food at the mud surface whereas P. hammoniensis feeds on subsurface low energy food. The surface feeder has a much higher growth rate--its life cycle is 1-2 years versus 4-6 years; production is ten times higher--75.3 kcal sq m versus 7.9 kcal sq m. Turnover rates are much higher for C. anthracinus (4.0 for the first year and 0.8 for the second year) than for P. hammoniensis (0.82). (Auen-Wisconsin)
W77-07979

VISUAL OBSERVATIONS OF PHOSPHORUS MOVEMENT BETWEEN ALGAE, BACTERIA, AND ABIOTIC PARTICLES IN LAKE WATERS,
Department of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
H. W. Paerl, and D. R. S. Lean.
Journal of Fisheries Research Board of Canada, Vol. 33, No. 12, p. 2805-2813, 1976. 18 fig., 20 ref.

Descriptors: *Analytical techniques, *Cycling nutrients, *Phosphorus, *Sorption, *Algae, *Bacteria, Detritus, *Canada, Phosphates, Lakes, Path of pollutants.
Identifiers: *Biotic phosphorus excretion, *Autoradiography, *Lake Hart(Ontario).

Rapid transfer of phosphorus from dissolved phosphate to the particulate fraction has been observed in lake waters during summer but the relative importance of uptake by algae, bacteria, or abiotic particles has been undefined. Using autoradiography combined with tracer kinetics this investigation noted the transfer of P33-phosphorus into plankton and the appearance of labeled colloidal material within minutes. By combining microautoradiography and scanning electron microscopy, microscopic forms of algae, bacteria, detritus and colloidal matter were separated to learn the sequence in which bacteria, algae, and suspended particles remove P33-phosphorus from solution and to determine the physical appearance of excreted material suspected of containing labeled phosphorus. Bacteria initially showed much more dense labeling but, since the algal biomass greatly exceeds the bacterial biomass, algal P33-phosphorus incorporation represented the most significant uptake pathway. After 2 hours, P33 accumulated in both the detrital aggregates which were harboring bacteria and the 'capsular' material surrounding Anabaena. Examination showed fibrillar and amorphous particles of colloidal size (.05-0.5 micrometer). It is suggested that constituents of a colloidal pool of phosphorus are microscopically similar to extracellular products of cell metabolism. In view of the fact that phosphorus is a growth-limiting factor in most lakes, several diverse hypotheses are considered to explain why phytoplankton and bacteria excrete copious amounts of phosphorus, and its ecological significance. (Auen-Wisconsin)
W77-07983

STABILITY IN STRUCTURE AND FUNCTION OF THE MUD-WATER INTERFACE,
B. T. Hargrave.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1073-1079, 1975. 2 fig., 1 tab., 14 ref.

Descriptors: *Sediment-water interfaces, *Mud-water interfaces, *Oxidation-reduction potential, *Stability, Respiration, Oxygenation, Biochemical oxygen demand, Chemical oxygen demand, Lakes, Bays, Canada.
Identifiers: *Lake Esrom(Denmark), *Bedford Bay Basin(Nova Scotia).

Observations in Lake Esrom, Denmark and Bedford Bay, Nova Scotia confirm two postulates: (1) that an intact sediment-water interface has physical and chemical stability properties which regain equilibrium levels soon after disturbance; and (2) that the depth of the surface oxidized layer can be thickened by aeration only to a limited extent, thus establishing a balance between oxygen supply and utilization. Temporal changes in the depth of oxygen penetration and rates of oxygen uptake partitioned beteen chemical oxidation and biological respiration were compared to indicate that physical stratification and metabolic processes within a sediment-water interface are closely related and rapidly stabilized to steady-state levels after disturbance. Changes in redox profiles in reconstituted mud cores from the lake and the marine bay indicated rapid formation of an oxygenated mud-water interface to a depth similar to that observed in freshly-collected undisturbed cores. Measurements of oxygen uptake, initially high during restratification, demonstrated that chemical oxidation is replaced by biological respiration due to bacterial colonization, which approaches equilibrium within two weeks. The addition of tube-dwelling invertebrate or debris from a senescent algal culture did not significantly alter either the final equilibrium level of community metabolism or the rate at which it is achieved. (Auen-Wisconsin)
W77-07985

THE CONTRIBUTION OF AUTOCHTHONOUS AND ALLOCHTHONOUS MATTER TO THE TROPHY OF A RIVER IN THE BARBEL REGION,
Lodz Univ. (Poland). Dept. of Comparative Anatomy and Animal Ecology.
T. Penczak, M. Molinski, and M. Zalewski.
Ekologia Polska, Vol. 24, No. 1, p. 113-121, 1976. 3 fig., 3 tab., 20 ref.

Descriptors: Rivers, *Energy budget, *Seston, *Phytoplankton, Nutrients, Primary productivity, *Organic matter, *Trophic level.
Identifiers: *Pilica River(Poland), *Allochthonous matter, Nutrient sources, *Autochthonous matter.

Caloric contributions of phytoplankton and of seston were measured in the Pilica River, below the mouth of the River Czarna Konecka, Poland. Mean annual respiration was about 14% gross production and mean annual gross production was 538.43 mg oxygen/sq m/24 hr. As based on caloric oxygen equivalent, the amount of chemical energy produced was 689.73 kcal/sq m/yr. Phytoplankton production was measured by dark-light bottle technique. Quantitative seston samples were taken by filtering water through a planktonic No. 25 net and by means of water centrifugation, then dried or combusted. The centrifugation method proved several times more efficient. The caloric value of seston in an annual cycle ranged from 1.03040 to 2.1267 cal mg dry weight. The caloric value of organic matter in 1 cu m of water averaged 5990.4 cal and the flow of organic matter in the river bed cross section was 152.75 kcal/sec, which corresponds to about 13,000 megacal/24 hr. Comparison of the caloric value of the autochthonous matter to the caloric value of seston per 1 cu m water, indicated that the role of phytoplankton in the fertilization of the river is slight when compared to the allochthonous input. (Auen-Wisconsin)
W77-07986

THE INVERTEBRATES ON SUBMERGED MACROPHYTES IN THREE MASURIAN LAKES,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
G. J. Soszka.
Ekologia Polska, Vol. 23, No. 3, p. 371-391, 1975. 12 fig., 5 tab., 50 ref.

Descriptors: *Invertebrates, Mollusks, Oligochaetes, Midges, *Submerged plants, Pondweeds, Aquatic plants, *Littoral, *Benthos, Benthic fauna, Biological communities, Lakes, Biomass, Census, Population.
Identifiers: *Macrophytes, Potamogeton lucens, Potamogeton perfoliatus, Myriophyllum spicatum, Elodea canadensis, Composition, *Poland(Masurian lakes).

The composition and number dynamics of invertebrates inhabiting the submerged macrophytes, Potamogeton lucens, P. perfoliatus, Myriophyllum spicatum, and Elodea canadensis, were analyzed and compared with littoral benthos. The community of invertebrates found to associate with macrophytes consisted of a variety of groups having different biology, with Chironomidae, Oligochaeta and Mullusca the most abundant The numbers of invertebrates changed noticeably over time, space, and on different species of macrophytes. Numbers of invertebrates were larger on P. lucens and P. perfoliatus than on E. canadensis and M. spicatum, but because the E. canadensis and M. spicatum biomass per square meter on the littoral bottom was greater, the numbers of fauna per square meter on the bottom area overgrown with these macrophytes was larger than in the pondweed environment. Analysis of benthos close to these macrophyte-associating fauna indicated that although the same groups of invertebrates dominated, the species composition of these groups and the number dynamics of both communities varied, and the littoral benthos was usually less abundant. While the macrophyte-associating invertebrates and benthic fauna came into contact, differences in composition and num-

bers showed that these were two different communities. (LuedtkesWisconsin)
W77-07987

THE INFLUENCE OF MINERAL FERTILIZATION ON PHYTOPLANKTON PRODUCTION IN LAKES OF VARIOUS TROPHIC TYPES,
Instytut Rybactwa Srodladowego Olsztyn Kortowo (Poland). Zaklad Hydrobiologii.
B. Zdanowski.
Ekologia Polska, Vol. 24, No. 2, p. 167-195, 1976. 16 fig., 5 tab., 75 ref.

Descriptors: *Lakes, *Phytoplankton, *Productivity, Nitrogen, Phosphorus, Potassium, Lime, *Trophic level, *Dystrophy, *Eutrophication, Hydrogen ion concentration, Water chemistry, Respiration,Lake morphology, *Fertilization, Secchi disks, Light penetration, Water temperature.
Identifiers: Lake Smolak(Poland), Lake Piecek(Poland), Lake Dgal Maly(Poland), Lake Czarna Kuta(Poland), Water transparency.

Phytoplankton production changes under the influence of mineral fertilization was studied over the period 1970-1974 on four lakes with different trophic and morphometric conditions. Nitrogen and phosphorus were applied to all lakes three times per year, and potassium was added once a year to three of them. Liming of the dystrophic lakes was carried out each winter. The greatest water chemistry changes were noted in the two dystrophic lakes, Smolak and Piecek. Changes included a constant increase in calcium and potassium content, a higher pH value, and a higher electrolytic conductivity, however, no changes were noted in nitrogen and mineral salt content. The higher production growth was also found in the dystrophic lakes. Gross production in Lake Smolak showed an increase from around 0.5 to 3.1 mg of oxygen/l/day together with a drop in water transparency and share of respiration in gross production. Lake Piecek showed an increase from about 1.5 to 6.5 mg of oxygen/l/day with no changes in water transparency and share of respiration. No production changes were found in the deep Lake Dgal Maly throughout the study period, while the maximum production period moved from autumn to summer in the shallow eutrophic Lake Czarna Kuta. The latter was accompanied by a drop in production below 1 m, a drop in water transparency and light conductivity, and a growth in the variability of the share of respiration in gross production. (Leuudtke-Wisconsin)
W77-07988

PHOSPHORUS: CHANGES IN ECOSYSTEM METABOLISM FROM REDUCED LOADING,
D. R. S. Lean, M. N. Charlton, B. K. Burnison, T. P. Murphy, and S. E. Millard.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 240-257, 1975. 7 fig., 1 tab., 17 ref.

Descriptors: *Phosphorus, *Bottom sediments, *Cycling nutrients, Productivity, Algae, Nitrogen, *Canada, On-site invesrgation, *Lake Ontario, Lakes, Bays, Path of pollutant, *Metabolism.
Identifiers: *Bay of Quinte(Ontario).

Phosphorus movement between sediments and overlying waters that remained unstratified and that were never anoxic was investigated in eutrophic Bay of Quinte on the northern shore of Lake Ontario, where the respective loading rates for phosphorus and nitrogen were 1.46 and 19.0 g/sq m. The investigations were conducted by means of 25 sq m enclosures, one fertilized with 0.707 g phosphorus/wk and a second to which a similar amount of phosphorus was added and also 9.19 g nitrogen/wk, with the movement of phosphorus compared to a control enclosure. In addition to phosphorus movement within the community, exchange rates between the open water, the littoral zone and the sediments was measured with isotopelabeled phosphorus. The results indicated that concentration of phosphorus in water is controlled by sediment properties. Net release of large amounts of biologically-available phosphorus occurred only after energy input of sedimenting organic matter during the summer. Net phosphorus movement in water was to the sediments. Thus reduction of nutrient input to shallow lakes may not change the total analytical phosphorus concentration but since the load of sedimenting material would be reduced, heavy mid-summer algal blooms would occur less frequently. (Auen-Wisconsin)
W77-07989

SEDIMENTATION: MEASUREMENTS IN EXPERIMENTAL ENCLOSURES,
M. N. Charlton.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 267-272, 1975. 4 fig., 3 tab., 9 ref.

Descriptors: *Sedimentation, *Measurement, *Nutrients, *Canada, Phosphorus, Dispersion, Cycling nutrients, On-site investigations, Lake Ontario, Lakes, Bays, Pollutant identification.
Identifiers: *Bay of Quinte(Ontario).

Nutrient accumulation in sediments was measured by sedimentation rates in equilateral triangular experimental enclosures (limnocorrals) containing about 100,000 liter of water and associated sediments in the Bay of Quinte, Ontario. The experiment used three containers enriched respectively with phosphorus plus nitrogen, phosphorus alone, and an unenriched control. Dry weight sedimentation was generally the same in all corrals, but sedimentation in the corral receiving phosphorus plus nitrogen was usually greater than in the enclosure receiving only phosphorus and the control. The results were consistent with those measured in open lake water and may be used for calculation of phosphorus sedimentation. The traps did not measure storage but rather the rate at which phosphorus arrived at the bottom to be recycled, although actual return rates must have been higher than settling rates in order to support aufwuchs growth on the sides of the corral. If the role of phosphorus already stored in sediments is neglected, then water column phosphorus in corrals I, II and III would be recycled 12, 14, and 34 times per year, respectively, at the rates computed from the experiments. (Auen-Wisconsin).
W77-07990

BACTERIAL DECOMPOSITION OF DIFFERENT POLYSACCHARIDES IN A EUTROPHIC LAKE,
W. Reichardt.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 2636-2642, 1975. 4 fig., 9 ref.

Descriptors: *Carbohydrates, *Biodegradation, *Bacteria, *Eutrophication, Productivity, Carbon, Europe, Organic compounds, Water temperature, Cycling nutrients, Lakes.
Identifiers: *Polysaccharide biodegradation, *Mindel Lake(Germany).

Laboratory experiments using water samples from Mindel Lake, near Constance, West Germany, were conducted with natural strains of Cytophaga species and C. johnsonae in pure cultures to determine bacteria population densities suffiecient to degrade various solid, beta-linked polysaccharides to provide an indicator of the potential of biodegradation. Population density sufficiency for degradation of solid polysaccharides were determined on mineral agar containing suspensions of either chitin, xylane or cellulose. Bacterial degradation of these substrates was indicated by clearing zones around the colonies. However, peptone or yeast extract seemed to suppress this reaction. When grown on nutrient broth or glucose, Cytophaga sp., the most predominant polysaccharide degrading bacteria in the lake, was inhibited on two levels: (1) in mixed cultures the dissolved organic matter prevented Cytophaga from competing successfully with other populations, and (2) in pure cultures of C. johnsonae it repressed the production of chitinases. Culture experiments indicated that not only are carbon sources efficient in the environmental control of bacterial degradation of polysaccharides, but temperature was also able to control the competition of the polysaccharide degrading Cytophage with other bacteria, as well as their production of polysaccharide-degrading enzymes. (Auen-Wisconsin).
W77-07991

ELECTRON TRANSPORT ANALYSIS AS AN INDICATOR OF BIOLOGICAL OXIDATION IN FRESHWATER SEDIMENTS,
A. P. Zimmerman.
Verhandlungen Internationale Verinigung Limnologie, Vol. 19, Part II, p. 1518-1523, 1975. 3 fig., 10 ref.

Descriptors: *Analytical techniques, *Biodegradation, *Oxidation reduction potential, *Bottom sediments, Microorganisms, Metabolism, *Georgia, Lakes, *Bioindicators.
Identifiers: *Electron transfer, Tetrazolium analysis, *Lake Jackson(Geo).

Tetrazolium analysis detects the potential for electron transfers in microorganisms regardless of whether they are aerobic, anaerobic or fermentative and this non-discrimination may be useful in determining biological oxidation capacities of sediments. A theoretical model can be constructed for microbial electron transport; from eucaryotic data, one can determine the reduction activity of INT or (2-p-iodophenyl)-(3-p-nitrophenyl)-5-phenyl tetrazolium chloride and thus measure the activity on any metabolic pathway which includes the flavo-protein-cytochrome pathway. This electron transport system analysis was tested on sediment cores taken from Lake Jackson in southeast Georgia, and showed that phaeophytin and pollen particularly indicate a high rate of sedimentation. Preliminary experiments showed that electron transport system activity response of exhausted and non-exhausted sediments to various organic and inorganic substances differs; thus tetrazolium salts can be used successfully in detecting electron transfers in sediments and the analysis itself is useful in determining the capacity of a system for biological generation of electrons. Its use in a lake with an unusually high sedimentation rate may be helpful in explaining the relationship between the biological and chemical reactions of sediments and in assessing the impact of watershed hydragraphic events on lake sediments. (Auen-Wisconsin).
W77-07992

PLANKTONIC MICROBIAL HETEROTROPHY: ITS SIGNIFICANCE TO COMMUNITY BIOMASS PRODUCTION,
R. H. Monheimer.
Verhanlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 2658-2663, 1975. 1 fig., 1 tab., 13 ref. SNF GB-39974.

Descriptors: *Analytical techniques, *Microorganisms, *Productivity, Measurement, Sulfates, Aerobic conditions, Biomass, Microbiology.
Identifiers: *Heterotrophic production.

A method of measuring microbial heterotrophic production by sulfur uptake is proposed. The idea of using sulfur as a yardstick is based on the presence of carbon and sulfur innaturally-occuring organic matter at an average 500:1 ratio; under aerobic conditions, a microbial community utilizes sulfate as its primary sulfur source, and organic sulfur uptake by microplankton is insignificant as compared to the uptake of sulfate-sulfur. Therefore, since sulfate is the only significant source of

sulfur utilized by aerobic microplankton, sulfate uptake should be representative of total biomass production at an average 500:1 C:S ratio. The technique is basically the same as the carbon-14 method for determining primary production except that sulfur-35 labeled sulfate is used and ambient sulfate concentrations must be measured. Laboratory measurements of microbial heterotrophy assumed that if photosynthesis was the only process taking up carbon and sulfate when incubation occurred in the light, then the measured C:S uptake ratios should vary around and average out to 500:1, i.e., more sulfate-sulfur was taken up than could be accounted for by photsynthesis alone, thus the high sulfate uptake must have been caused by microbial heterotrophic production. How to partition the heterotrophic from the photosynthetic production is described. (Auen-Wisconsin).
W77-07993

OPTIMAL GROWTH TEMPERATURES AND MEDIA PARAMETERS OF BACTERIAL COMMUNITIES FROM LAKES OF DIFFERENT TROPHIC STATES,
R. Guerrero, F. Roda, C. Abella, and F. Torrella.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 2620-2626, 1975. 2 fig., 4 tab., 5 ref.

Descriptors: *Bacteria, *Growth rates, *Trophic level, Density, Physiological ecology, Nutrient requirements, Water temperature, Europe, Cultures, Analytical techniques, *Lakes.
Identifiers: *Spain(Lakes).

Parameters useful in determining bacterial populations adapted to specific temperatures and nutrient factors are discussed; a description is given of media and temperature differentials to distinguish between bacterial types grown on agar plates, to facilitate distinguishing between similar plate counts. Samples were collected from oligotrophic, mesotrophic, eutrophic, and heavily polluted lakes in northeastern Spain. The plate count method was used to construct quotients, defined as an 'auxotrophy index' (Ia)--representing bacteria that can grow on a rich medium (CPS) but not on a poor one; and a 'psychrophily index' (Ip)--indicating the ratio of bacteria that can grow at 20C but not at 37C. Thus in oligotrophic lakes Ia is small relative to Ip, while the reverse is true in highly eutrophic lakes. In an oligotrophic lake the number of bacteria adapted to live exclusively under auxotrophic conditions is much lower than the number adapted to the psychrophilic life. The contrary happens in a highly eutrophic lake, thus the concentration of organic material and growth factors is much higher in a eutrophic lake and this higher concentration somehow changes the species compsition of the bacterial community, and consequently their adaptation to the changing environment. (Auen-Wisconsin).
W77-07994

THE INFLUENCE OF TEMPERATURE AND BACTERIAL NUMBERS ON THE HETEROTROPHIC UPTAKE OF C14 GLUCOSE IN WEST BLUE LAKE, MANITOBA,
G. G. C. Robinson, and L. Brandt.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 2616-2619, 1975. 2 tab., 12 ref.

Descriptors: *Productivity, *Organic compounds, *Carbon, *Absorption, *Bacteria, Radioactivity techniques, Tracers, *Water temperature, *Canada, Cycling nutrients, Analytical techniques, Lakes.
Identifiers: *West Blue Lake(Manitoba), *Heterotrophic uptake.

The influence of temperature upon bacterial uptake of C14 glucose was investigated in West Blue Lake, Manitoba, by experiments in which uptake was determined throughout the water column, and consequently at different environmental temperatures, and then the maximum uptake velocity calculated. On three sampling dates during summer 1972, a positive correlation was found between uptake and temperature, although the composition of the bacterial populaton may have differed. Analysis of covariance indicated no significant difference between slopes of the lines calculated for each experiment although there were differences in intercepts. On the basis of the covariance analysis, the data was combined and a Q10 value of 3.129 was calculated. If it is assumed that uptake of C14 glucose represents at least a partial measure of potential bacterial production, then it is apparent from the results that both environmental temperature and plate counts of bacteria contribute to such production. (Auen-Wisconsin)
W77-07995

EXTRACELLULAR RELEASE IN PLANKTONIC BACTERIA,
T. G. Dunstall, and C. Nalewajko.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 2643-2649, 1975. 3 fig., 1 tab., 25 ref.

Descriptors: *Productivity, *Organic compounds, *Bacteria, *Exudation, Microorganisms, *Carbon, Plankton, Pseudomonas, Organic matter, Cycling nutrients, Primary productivity, Waste assimulative capacity.

In primary production experiments any dissolved organic compounds in the filtrates are assumed to be of algal origin, however assimilation of organic carbon excreted by algae and subsequent excretion of dissolved organic carbon by bacteria may also contribute to the extracellular carbon pool and thus modify the composition and the quantity of dissolved organic matter originally excreted by the algae. Extracellular compounds excreted by Pseudomonas fluorescens were investigated on glucose, fructose or sucrose substrates with indications that with these substrates excretion if Pseudomonas is low and does not represent a significant carbon loss in experiments of several hours duration. Similarly, mixed heterotrophic populations provided with glucose, glycollate, and alanine showed negligible excretion up to 24 hours. After two days' incubation, however, Pseudomonas growing on glucose excreted 30% of the assimilated carbon in high molecular weights with indications that some of these may be polysaccharides; rates of polysaccharide production and excretion depend on the type of substrate and concentration as well as on various environmental factors. Direct excretion could not be experimentally distinguished from indirect formation by abiotic processes. It is likely that while low molecular weight algal and bacterial extracellular products are rapidly utilized by heterotrophs, large molecular weight compounds, by further complexing and binding, may grow to colloidal and particulate dimensions. (Auen-Wisconsin)
W77-07996

CHANGES IN THE PROPERTIES OF E. COLI UNDER THE INFLUENCE OF WATER ENVIRONMENTS,
For primary bibliographic entry see Field 5A.
W77-07997

BIOLOGICAL LONG-TERM INVESTIGATIONS OF SWEDISH LAKES,
T. Willen.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1117-1124, 1975. 6 fig., 14 ref.

Descriptors: *Baseline studies, *Biological communities, *Indicators, Trophic level, Benthic fauna, Plankton, Chlorophyll, Data collections, Phosphorus, Nitrogen, Lakes.
Identifiers: Lake Malaren(Sweden), Lake Vanern(Sweden), Lake Vattern(Sweden), Lake Hjalmaren(Sweden), *Sweden.

Biological communities recorded between 1964 and 1974 in the Swedish Lakes Vanern, Vattern, Malaren and Hjalmaren are compared to determine the degree of water quality improvement. The comparison was especially important in Lake Malaren, where after 1969 there had been a decreased input of nutrients, low water levels, higher Secchi disk transparency values and a tendency toward decreasing phytoplankton biomass. The abundance of oligochaetes, however, has increased. General water quality improvement has not bettered oxygen conditions in the hypolimnion, which may partially explain the oligochaete development; another factor is the alteration of influent water followed by longer residence time and increased sedimentation. Small changes in the species composition in Lake Vattern indicate a slow, gradual change from true oligotrophic conditions, but local industrial influences in the northern and southern parts have induced greater changes. Study of the bottom fauna in these lakes has yielded basic data and by analyzing some ecologically significant species it is possible to perform correlations and to specify the trophic level. (Auen-Wisconsin)
W77-07998

PHOSPHORUS RELEASE FROM A HIGHLY EUTROPHIC LAKE SEDIMENT,
L. Bengtsson.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1107-1116, 1975. 5 fig., 4 tab., 16 ref.

Descriptors: *Phosphorus, *Lake sediments, *Cycling nutrients, *Eutrophication, Nutrient removal, Shallow water, Diversion, Nutrient requirements, Lakes.
Identifiers: *Lake rehabilitation, *Lake Sodra Bergundasjon(Sweden), Phosphorus budget, Sewage diversion.

Sediment phosphorus release and its effect on the recovery of Lake Sodra Bergundasjon (Sweden) were investigated after sewage effluent diversion. Experimental results were based on mean release under anoxic conditions and no relationship was apparent between the concentrations of phosphate, iron, and manganese in the interstitial and bottom waters. Nor was there any apparent direct connection between the phosphate concentrations in the interstitial water and the phosphate release in the laboratory experiments, as the phosphate concentrations in the water at the termination of the experiments exceeded the interstitial water connections during sampling. The experimental results showed a high potential for anoxic phosphorus release from the sediments but of the same magnitude as the maximum value calculated from a mass balance of phosphorus for the lake. Due to the high phosphorus regeneration from the sediments, phosphorus will probably not become a limiting factor for the primary production in the near future although 97.5% of the phosphorus load has been diverted. (Auen-Wisconsin)
W77-07999

STUDIES ON THE ROLE OF DETRITUS IN FRESH WATER LAKES,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
L. S. Clesceri, C. W. Boylen, S. Kobayashi, and R. Park.
FWI Report 76-9, October 1976. 29 p. 17 fig., 2 tab., 7 ref.

Descriptors: *Detritus, *Carbon, *Bottom sediments, *Biodegradation, *Degradation(Decomposition), Tributaries, Nitrogen, Phosphorus, Solubility, Polymers, Cellulose, Sorption, Pore water, Model studies, Cycling nutrients, *New York.
Identifiers: Lake George(NY).

The relative importance of detritus decomposition and allochthonous inputs in supplying carbon, nitrogen and phosphorus for the biomass, as well as the bio-degradability of the particulate organic matter from both sources were investigated in Lake George (New York) and two of its tributaries. Preliminary conclusions indicate that: (1) allochtonous dissolved organic carbon inputs from streams significantly exceed the particulate organic stream loadings; (2) organic polymer decomposition in sediment is mediated by temperature and agitation. Dependence on dissolved nutrient levels exists for brook delta sediments but not for littoral sediments; (3) the flocculent layer serves as a filter for nutrients initially through physicochemical mechanisms; (4) vertical distributions of nitrate anions, ammonia ions, phosphorus anions, and DNA occur in sediment cores and that their levels vary for different sediments; and (5) conversion of dead biological material to particulate organic matter takes place at varying rates characteristics of the source of the material. Mineralization occurring in the compacted sediment layers probably does not normally result in enrichment of the upper water column; the highly-sorptive flocculent layer probably acts as a barrier to the release of intersititat water nutrients, and the sorptive capability of the particles suspended in the water column. (Auen-Wisconsin)
W77-08001

CHEMICAL INTERACTIONS IN A EUTROPHIC LAKE,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
D. B. Aulenbach.
FWI Report 76-6, August 1976. 41 p. 16 fig., 4 tab., 18 ref.

Descriptors: *Eutrophication, Control, *Nutrient removal, Anaerobic conditions, Cyanophyta, Estimated costs, Chemcontrol, Mechanical control, Oxygenation, Silica, Dissolved oxygen, *New York, Runoff, Nuisance algae, Lakes.
Identifiers: *Lake restoration, *Saratoga Lake(NY).

Interreltionships among carbon dioxide, oxygen, light penetration, iron, phosphate, ammonia, nitrate nitrogen, silica and predominant algal forms were correlated with the presence or absence of oxygen and with biological productivity in eutrophic Saratoga Lake in eastern New York. The lake receives raw, partially and fully treated sewage effluents and agricultural runoff from the watershed and from an influent stream. The hypolimnion is devoid of oxygen during summer stratification and there is a marked oxygen deficiency below the 6 m level in the epilimnion on calm days. To reduce the trophic level, one proposed step was diversion of sewage effluents; however only 26% of the nitrogen and 17.5% of the phosphorus is contributed by the watershed's effluents and the influent creek contributes 1.36 mg/l of N and 0.3 mg/l P, thus diversion would not reduce these nutrient levels sufficiently to control the nuisance algae. Other alternatives considered were reaeration, phosphorus precipitation by chemicals and addition of silicon on the premise that diatoms would supplant the blue-green algae. Cost estimates of alum, lime, ferric chloride and sodium silicate were compiled, based on the present 116,000 kg P yr input and projected loading of 95,300 kg P/yr after completion of the sewage treatment plant and effluent diversion. The least costly lake renovation approach would be an air reaeration system representing $130,000 capital costs and $11,000 for annual operation. (Auen-Wisconsin)
W77-08002

THE PROBLEM OF THE BEHAVIOR OF CHEMICAL POLLUTANTS IN THE ENVIRONMENT, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W77-08028

INFLUENCE OF MUSSEL METABOLITES ON THE DYNAMICS OF NUTRIENTS IN THE COASTAL WATERS OF THE EASTERN MURMAN COAST, (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Institut (USSR).
A. N. Golovkin, G. P. Garkavaya, and I. V. Churbanova.
Okeanologiya 16(3), p 451-456, 1976.

Descriptors: *Phosphates, *Organic wastes, *Nutrients, *Phosphorus, *Nitrogen, Mussels, Surveys, Water chemistry, Water pollution, Coasts.
Identifiers: Metabolites, USSR, *Murman Coast(USSR).

Hydrochemical surveys were made in the Porchnikha and Vyselkovskaya (southern) USSR gubas (inlets) in July-Aug., 1971- and 1972, to determine the influence produced by the populations of East Murman mussels on the hydrochemical regime of the littoral zone. The highest phosphate, organic P and organic N concentrations were characteristic of the areas corresponding to the water level during the low tide or the initial phase of the high tide, i.e., places with the most dense mussel populations. Growth in NO3 concentrations was not related to mussel grounds. A noticeable enrichment of water with phosphates at the initial phase of the high tide may originate from muussel metabolites accumulated during drainage in the mantle cavity as corroborated by calculations. The observations made in the 1972 mass mussel mortality showed that no growth in phosphate concentrations occurred at the initial phase of the high tide. Sharp changes in the content of nutrients in the coastal water may evidently be attributed to their isolation by mass organisms.--Copyright 1977, Biological Abstracts, Inc.
W77-08043

THE AVAILABILITY OF CHLOROPHYLLIDE IN HYDROPHYTES AND ALGAS OF LAKE TRASIMENO AND THE VARIABILITY OF PIGMENT CONTENT IN SPIROGYRA, (IN ITALIAN),
Perugia Univ. (Italy). Istituto di Orto Obot.
M. Antonielli, and M. R. Cagiotti.
Riv. Idrobiol 14(1/2), p 3-12, 1975.

Descriptors: Algae, *Pigments, Lakes, Variability, Aquatic plants, *Chlorophyl, Water temperature, Light, Water pollution, *Aquatic algae.
Identifiers: Azolla-Filiculoides, Chara-Sp, *Chlorophyllide, Cladophora-Sp, *Hydrophytes, Lemna-Trisulca, Myriophyllum-Spicatum, Phragmites-Communis, Ranunculus-Aquatilis, *Spirogyra, Spirogyra-Irregularis, Lake Trasimeno(Italy).

Large amounts of chlorophyllide were found in the following water plants; Spirogyra irregulris N., Cladophora sp., Chara sp., Azolla filicuuloides, Myriophyllum spicatum, ranunculus aquatilis, Lemna trisulca, Phragmites communis. The variability of pigments in Spirogyra during the last year was investigated and the highest chlorophyllide content in the wild types was found from March-May; at the same time the highest chlorophyll content was also found; the chlorophyll alpha/chlorophyllide ratio was near 4. With controlled conditions of temperature and light the highest content of green pigments was obtained in Spirogyra growing at 15 degrees C and 58.10-3 cal cm-2.m-1. This content decreased at 0 degrees C and lower light (9.7.10-3 cal cm-2.m-1); with the highest light at 22 degrees C the chlorophyllide increased by the chlorophyll decreased and the chlorophyll alpha/chlorophyllide ratio approached 3.--Copyright 1977, Biological Abstracts, Inc.
W77-08044

5D. Waste Treatment Processes

WORKSHOP PROCEEDINGS – RESEARCH NEEDS RELATED TO RECYCLING URBAN WASTEWATER ON LAND,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 073, Price codes: A08 in paper copy, A01 in microfiche. Conference held June 19-21, 1974 in Harrisburg, Pennsylvania, Published June, 1974. 155 p. OWRT B-061-RI(1).

Descriptors: Water reuse, Recycling, Research priorities, *Sludge, *Waste water treatment, *Municipal wastes, Public health, Management, Legal aspects, Political aspects, Social aspects, Vegetation, Topography, Soils, Climates, Cities, *Waste water disposal, Institution, Environment.
Identifiers: *Land disposal, *Municipal wastewater.

A significant increase in land disposal of municipal wastewater and sludge has occurred recently in the U.S. However, concomitantly there is a lack of definitive data on parameters and constraints which must be considered in the design and operation of land disposal systems under varying environmental conditions. Therefore, a series of workshops attempted to summarize what is known about land disposal and what information is available, and to determine specific research needs as related to specific characteristics (climate , soils, geology, topography, vegetation). This workshop, sponsored by Northeast Water Center Directors, was held in Harrisburg, Pa., June 19-21, 1974. Workshop topics covered the following aspects: Social, political-legal-institutional, economic, biological and chemical, hydrological and physical, engineering and management, environmental and public health. The workshops and subsequent proceedings are intended to provide directives for future research in this area of critical importance. (Sink-Penn State)
W77-07607

EXAMINATION OF SEWAGE SLUDGE FOR ENTEROVIRUSES, VOLUME 2,
Ontario Ministry of Health, Toronto. Lab. Services Branch.
For primary bibliographic entry see Field 5B.
W77-07615

EXPERIENCE OF THE PAVLODAR OBLAST PUBLIC HEALTH SERVICE IN SANITARY PROTECTION OF THE IRTYSH RIVER, (IN RUSSIAN),
For primary bibliographic entry see Field 5G.
W77-07686

REVIEW OF COLOUR REMOVAL TECHNOLOGY IN THE PULP AND PAPER INDUSTRY,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
R. J. Rush, and E. E. Shannon.
--Economic and Technical Review Report EPS-3-WP-76-5, Environmental Protection Service, April, 1976, 113 p., 23 fig., 7 tab., 249 ref.

Descriptors: *Pulp and paper industry, *Waste water treatment, Effluents, Lignins, Aquatic environment, Land disposal, *Pulp wastes, Water pollution control, Color, Ozone, Reviews.
Identifiers: *Color removal, Effluent treatment system, Ozonation, Alum, Chemical treatment, Color control regulations.

--Developmental work on several processes for color reduction has reached full scale application and color removal is now required in many local areas. Color reduction can be achieved by either technical changes within the mill or by effluent

treatment systems. In-plant modification can range from simple, inexpensive measures such as pulp washing and better housekeeping practices, to complex technological changes such as implementation of oxygen bleaching. There are a large number of external treatment methods which are known to be technically feasible for color removal from pulp and paper mill effluents. Chemical treatment methods based on precipitation with Ca2+, Mg2+, A13+ and Fe3+ have advanced to the stage of full scale application, as has the resin separation method of Uddeholm-Kamyr. The Rohm and Haas resin process, membrane processes (both ultrafiltration and reverse osmosis) and activated carbon adsorption have been tested on a large scale, while certain foam separation techniques, ozonation and extraction with amines have been examined on a smaller laboratory scale. These methods are known to be technically feasible, but the question of economics remain to be answered by further large and full scale testing. Several other methods have been and are being investigated. These include irradiation treatment, adsorption on fly ash and other waste materials, adsorption on activated alumina, land disposal, electrolysis and biological treatment. Color removal technology, although advancing rapidly, is still in its infancy. Many methods are known to work, but due to the wide range of effluents in the industry, no one method is likely to be applicable to all types. Therefore, research should continue to develop many viable alternatives for treatment. There is room for innovation in this aspect of wastewater treatment. (WATDOC)
W77-07734

UTILIZATION OF FLY ASH IN POLISHING OXIDATION POND EFFLUENTS,
North Dakota Univ., Grand Forks. Engineering Experiment Station.
Y.-T. Hung.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 307, Price codes: A05 in paper copy, A01 in microfiche. North Dakota Water Resources Research Center, Fargo. Research Report, WI-221-037-76, August 1976. 76 p, 5 fig, 40 tab, 8 ref. OWRT A-046-NDAK(1), 14-34-0001-6035.

Descriptors: *Oxidation lagoons effluents, *Tertiary treatment, Adsorption, *Fly ash, Filtration, *Organic wastes, Chemical oxygen demand, *North Dakota, Great Plains, Montana, *Waste water treatment.
Identifiers: Eastern North Dakota, Saskatchewan, Total organic carbon.

Sixteen fly ashes were investigated for their organic pollutant removal efficiency in the tertiary treatment of oxidation pond effluents in eastern North Dakota. The majority of fly ashes used were from the northcentral region including North Dakota, South Dakota, Montana and Saskatchewan. Both shaking runs (batch units) and filtration runs (continuous units) were employed. Mechanisms of organic removal by fly ashes were due to coagulation and adsorption by metallic oxides and also due to carbon adsorption. From batch tests it was found that increase in fly ash concentration resulted in an increase in TOC removal; sizes of fly ash and pretreatment of fly ashes employing washing of fly ashes did not have definite effect on the TOC removal for oxidation pond effluents. From continuous filtration tests it was shown that fly ash contained a high proportion of small particles which need to be removed before a reasonably high filtration rate can be attained. All filtration runs except the first run used those portions of fly ash with particle sizes larger than 0.0029 inches (U.S. sieve No. 200). Using a filtration rate of 0.0717 gpm/ft2, which is commonly used in the slow sand filters, TOC removal by fly ashes was found to vary from 50 percent to 92.48 percent. Stratification of fly ash has effect on both the TOC removal and the filtration rate during the filtration study. The ungraded fly ash has the highest TOC removal but the lowest filtration rate, while the fine at top to coarse at bottom stratificatiion has the lowest TOC removal but the highest filtration rate. It was also found that TOC removal decreases as filtration rate increases. Filtration process appears to be a better process than batch process for TOC removal of oxidation pond effluents.
W77-07815

DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION,
Kansas Water Resources Research Inst., Manhattan.
K. A. Bishop, and H. F. Rosson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 324, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, KWRRI Contribution NO. 186, January 1977. 62 p, 10 fig, 17 tab, 18 ref, append. OWRT A-065-KAN(1), 14-31-0001-5016.

Descriptors: *Feed lots, Water pollution control, *Waste disposal, *Farm wastes, *Incineration, *Oxidation, Energy, *Byproducts, *Waste treatment, Effluents.
Identifiers: *Manure disposal, *Wet oxidation, Supplemental energy, Waste incineration.

Control of Water Pollution from feedlot operations continues to be a major problem. In certain cases, the choice of a disposal process which will result in a saleable by-product could partially or completely defray the expense of manure disposal. A process in which energy is the by-product is thermodynamically feasible; about half of the heating value of the manure can be recovered as useful thermal energy. A process was envisioned in which wet, undried feedlot manure would undergo a wet oxidation reaction followed by a second incineration step to complete the oxidation, with requisite heat exchange to recover thermal energy. In support of the wet oxidation step, experimental data on heating value, equilibrium oxidation, and kinetic rate were obtained. These data correspond reasonably well to literature values for domestic sewage sludge, the principal variation probably being due to particle size distribution. Because small particle size tends to favor rapid kinetics, control thereof should lead to lower pressure operation in smaller equipment, resulting in capital and operational economies. Because of the very dilute nature of the wet oxidation effluent and the low heating value of the contained solids, use of a second-stage incinerator was counterproductive to the overall system.
W77-07816

HIGH GRADIENT MAGNETIC SEPARATION OF FOOD PROCESSING WASTEWATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Environmental Sciences and Engineering.
J. A. Petruska.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 440, Price codes: A06 in paper copy, A01 in microfiche. Master's thesis, March 1977. 92 p, 11 tab, 28 fig, 49 ref. OWRT A-065-VA(1).

Descriptors: *Waste water treatment, Liquid wastes, Industrial wastes, Turbidity, *Separation techniques, Phosphorus, Chemical oxxygen demand, Organic wastes, Sampling, Activated carbon, Adsorption, *Food processing industry.
Identifiers: *Food processing, Waste treatment, *High gradient magnetic separation.

The amenability of food processing wastewater to treatment by High Gradient Magnetic Separation was studied. Initially, soluble organic removal by a combined use of activated carbon adsorption and HGMS was investigated. The studies with known concentrations of soluble starch revealed that although adsorption of the starch could be accomplished, the removal of the activated carbon in the magnetic separator was inefficient. At concentration levels of 3,000 mg/l and 6,000 mg/l, only approximately 70 percent of te activated carbon could be removed from the water slurry by HGMS. Actual composite wastewater samples collected from a food processing unit were treated by magnetic separation. Certain parameters such as color plus turbidity, chemical oxygen demand, total phosphorus, and solids were monitored to determine the effectiveness of the treatment. In most cases reductions in these parameters after magnetic treatment were noted.
W77-07852

FACTORS AFFECTING NITRIFICATION,
Engineering-Science, Inc., Atlanta, Ga.
M. R. Hockenbury, G. T. Daigger, and C. P. L. Grady, Jr.
Journal of the Environmental Engineering Division-ASCE, Vol 103, No EE1, p 9-19, February, 1977. 1 fig, 3 tab, 13 ref.

Descriptors: *Nitrification, *Bacteria, *Organic matter, *Activated sludge, Domestic wastes, Industrial wastes, Dissolved oxygen, Growth rates, Aeration, Hydrogen ion concentration, *Waste water treatment.

Laboratory studies were conducted to investigate factors which affect nitrification. These included the effect of heterotrophic bacteria and organic compounds on nitrifying bacteria, and the possible adverse effects created by material released in waste water during treatment in a plug flow activated sludge aeration basin. Results indicated no effects by actively metabolizing heterotrophic bacteria upon nitrate production by autotrophic nitrifiers. Domestic sewage did not affect nitrate production by nitrifying bacteria when inhibitory industrial wastes were absent. No adverse effects from treatment in plug flow activated sludge aeration basins were found when suitable pH and dissolved oxygen levels were maintained for autotrophic nitrifiers. Heterotrophic bacteria released growth factors which slightly stimulated autotrophic nitrifier activity. Many inhibitory compounds in tested sewage were apparently degraded within the first half-hour of activated sludge treatment. (Collins-FIRL)
W77-07854

STUDIES ON ADSORPTION WITH ACTIVATED CARBON,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. H. Y. Tebbutt, and S. J. Bahiah.
Effluent and Water Treatment Journal, Vol 17, No 3, p 123-127, March, 1977. 7 fig, 1 tab, 5 ref.

Descriptors: *Adsorption, *Activated carbon, Analysis, Chemical oxygen demand, Chemical properties, Physical properties, Separation techniques, Water purification, Toxicity, Carbon, *Waste water treatment.

Adsorption studies using activated carbon were conducted to gather information on low organic concentrations in treated waste water and polluted raw waters. Factors involved in adsorption are surface tension, capillary condensation, chemical adsorption, and physical adsorption. Test results revealed that fatty acids and lipids were adsorbed more efficiently on activated carbon than carbohydrates. Amino acids were adsorbed to an even lower degree. There is a predictable increase in adsorbability with the increase in the molecular weight of a compound class. There is also a trend towards increased adsorbability with decreased solubility for a given compound class. Designing an efficienct adsorption facility rests on a knowledge of water and waste water chemical composition, and on the use of parameters such as TOC or COD. Adsorption may not always be a suitable removal process since the adsorption behavior of organic compounds varies considerably. (Collins-FIRL)

W77-07855

BIOLOGICAL PHOSPHATE ELIMINATION OF PRELIMINARILY CLEANED COMMUNAL WASTE WATER BY USE OF IRON BACTERIA (BIOLOGISCHE ENTPHOSPHATUNG VORGEREINIGTEN KOMMUNALEN ABWASSERS UNTER MITWIRKUNG VON EISENBAKTERIAN),
G. Bringmann.
Zeitschrift fuer Wasser und Abwasser Forshung, Vol 9, No 6, p 195-196, 1976. 1 fig.

Descriptors: *Phosphates, *Biological treatment, *Oxidation, Microorganisms, Carbon dioxide, Iron, *Sewage treatment, Pilot plants, Treatment facilities, *Waste water treatment.

A report was presented of a model plant for the removal of biological phosphate from the phosphate-rich effluent of a sewage treatment plant after biological pretreatment. It was found that autotrophic microorganisms, gaining their chemoenergy from oxidation of Fe(2+) to Fe(3+) as they assimilated carbon dioxide, provided an effective means of phosphate removal. (Collins-FIRL)
W77-07856

PROCESS STABILITY OF ACTIVITY SLUDGE PROCESSES,
Pirnie (Malcom), Inc., White Plains, N.Y.
C. H. Chiang.
Journal of the Environmental Engineering Division-ASCE, Vol 103, No EE2, p 259-271, April, 1977. 3 fig, 3 tab, 2 append.

Descriptors: Model studies, *Stability, *Kinetics, *Mathematical models, *Activated sludge, Chemical properties, Physical properties, *Waste water treatment, Sludge treatment, Sewage effluents.
Identifiers: Retention times, Substrate concentrations.

Process stability indicators were developed and their importance considered for completely mixed activated sludge processes. Kinetic and mathematical models were used to determine the relationship of stability indicators. Process response and the transient concentration of soluble effluent substrate characterized process stability. Solids retention time and hydraulic detention time were found to be very important in the determination of process response. Transient soluble effluent substrate was found to be a function of solids retention time and influent substrate concentration. Hydraulic detention time in this case was unimportant. (Collins-FIRL)
W77-07857

CONCENTRATION OF BACTERIA IN WATER USING THE ULTRAFILTRATION METHOD, (IN FRENCH),
Institut National de la Sante et de la Recherche Medicale, Villeneuve D'Ascq (France). Ecotoxicol. Microb. Unit.
P. A. Trinel, and H. Leclerc.
Ann Microbiol (Paris) 127B(2); p 201-212, 1976.

Descriptors: *Bacteria, *E. coli, *Filtration, Separation techniques, *Waste water treatment, Water treatment.
Identifiers: *Ultrafiltration method.

The experiments with Escherichia coli allow the selection of an ultrafiltration apparatus which concentrates bacteria with high recovery efficiencies. The use of this concentrator is simple and fast. Its filtration power is very stable and its capacity allows the continuous ultrafiltration of large volumes of water.--Copyright 1977, Biological Abstracts, Inc.
W77-07860

ESTIMATING COSTS OF WASTE WATER SLUDGE DISPOSAL,
Boyle Engineering Corp., Orlando, Fla.
For primary bibliographic entry see Field 5E.
W77-07861

NITRIFICATION IN SOIL TREATED WITH DOMESTIC AND INDUSTRIAL SEWAGE SLUGE,
Georgia Univ., Experiment. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W77-07862

GERMAN POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W77-07863

DIRECT AND INDIRECT WASTE WATER REUSE FOR MUNICIPAL PURPOSES,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
H. I. Shuval.
Ambio, Vol 6, No 1, p 63-65, 1977. 11 ref.

Descriptors: *Water reuse, *Water purification, Domestic water, Irrigation, *Municipal water, *Potable water, Pathogens, Toxicity, *Waste water treatment, Treatment facilities, Water quality control, Planning.
Identifiers: *Israel.

The reuse of waste water in Israel was discussed. It is hoped that eventually waste water will be reusable for unlimited domestic purposes, and that it will provide a source of potable water. Limited municipal uses now include firefighting, irrigation of parks and recreational areas, and street cleaning. Highly treated water can be used in public buildings, and in homes for toilet flushing. Even for these applications, purification would have to assure freedom from microbiological hazards. One problem is that there are inadequate standards for pollutants and contaminants in drinking water. Many bacterial pathogens are effectively countered by chlorination but others are resistant. There should be an established maximum allowable concentration or limit for each potentially hazardous chemical found in renovated waste water. Tolerance levels to known toxicants should also be established. If waste water is to be reused domestically, a full-scale epidemiological evaluation of such reuse should be conducted. Regardless of these problems, the reuse of waste water for agricultural, industrial, and non-potable municipal purposes should be considered until more complete answers to these questions are provided. (Collins-FIRL)
W77-07866

SILK FROM SOW'S EARS.
Engineering News-Record, Vol 198, No 15, p 52, April, 1977.

Descriptors: *Recycling, *Sludge treatment, *Waste disposal, Fuels, Metals, Treatment facilities, Planning, Costs, *Waste water treatment, Combustion.

Various projects being developed for refuse and sludge recycling were described. A solid waste and sludge recycling plant will be constructed in Wilmington, Delaware. The operation combines metal and gas recovery with a process to provide fuel for a powerplant and compost production. It will cost about $30 million for the plant to process 1,000 tons/day of refuse and 50 tons/day of dry sludge. Another facility for Monroe County, New York, will process 2,000 tons/day of solid wastes at a cost of nearly $20 million. An electric company in St. Louis dismissed a proposed facility because of difficulty in obtaining collection sites. Increased transportation costs, the inability of boilers to accept the material, and possible damage to boilers from waste combustion, eliminated Tennessee Valley Authority plans to burn refuse from its fossil-fueled plants. Seattle, Washington, is considering a pyrolysis plant similar to the one in South Charleston, West Virginia, which is experimenting with sludge disposal. (Collins-FIRL)
W77-07867

SAVE SLUDGE HANDLING COSTS BY LEVEL CONTROL,
Markland Specialty Engineering, Ltd., Toronto (Ontario).
J. R. Tansony.
Modern Power and Engineering, Vol 71, No 3, p 34, March, 1977.

Descriptors: *Sludge treatment, *Costs, *Automatic controls, *Sludge disposal, Slurries, Suspended solids, Pumps, Treatment facilities, Flow, Performance, Equipment, *Waste water treatment.

Reductions can be made in sludge treatment and handling costs by the use of an automatic sludge level control. Significant savings result from the removal of excess water, which is nearly 90% of sludge composition. The process involves pumping sludge from clarifiers or settling tanks at the highest suspended solids level possible with the minimum of water possible. To institute automatic control, the optimum sludge blanket for each clarifier and/or settling tank must be known. The level should not be allowed to vary more than a few inches from this optimum. A sludge blanket detection probe is needed, and one has been developed which works on the principle of ultrasonic adsorption. This system operates accurately even in opaque slurries and resists fouling in slimy wastes. Pumping solids only on demand and maintaining an optimum sludge blanket level reduces the amount of gallons discharged from the sludge pump for added handling. Potential savings are high and equipment costs would be quickly repaid. (Collins-FIRL)
W77-07868

'HYDIG'-ONE EXAMPLE OF CONTROLLED SLUDGE USE,
For primary bibliographic entry see Field 5E.
W77-07871

WASTE WATER PLANTS USE LESS INSTRUMENTATION THAN RELATED INDUSTRIES,
Raytheon Co., Portsmouth, R.I.
A. E. Molvar, J. F. Roesler, R. H. Wise, and R. H. Babcock.
Water and Wastes Engineering, Vol. 14, No. 4, p 58, 60-61, April, 1977. 2 fig, 1 tab.

Descriptors: *Treatment facilities, Automation, *Instrumentation, Costs, Equipment, *Automatic control, Operations, Maintenance, *Water quality standards, Measurement, Computers, *Waste water treatment.

Waste water treatment plants were found to use less instruments and automatic controls than related water supply and chemical processing plants. The average secondary plant allocates about 3% of construction costs for installed instruments, although related industries allocate from 6 to 8% for this purpose. About 2% was allotted for remote satellite, wet-weather treatment plants. Only central, computerized, storm water-routing and in-line storage systems had an apparently adequate number of instruments and automatic controls. Reasons for this included the lack of a profit motive to produce high quality effluent; no legal penalties for low quality effluent and poor enforcement of effluent standards and guidelines; lack of commercially available, reliable instruments for process parameter measurement; oversized plant capacity that allows for less controlled operations; and a lack of familiarity with instrumentaton practices and needs. Unreliable sensors were a major problem. They created more main-

tenance problems than their industrial counterparts. Successful controls were used for automatic liquid-level, liquid-flow rate, and air-flow rate control. Systems for controlling chemical addition, residual chlorine feedback, and digester temperature worked well. Computers were used for data acquisition in 20% of the facilities studied; only two facilities had process control computers. Storm water control with computer supervision was seen in three facilities. Research on and the development of reliable instruments was highly recommended. (Collins-FIRL)
W77-07872

FINANCING: THERE MUST BE A BETTER WAY,
Quad-City Solid Wastes Committee, Paterson, N.J.
For primary bibliographic entry see Field 5G.
W77-07873

WASTE WATER RECLAMATION IN ST. CROIX,
Black, Crow and Eidsness, Gainesville, Fla.
O. K. Buros.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 429-435, March, 1977. 5 fig, 2 tab, 3 ref.

Descriptors: *Groundwater recharge, *Groundwater resources, *Water reuse, Artificial recharge, Groundwater availability, Sewers, Water use, Water conservation, Treatment facilities, Desalination, *Virgin Islands.
Identifiers: *St. Croix(Virgin Islands).

A report was presented on waste water reclamation in St. Croix, U. S. Virgin Islands. The advent of tourism and industrial and economic development has greatly increased water demand on the island while depleting groundwater supplies. Various water reuse schemes have been investigated. Groundwater recharge received much attention in preventing deterioration of well field and augmenting water supplies. Interceptors and pumping stations are being constructed to deliver waste water to a central treatment plant. The quality, quantity, and movement of surface and groundwaters were studied intensely to determine placement of these facilities for the best advantage. The reclamation plant is a completely mixed, activated sludge plant with aeration tanks, clarifiers, solids removal by coagulation and flocculation with aluminum sulfate, filtration, and chlorination. Artificial recharge began in 1974 and studies indicated that expansion of the program was economical and technically feasible. The program is expensive, but much cheaper than the desalination programs which were tried. (Collins-FIRL)
W77-07875

SURVEY PREDICTS 33 PERCENT MUNICIPAL COMPLIANCE WITH 1977 DEADLINE,
For primary bibliographic entry see Field 5G.
W77-07877

1976 NEEDS SURVEY MARKEDLY LOWER,
For primary bibliographic entry see Field 5G.
W77-07878

TELESCOPING FORM SYSTEM SPEEDS SEWER CONCRETING.
For primary bibliographic entry see Field 8F.
W77-07879

GAS DETECTORS DETERMINE HEALTH HAZARDS IN SEWAGE TREATMENT.
For primary bibliographic entry see Field 5A.
W77-07880

HOW TO DETERMINE WASTE WATER FLOW,
For primary bibliographic entry see Field 5F.
W77-07881

A NEW VACUUM SEWAGE SYSTEM BY IFO WARTSILA.
Shipbuilding and Marine Engineering International, Vol 99, No 1204, p 684-686, December, 1976. 1 fig.

Descriptors: *Sewerage, Boats, *Sewage disposal, Storage, Piping, Pollution abatement, Pressure conduits, Plumbing, Economics, Waste disposal, Storage.
Identifiers: Vacuum pressure, Marine sanitation.

A new marine vacuum sewage system was introduced by Swedish firms. All sanitary fittings are connected to a piping system kept under partial vacuum pressure. This pressure is generated by pumps at the outlet end of the system. Sewage is pumped to a holding tank which can be emptied at port or directly into the sea in unrestricted waters. The holding tank need not be a vacuum tank and the vacuum system may be connected to any receptacle under atmospheric pressure by a special discharge unit. The holding tank can be designed to accommodate available space or an existing facility may be used. The components of the system are more expensive than a conventional system, but the freedom of pipe routing which benefits the sewage system and other ship sub-systems, along with the retrofit installation advantages, provide many cost reductions. Only 1.2 liters of water are used per flushing, and the toilet water can be separated from other waste water. This creates water savings and produces about 10 liters of sewage per person per day, as compared to 200-300 liters for conventional gravity flow systems. (Collins-FIRL)
W77-07882

INCREASING SEWER CAPACITY BY POLYMER DOSING,
Bristol Univ., (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W77-07883

STUDY OF IN-SERVICE BITUMINIZED FIBER SEWER PIPE,
University of South Florida, Tampa. Dept. of Structures, Materials, Fluids.
For primary bibliographic entry see Field 8G.
W77-07884

MOVEMENT JOINT FOR CONCRETE SEWER BRIDGE.
For primary bibliographic entry see Field 8F.
W77-07885

HANDLING SMALL AMOUNTS OF CRUDE SEWAGE.
For primary bibliographic entry see Field 8G.
W77-07886

PIPES FOR SEWERAGE AND SURFACE WATER.
For primary bibliographic entry see Field 8G.
W77-07887

THE CONCEPTION, DESIGN, AND CONSTRUCTION OF METROPOLITAN TORONTO MID-TORONTO SEWER,
Maclaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 8B.
W77-07888

IMPROVEMENT AND EXPANSION OF THE DRAINAGE SYSTEM OF HAMBURG,
Abwassentechnische Vereinigung e. V., Bonn (West Germany).
E. Kuntze.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 499-502, March, 1977.

Descriptors: *Drainage systems, *Water quality control, *Public health, *Combined sewers, *Separated sewers, Urban drainage, Cities, Pollution abatement, Storm water, Treatment facilities, Overflows, Construction, Engineering structures, Waste water treatment.
Identifiers: *Hamburg(West Germany).

The City of Hamburg, West Germany, has embarked on a program to improve its drainage system. Deterioration of its waterways and the rapid growth following its devastation after World War II made improvements and expansion of drainage and water treatment systems necessary. The system was primarily a combined sewer system with separate sewers added to accommodate post-war expansion. Results of this construction, aided by geographical considerations, were increased loads of existing trunk sewers which led to frequent storm overflows, and sewers which were overloaded by the increased per capita water consumption. A study revealed that nearly 1,000 kilometers of the system were older than 50 years and needed renovation; 92% of the population was connected to the drainage system; most of the industrial firms were connected to the drainage system or had their own treatment facilities; treatment efficiency was between 50 and 94%; and about 75 million cubic meters of highly polluted storm water was discharged into smaller city streams and created extreme pollution. The proposed solutions involve stopping the direct disposal of untreated waste water into natural water resources; banning disposal of treated effluents into streams incapabele of sufficient self-purification; reducing overflows from combined sewers and relocating storm overflows to more suitable areas; expanding treatment plants which discharge effluents into the Elbe; renovating the old central drainage system and improving its capacity; building new sewers in areas already built up, but not connected to the drainage system; and finding an economical treatment for storm water from separated systems before disposal. The city is applying model studies, electronic analysis, flow control investigations, and economic analysis in various investigations of the best means for solving these problems. (Collins-FIRL)
W77-07890

MARINE SANITATION METHOD AND DEVICE,
Filteron Systems Inc., Dallas, Tex. (Assignee).
G. H. Behrendt, and J. L. Potter.
United States Patent 4,009,104. Issued February 22, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 4, p 1264, February, 1977. 1 fig.

Descriptors: *Patents, Equipment, Sewage treatment, Saline water, Sanitary engineering, *Waste water treatment, Electrolysis, Water purification, Storage.
Identifiers: Marine sanitation.

A patent was issued for an automatic marine sanitation unit and sanitation method. The system incorporates two storage tanks, a sewage inlet to the first tank, and a separator for solids beyond a determined size limit. A means is provided for the circulation of salt water containing sewage from the first to the second tank while the first tank is filling. The effluent passes through an electrolytic cell during this transfer. A portion of treated effluent is returned to the first tank. (Collins-FIRL)
W77-07891

COAL DISTN. WASTE LIQUOR PURIFICN. TO REMOVE PHENOLS, AMMONIA- AND HYDROGEN SULPHIDE BY 2-STAGE SOLVENT EXTN. AND DISTN.,
South African Patent ZA 7600-011. Issued November 11, 1976. Derwent French Patents Abstracts, Vol. Y, No. 4, p D4, March, 1977.

Descriptors: *Patents, *Separation techniques, *Phenols, *Ammonia, *Hydrogen sulfide, Distillation, Liquid wastes, Sewage treatment, *Waste water treatment, Treatment.

A patent was issued for a method to remove monohydric and polyhydric phenols, hydrogen sulfide, and free and combined ammonia from sewage by extracting and distilling waste water formed during degasification or gasification of coal with subsequent biological purification. Most of the monohydric phenol, part of the polyhydric phenols, and any free fatty acids present are separated by extraction. Phenols are separated by distillation. Next, a major portion of the polyhydric phenols is separated and the remainder of the monohydric phenols and free fatty acids are separated by extraction with an organic solvent. Phenols in this extract are changed to their salts which are then washed. This mixture is separated into an organic and aqueous phase. The organic phase is recycled, and free phenols are separated from the aqueous phase by surplus C02 and by decanting and/or extraction with the organic solvent or the sump product. (Collins-FIRL)
W77-07892

OXYGEN ADDN. REGULATION IN WATER AND SEWAGE PURIFICN.--USING EJECTORS TO SECURE INTIMATE CONTACT WITH ACTIVATED SLUDGE,
Belgian Patent BE 845-103. Issued February 14, 1977. Derwent Belgian Patents Abstracts, Vol. Y, No. 6, p J3, March, 1977.

Descriptors: *Patents, *Oxygenation, Treatment facilities, Oxygen, Sludge treatment, Sewage treatment, Activated sludge, Water purification, Dissolved oxygen, Gases, *Waste water treatment.

A patent was issued for oxygen addition regulation in water and sewage purification. The process is designed for plants with at least one treatment unit mounted in cascade. A gas with a 20-45% volume of oxygen is introduced in the finely divided state to produce a great agitation of the waste water. Two units in cascade are fed with water from the inlet on the suction side of the pump which also recycles partially purified water containing activated sludge. This mixture is pumped through an ejector to meet the recycled gas from a compressor. Activated sludge from the settlement tank has a flocculant structure and goes into suspension in the liquid in the first unit. Technical oxygen is introduced in a quantity dependent upon the content of biodegradable materials in the water. Oxygen in the first unit water is maintained at 1-4 milligrams/liter. A rapid transfer of oxygen to the liquid and of dissolved oxygen in the liquid to the finely divided activated sludge is assured. The amount of dissolved oxygen can be maintained at a constant value despite variations in the rate of the raw water supply. (Collins-FIRL)
W77-07893

FLOTATION TREATMENT OF WASTE WATER AND SEWAGE-USING GAS CONTG. OXYGEN IN DEEP PIT TO FLOAT THE PARTICLES,
French Patent FR 2306-745. Issued December 10, 1977. Derwent French Patents Abstracts, Vol. Y, No. 6, p J3, March, 1977.

Descriptors: *Patents, *Separation techniques, *Flotation, Equipment, *Waste water treatment, Sewage treatment, Sludge treatment, Air, Gases, Oxygen.

A patent was issued for the flotatior treatment of waste water and sewage. The device is composed of a tank with a pit beneath it which contains rising and descending passages separated by a partition. These passages are connected above and below the partition. The upper passage extends above the tank base and contains a means for directing flow. The rising passage opens in a flotation chamber near a separator, and the upper end of the chamber opens in a flotation tank. Gas containing oxygen is injected into the two passages. The bubbles of the gas are injected into the descent passage and move down to where the pressure is greatest and their size is reduced. Most of the bubbles are completely absorbed by the water at the lowest levels. When the water rises, the bubbles reappear and grow. air bubbles attach to the particles which pass through the opening into the flotation chamber, and raise the solids to the surface where they are raked off and evacuated. Substantial sludge recycling is possible without sedimentation, thereby avoiding long anaerobic tank treatment. Special compression chambers or decompression systems are not necessary to achieve flotation. (Collins-FIRL)
W77-07894

MACERATOR-STERILIZER SEWAGE TREATMENT SYSTEM,
General American Transportation Corp., Chicago, Ill. (Assignee).
P. A. Saigh, and A. J. Glueckert.
United States Patent 4,012,322. Issued March 15, 1977. Official Gazette of the United States Patent Office, Vol. 956, No. 3, p 958-959, March, 1977. 1 fig.

Descriptors: *Patents, *Domestic wastes, *Liquid wastes, *Sewage treatment, Automatic controls, Temperature, Heat treatment, Equipment, Sewage effluents, *Waste water treatment.
Identifiers: *Sterilization.

A patent was issued for a sterilizer sewage treatment system which collects, treats, and discharges toilet wastes. The system is composed of a collection tank, a sterilization tank and a transfer pump which is connected to the collection tank and to the sterilization tank by a power-operated valve transfer mechansim. Liquid sewge is measured into the sterilization tank where the temperature is elevated to a preset level. Automatic controls and sensors operate the valves, pumping, and heating mechanisms to control effluent flow. (Collins-FIRL)
W77-07895

SEWAGE TREATMENT APPARATUS,
Sloan Valve Co., Franklin Park, Ill. (Assignee).
J. D. Snodgrass, and J. J. Pilolla.
United States Patent 4,013,557. Issued March 22, 1977. Official Gazette of the United States Patent Office, Vol. 956, No. 4, p 1379, March, 1977. 1 fig.

Descriptors: *Patents, *Electrolysis, *Electrodes, Equipment, Water purification, *Waste water treatment, Liquid wastes, Waste treatment, Treatment facilities, Mechanical engineering, *Sewage treatment.

A patent was issued for an apparatus providing for the electrolytic treatment of sewage. This treatment occurs in a casing with electrodes positioned between the casing inlet and a valve adjacent to the discharge outlet. A fluid is introduced to this treatment zone to provide agitation and turbulence which produces a homogeneous sewage liquid. Projections above the treatment area, and adjacent to the electrodes aid sewage reducdtion. (Collins-FIRL)
W77-07896

CONTROL OF AEROBIC BIOLOGICAL GROWTH IN ACTIVATED CARBON WASTE TREATMENT,
Australian Patent 480,396. Issued June 25, 1973. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 47, No. 5, p 382, February 17, 1977.

Descriptors: *Patents, *Activated carbon, Suspended solids, Organic matter, Filtration, Oxygen, Chemical oxygen demand, *Waste water treatment, Water purification, Pollution abatement.

A patent was issued for a process to remove suspended and dissolved organic matter from waste water. The waste water is pretreated for removal of suspended matter and passed through at least one activated carbon bed to remove dissolved contaminants. Oxygen is added to the bed at a rate of 0.09-0.15 pounds per pound of COD contaminants removed. (Collins-FIRL)
W77-07897

AUTOTHERMAL AEROBIC DIGESTION,
Union Carbide Corp., Tonawanda, N.Y.
L. C. Matsch, and R. F. Drnevich.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 296-310, February, 1977. 3 fig, 10 tab, 7 ref.

Descriptors: *Aerobic treatment, *Sludge digestion, Temperature, Oxygen, Design criteria, Metabolism, Laboratory tests, Physical characteristics, Chemical characteristics, Waste water treatment, Nutrients.
Identifiers: *Aerobic digestion.

Union Carbide has studied aerobic digestion systems using high purity oxygen since 1972. Aerobic digestion at temperatures greater than 45 C produces a sludge which is practically pathogen-free and more suitable for land or ocean disposal. A high degree of digestion at a residence time of 5 days or less can be obtained at this temperature. Reducing vaporization losses allows the oxygen to utilize the exothermal nature of endogenous metabolism and maintain the temperature above ambient. Autothermal thermophilic aerobic digestion (ATD) is self-regulting due to a decrease in the digestion rate when temperature rises above 60 C and the system inhibits nitrification to decrease oxygen requirements. The process is very stable and recovers from extreme equipment malfunctions and operator errors within hours of correction of the problem.The sludge from this system dewaters as well as anaerobically digested sludge. A higher degree of digestion at the same retention time, an improved oxygen use and no pathogen leakage are advantages of the two-stage thermophilic digestion system over the single stage system. Defining 'stable sludge' from an aerobic digestion system was also a part of the investigation. Different degrees of stability are required depending upon the means of ultimate disposal. The ATAD process was found to be less costly than a mesophilic system because of small reactor volumes, lower oxygen requirements, less energy requirements, and the production of a pathogen-free sludge. (Collins-FIRL)
W77-07898

EXPERIENCES IN EVALUATING AND SPECIFYING AERATION EQUIPMENT,
Black and Veatch, Kansas City, Mo.
J. R. Stukenberg, V. N. Wahbeh, and R. E. McKinney.
Journal Water Pollution Control Federation, Vol. 49, No. 1, p 66-82, January, 1977. 13 fig, 7 tab, 18 ref.

Descriptors: *Aeration, Equipment, *Activated sludge, Theoretical analysis, Oxygen demand, Performance, Design criteria, Testing, Evaluation, Sludge treatment, *Waste water treatment.

The advancement of testing methods and knowledge of aeration theory have allowed the proper application and evaluation of aeration equipment. Testing of aeration equipment is important, even though it adds to installation costs, because performance cannot be accurately predicted. Criteria for choosing equipment should include: oxygen requirements, maximum power use allowable, turndown requirements, mixing, noise, mist or spray, allowable power variation, and method of testing. The steady state and non-steady state aeration equipment tests are valid, although they do contain problems. Problems with the steady state test are the determination of the rate of 02 uptake by activated sludge and of the 02 transfer coefficient, and the correct values of DO saturation and of the DO residual. Problems with the non-steady state test are the values of DO saturation used for the determination of the 02 transfer rate coefficient and possible cobalt interference on the Winkler DO analysis. Direct analysis of test data is valid as a supplement to conventional methods of determining 02 transfer rate coefficients. (Collins-FIRL)
W77-07899

INTERMITTENT SAND FILTRATION FOR UPGRADING WASTE STABILIZATION POND EFFLUENTS,
Utah Water Research Lab., Logan.
S. E. Harris, J. H. Reynolds, D. W. Hill, D. S. Filip, and E. J. Middlebrooks.
Journal Water Pollution Control Federation, Vol 49, No 1, p 83-102, January, 1977. 12 fig, 9 tab, 7 ref, 1 append.

Descriptors: *Filtration, *Soil filters, *Filters, *Oxidation lagoons, Performance, Economics, Suspended solids, Phosphorus, Nitrification, Temperature, Costs, *Waste water treatment, Water purification, Sewage effluents.
Identifiers: *Sand filtration.

A simple, economical, low maintenance treatment method was found necessary for polishing lagoon effluent to meet the requirements of PL 92-500. The need was especially urgent because many communities with a population of less than 5,000 use stabilization ponds for economical waste water treatment and lack operators and maintenance crews having a high degree of technical knowledge. Research indicated that intermittent sand filters might economically satisfy the demands of this legislation. The length of filter run was found to be related to the influent suspended solids concentration and the hydraulic loading rate, as well as to algal growth in the standing water above the filter. These filters can produce an effluent with a BOD of less than 100 milligrams/liter and a suspended solids concentration of less than 10 milligrams/liter, as well as a volatile suspended solids concentration of less than 5 milligrams/liter. Winter effluent quality was slightly lower than warm weather effluent quality, but winter operation created no serious problems. Optimum single stage intermittent sand filter hydraulic loadings were about 0.4 to 0.6 million gallons/acre/day. (Collins-FIRL)
W77-07900

BRISTOL REGIONAL SEWAGE TREATMENT WORKS--PAST, PRESENT AND FUTURE,
Wessex Water Authority, Bristol (England). Development and Planning Div.
P. H. Steel.
Chartered Municipal Engineer, Vol 104, No 1, p 5-12, January, 1977. 10 fig, 1 tab, 4 ref.

Descriptors: *Treatment facilities, *Planning, Water purification, Water quality control, Waste identification, Waste disposal, *Waste water treatment, Water districts, Sanitary engineering, Sewage treatment, Sewage disposal, Drainage, Costs, Design, Comprehensive planning.
Identifiers: Bristol Regional Sewage Treatment Works(England).

A review of past, present, and future sewage treatment in the Bristol, England, area was presented. Proposals and actual treatment plans from 1879 to the present were first explored. The present system contains a system of main sewers which intercept old outfalls into the River Avon and provide adequate trunk sewers for the area; pumping stations which raise sewage from low-lying areas into the trunk sewer system; a main inverted siphon under the River Avon to carry sewage from south of the city to the north of the river; a main pumping station to pump sewage from the main trunk sewer to the treatment facilities; and a treatment works which handles a dry flow of 21 mgd. Partial treatment includes comminution or screening, grit removal, sedimentation and sludge digestion and secondary treatment to provide water for industrial purposes. Also included in the system is an effluent outfall on the bank of the River Severn. The advantages and disadvantages of phased development were discussed. Future proposals include modifications of the main pumping station, storm sewage treatment, sedimentation tanks, sludge thickening, regional sludge disposal, sludge digestion, added generating stations, industrial water treatment, and a tidal pumping station. These proposed additions and alterations would provide an ultimate capacity flow of 100 mgd and a hydraulic capacity of 1,520,000 cubic meters/day for the main pumping station. (Collins-FIRL)
W77-07901

EVALUATION OF ALTERNATE SOLIDS HANDLING METHODS FOR ADVANCED WASTE TREATMENT,
Flood and Associates, Inc., Jacksonville, Fla.
B. A. Bell, and T. M. Zaferatos.
Journal Water Pollution Control Federation, Vol 49, No 1, p 146-155, January, 1977. 4 fig, 8 tab, 10 ref.

Descriptors: *Solid wastes, *Solids contact processes, *Tertiary treatment, Sludge treatment, Operating costs, Capital costs, Sludge disposal, Chemical treatment, Evaluation, Performance, *Waste water treatment.

Various methods for handling solids in advanced waste treatment were explored. Eight systems considered included: single-stage recarbonation with disposal of dewatered sludge in landfill; single-stage recarbonation, dewatering, and incineration; single-stage recarbonation, recalcination of dewatered sludge, air classification, and lime recycle; single-stage recarbonation, wet centrifical classification, recalcination of dewatered sludge, air classification, and lime recycle; two-stage recarbonation, dewatered sludge recalcination, air classification and lime recycle; two-stage recarbonation, wet centrifical classification, dewatered recalcination and lime recycle; and two-stage recarbonation, wet centrifical classification, dewatered sludge recalcination, air classification and lime recycle. Each was considered as to equipment sizing and capital and operating costs. The solids material balance must be determined for proper sizing and economic comparison; wet centrifical classification of sludge is economical for most municipal waste waters. Two-stage recarbonation with intermediate settling was thought to be economical for many municipal waste waters, although prior piloting of two-stage recarbonation is recommended before design. Waste water hardness and alkalinity, cost and availability of ultimate dispiosal, and quality and quantity of sludge from two-stage recarbonation greatly affect the economics of lime recalcination and recovery. (Collins-FIRL)
W77-07902

SURVEY OF ANAEROBIC DIGESTION SUPERNATANT TREATMENT ALTERNATIVES,
N. A. Mignone.
Water and Sewage Works, Vol 124, No 1, p 42-44, January, 1977. 5 tab, 31 ref.

Descriptors: *Sludge digestion, *Anaerobic digestion, Sludge treatment, Activated carbon, Sludge disposal, Oxidation, Biological treatment, Fertilizers, *Waste water treatment, Sewage treatment.
Identifiers: Air stripping, Kraus system, Gas mixing, Sand beds.

Several options for the treatment of anaerobic digestion supernatant were explored. Intermittent mixing was considered and outperformed continuous mixing, which seemed to result in poor bioflocculation and inefficient solids-liquid separation. Vacuum degasification increased the quality of sludge settleability and did not have the odor and foaming problems associated with air stripping. Activated carbon treatment is suppoed to increase gas production and methane content, reduce odors, increase draining, and improve supernatant quality. Returning untreated supernatant to the treatment influent can cause increases in BOD5, in dissolved and suspended solids, and in nutrients in the effluents. Supernatant disposal to sand beds is considered a solution only for very small plants. Air stripping or oxidation has mixed results, probably because the nitrification demand of supernatant liquid is more important than the carbonaceous demand. The Kraus system uses supernatant to increase organic loading on aeration tanks, provides biological process stability with variable influent flow and organic inputs, provides a ready supply of excess oxygen, and is a means for immediate plant recovery from system upsets. Phosphate could be removed from supernatant in a form suitable as fertilizer or the supernatant could be used as a growth accelerator for fish. Elutriation reduces chemical conditioning cost and improves compaction, but the loss of solids in the elutriate is considered undesirable. (Collins-FIRL)
W77-07903

PROCESS COULD SAVE MILLIONS OF POUNDS ON SEWAGE TREATMENT PLANTS,
Water Services, Vol 80, No 970, p 740, 742, December, 1976.

Descriptors: *Adsorption, *Separation techniques, Flocculation, Suspended solids, Water purification, Organic matter, Odor, Sedimentation, *Activated carbon, Disinfection, *Waste water treatment, Costs, Potable water, Sewage treatment, Polymers.
Identifiers: *Polysorb Process.

The Polysorb Process, developed by Chemviron, may reduce construction costs of British treatment plants. The process employs polymers and granular activated carbon in a two-step physical/chemical program. It is economical, more quickly installed, and requires 85% less land than conventional biological treatment systems. The system produces no secondary effluent, removes more than 90% of most organic matter, and eliminates odor. The first stage removes suspended solids and the second removes dissolved organics. After disinfection the effluent can be directly discharged into lakes and streams or used for recreational, agricultural, or wildlife management purposes. Granular activated carbon can also be used to remove objectional taste and odor from potable water. Estimates suggest that about one billion gallons of water/day could be saved by industry if activated carbon filters were used instead of sand, allowing nearly indefinite recycling of water within a plant. Many millions of pounds could be saved in the construction and operating costs of plants using this process. (Collins-FIRL)
W77-07904

SLUDGE DEWATERING BY BELT FILTER.
Water Services, Vol. No. 80, No. 970, p 742, December, 1976.

Descriptors: *Dewatering, *Filters, *Sludge treatment, Equipment, Domestic wastes, Industrial

wastes, Operating costs, Polyelectrolytes, Suspended solids, Flocculation, Chemical properties, Physical properties, *Waste water treatment.
Identifiers: *Belt filters.

The Roediger SSP (straining, suction and pressure zones) belt filter, marketed in Britain, uses gravity draining and vacuum dewatering stages before the belt press and milling zones, where final moisture removal is conducted. The belt filter can be used with domestic and industrial waste sludge and the design reduces operating costs by requiring a minimum of flocculant. The stages of the process ensure a high solids capture as compared to conventional belt presses. A sludge cake with high solids content is produced, minimizing reconstitution during storage and facilitating handling. The sludge is mixed with polyelectrolytes in a rotating drum, and is passed over a straining zone allowing water to run through the filter belt media into a collection system. It continues through a suction zone where low vacuum ensures a filtrate slightly contaminated by fine suspended solids, necessitating only sludge flocculation, and then is pressed. The reduced flocculation requirement produces substantial cost savings. Normal final solids content is 35-40% from digested sludge, up to 35% from primary sludge, and up to 30% from aerobically stabilized sludge. (Collins-FIRL)
W77-07905

HYGENIC ASSESSMENT OF TERTIARY ADSORPTION TREATMENT OF DOMESTIC SEWAGE AND INDUSTRIAL EFFLUENTS (GIGIENICHESKAYA OTSENKA TRETICHNOYI ADSORBTSIONNOYI OCHISTKI BYTOVYKH I PROMYSHLENNIKH STOCHNYKH VOD),
E. I. Boncharuk, A. M. Koganovsky, V. N. Girin, and O. V. Salata.
Gigiena Sanitariya, No. 11, p 36-39, 1976. 2 fig, 2 tab, 2 ref.

Descriptors: *Adsorption, *Tertiary treatment, Domestic wastes, Industrial wastes, Ion exchange, Organic matter, Pathogens, Microorganisms, Water reuse, Water purification, *Waste water treatment.

A hygienic evaluation of a combined adsorption/ion exchange tertiary treatment system was conducted. A mixture of domestic and industrial sewage effluents was tested. Results showed a substantial removal of organic matter, pathogenic microorganisms, and bacterial pollution indicators. The treated effluent could be used as recirculated water. (Collins-FIRL)
W77-07906

TWO-STAGE FILTRATION OF SECONDARY EFFLUENT,
General Filter Co., Ames, Iowa.
C. D. Biskner, and J. C. Young.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 319-331, February, 1977. 14 fig, 3 tab, 10 ref.

Descriptors: *Filters, *Suspended solids, *Trickling filters, Filtration, *Waste water treatment, Sewage effluents, Evaluation, Water purification, Treatment, Equipment.
Identifiers: *Two-stage filter systems.

A study was used to evaluate a two-stage filter system for suspended solids removal from the effluent of a trickling filter plant. The two-stage filtration of secondary effluent suspended solids concentrations equal to that of dual-media filters operating at similar average loading rates. More frequent backwashing of the first-stage filter allows the increase of filter runs and the reduction of backwash water volumes. The main advantage of the two-stage filtration system is its flexibility, allowing a broader range of media size combinations, and thus the use of granular media filters for treating effluents high in large-size suspended solids particles. However, the size of the first-stage media is very important. Only a small fraction of solids load passes to the second-stage if it is too small, and if it is too large, excess amounts are passed to the second-stage. It was found that single- media filtration with simultaneous air-water wash was promising in the elimination of many problems associated with conventional backwash procedures.(Collins-FIRL)
W77-07907

A SECOND LOOK AT WATER REUSE,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
G. L. Dugan, and P. H. McGauhey.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 195-205,February, 1977. 2 fig, 16 ref.

Descriptors: *Water reuse, *Irrigation, *Reservoirs, *Outfalls, Water purification, *Waste water treatment, Oxygen demand, Eutrophication, Nitrogen, Phosphorus, Suspended solids, Coastal areas, Tertiary treatment.
Identifiers: Oahu(HI), Indian Creek Reservoir(CA).

A review of factors involved in the reuse of water was presented. Data and conclusions were drawn from experience involving a five-year investigation of the Indian Creek Reservoir, California, a three and one-half year waste water irrigation project in Oahu, Hawaii, and other related activities and projects at the Sand Island Outfall and Kaneohe Bay, Oahu. The waste water treatment plant at Kaneohe Bay was completed in the early 1950's to cope with cesspool wastes and secondary effluent which was discharged into the Bay. This disturbed natural erosion-resisting properties of the soil and vegetative covering and increased the quantity of nutrients and sediments in the Bay. Sand Island has had much more experience; proposals to improve conditions in the area involve protecting fresh waters from high oxygen-demanding wastes, upgrading treatment plants, and protecting waters from increased eutrophication by reducing nitrogen and phosphorus concentrations to remove oxygen-demanding materials. These materials, suspended solids, and other chemical concentrations are relatively unimportant in deep coastal waters and a variance to secondary treatment regulations is requested so Hawaii can reduce the financial burden of facilities where advanced primary treatment is adequate. It was noted that effluent standards are much easier to regulate than receiving water standards. The California reservoir project demonstrated the feasibility of using reservoirs and improved tertiary treatment in combination to provide waste water of a quality suitable for reuse. The goal of all the studies was to hasten improvement of receiving water quality by improving the sophistication of waste water treatment processes. (Collins-FIRL)
W77-07908

AUTOMATIC ANALYSIS CONTRIBUTES TO WASTE WATER TREATMENT EFFICIENCY,
For primary bibliographic entry see Field 5A.
W77-07909

AIR V. OXYGEN IN DORSET,
Water and Waste Treatment, Vol. 20, No. 1, p 14-15, January, 1977. 1 fig, 1 tab.

Descriptors: *Oxygen, *Oxygenation, *Activated sludge, Air, Aeration, *Treatment facilities, Filtration, Design, Automatic control, Equipment, Nitrogen, Sludge treatment, *Waste water treatment, Municipal wastes.
Identifiers: UNOX.

A preliminary evaluation was made of Europe's first municipal treatment plant which uses an oxygen activated sludge (UNOX) system. The plant at Dorset, England, has installed the system as an extension of existing facilities. It is a two-stage activated sludge system using oxygen in the first stage and air in the second. Surface aeration is employed in both stages. Conventional biological filtration is used with recirculation and the extension forms a separate parallel works with possible linkage to existing filters after the first stage tanks. Nitrification can be achieved by either filtration or second stage treatment. Flexibility is a design feature. Operation can be divided into two identical halves to treat one stream as a control and the other stream as a variation outside of the normal design limits. The plant can be operated in an automatic mode. In the oxygen stage, the gas space above water level is pressurized with high purity oxygen. Conventional mechanical aerators produce oxygenation. Air is compressed, cooled, dewatered, and passed into one of the beds of molecular sieve material where nitrogen is adsorbed. Three beds are used in sequence to maintain oxygen flow while the sieve material is regenerated. Claimed benefits of the system are lower capital costs, less required space, and lower sludge production. (Collins-FIRL)
W77-07910

POLY ALUMINUM CHLORIDE IN SLUDGE TREATMENT,
Water Services, Vol. 80, No. 970, p 748-749, December, 1976. 2 tab.

Descriptors: *Flocculation, *Sludge treatment, Chemical properties, Laboratory tests, On-site tests, Physical properties, Performance, Costs, Polyelectrolytes, Dewatering, *Waste water treatment.
Identifiers: *Poly aluminum chloride.

Poly aluminum chloride (PAC) has been recently marketed as a sludge conditioner. PAC is an aluminum hydroxy chloride of complex structure. Its controlled sulfate component ensures optimum coagulant performance and stability and it has a higher molecular weight than usual for inorganic flocculants. Its primary advantage is the floc structure it produces. These are larger and stronger, and form more rapidly than those of other inorganic coagulants. They also reform readily after disintegration. PAC is especially effective when used on sludges prior to dewatering on filter presses and rotary vacuum filters as an alternative to polyelectrolytes, iron compounds and lime or, in some cases, aluminum chlorohydrate. PAC is marketed as a liquid with 10% w/w A1201, and can be used without extensive systems modifications, such as those needed for the use of polymers. The product can also be used as a primary coagulant in potable water treatment and there are many industrial effluents it can effectively treat. (Collins-FIRL)
W77-07912

MULTI-STAGE FILTER PRESS.
Water Services, Vol. 80, No. 970, p 744, 747, December, 1976. 1 fig.

Descriptors: *Filters, *Dewatering, Sludge, Industrial wastes, Potable water, Equipment, Performance, *Waste water treatment, Sludge treatment, Organic matter, Inorganic compounds.
Identifiers: *Multi-stage filter press.

A multi-stage filter press for dewatering both organic and inorganic sludges from industrial wastes and sewage was considered. Sludge, mixed with a flocculating agent, is fed into polyester mesh pockets where initial dewatering occurs, and is then discharged onto the first of two continuous belts of finer mesh which move horizontally in the opposite direction for additional drainage. Afterwards, the sludge is caught between this and another belt, forming two wedges, to consolidate and reduce it into a homogeneous mass. After passing through a series of six rollers, high pressure is applied for final dewatering. Performance

is good. After gravity dewatering, volume is reduced by 80% and dry solids by 15%; after medium pressure and high pressure dewatering, reductions are 90 and 92% for volume, and 32 and 40% for dry solids. Filtrate and wash water fall into troughs and drain to a concrete sump for return to primary settling tanks, or the equivalent, for treatment. (Collins-FIRL)
W77-07914

PHOSPHORUS IS REMOVED AT LOW COST,
Williams and Works, Grand Rapids, Mich.
T. C. Williams.
Water and Wastes Engineering, Vol. 13, No. 11, p 52-54, 63, November, 1976. 1 fig, 2 tab.

Descriptors: *Phosphorus, Chemical wastes, *Polymers, Treatment facilities, Costs, Operation, Maintenance, Biological treatment, Design criteria, *Waste water treatment.
Identifiers: Alma(MI), *Chemical treatment.

Low cost phosphorus removal was achieved in Alma, Michigan, by a treatment process involving extended aeration, chemical precipitation using ferric chloride and a polymer, and chemical oxidation of sludge. The design of this new waste water treatment plant was influenced by the small size of the community, requiring relatively low operation and maintenance costs; and by site restrictions such as a nearby residential development, necessitating an odor-free system. Other factors relating to the design were the high sewer infiltration rate, and the periodic discharge of concentrated toxic materials from a metal finishing plant. The effluent produced by the plant was well within the discharge limits, even when flow was as much as 50% over design. (Collins-FIRL)
W77-07915

BIOCHEMICAL AND PHYSICAL-CHEMICAL TREATMENT OF WEAK MUNICIPAL WASTE WATER,
Nova Scotia Technical Coll., Halifax. Dept. of Civil Engineering.
D. Thirumurthi, and J. R. Orlando.
Journal Water Pollution Control Federation, Vol. 48, No. 2, p 2708-2722, December, 1976. 4 fig, 7 tab, 14 ref, 1 append.

Descriptors: *Biological treatment, Chemical wastes, Biological properties, Chemical properties, Physical properties, Microorganisms, Temperature, Hydrogen ion concentration, Lime, Phosphate, Growth rates, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, *Waste water treatment.
Identifiers: Biochemical treatment, *Physical-chemical treatment, Weak waste water, *Chemical treatment.

A study was conducted to compare the biological, biochemical, and physical-chemical treatment of weak municipal waste water (BOD less than 100 milligrams/liter). It was found that low-level lime addition to high-rate activated sludge treatment moderately improved phosphate removal. Low food:microorganisms ratios and high sludge ages had to be countered to achieve efficient biological or biochemical treatment processes. Colder temperatures had a negative effect on biochemical treatment of normal-strength waste water; an average temperature difference of 12C reduced treatment efficiency as much as one-third. Lime doses high enough to produce a pH greater than 9.5 can be used without harm to bacterial populations when handling weak and normal waste waters due to the fact that carbon dioxide production by microbes can reduce influent pH by 1.5 units. The SVI (sludge volume index) was increased in biochemical treatment by lime addition and colder temperatures. Biological and biochemical treatments were of little use in disolved solids removal. More than 95% phosphate removal at a high pH can be achieved in the physical-chemical treatment. As 5%, by volume, sludge recycle had no significant effect on treatment efficiency. Temperature reductions of 12C did not affect physical-chemical treatment at the pH values tested. Physical-chemical processes with lime produced higher removals of BOD, suspended solids, and PO4 than an activated sludge plant. Low residual phosphate concentrations needed for algae growth were present only with physical-chemical treatment. Advantages and disadvantages of biological and physical-chemical processes can be combined by treating raw waste water by physical-chemical processes when a biological treatment plant is expanded. With enough microbial population in the aeration tank, biochemical treatment of weak waste water is the same as that of normal-strength waste water. (Collins-FIRL)
W77-07916

IN-HOUSE TREATMENT.
The Consulting Engineer, Vol. 41, No. 2, p 25, February, 1977.

Descriptors: *Waste water treatment, *Treatment facilities, Sewage effluents, Industrial wastes, Biochemical oxygen demand, Chemical oxygen demand, Solid wastes, Liquid wastes, Suspended solids, Costs, Waste disposal.
Identifiers: In-house treatment.

Options were presented for in-house treatment to lessen the impact of increased water and effluent charges. This could be accomplished through the reduction of effluent quantities and loads discharged. A formula was presented for the calculation of the cost of volume discharged independently of the load. The formula consisted of fixed elements, variable elements, and quality parameters. In Britain, it costs about 7.5 pounds/cubic meter to treat standard effluents at a sewage works. Just under half of this expense was fixed costs, directly proportional to volume. The remaining costs varied according to the load of BOD, COD, or suspended or settleable solids. The main alternative to disposal to sewers was the removal of some portion of the effluent in a concentrated form for disposal. Constraints and parameters included transportation expenses, treatment costs, discharge standards, possibilities of discharge to rivers, availability of capital and space, and life of process, plant, or factory. (Collins-FIRL)
W77-07917

AWT PLANT MEETS TOUGH DEMANDS,
Benham-Blair and Affiliates, Inc., Oklahoma City, Okla.
J. F. Benham.
Water and Wastes Engineering, Vol. 14, No. 2, p 59-62, 75, February, 1977. 2 tab.

Descriptors: *Tertiary treatment, *Treatment facilities, Phosphate, Biochemical oxygen demand, Biological treatment, Filtration, Trickling filters, Nitrogen, Flows, Equipment, Construction costs, Operating costs, Chemical treatment, Design criteria, Water quality control, Water reuse, *Waste water treatment.
Identifiers: Lawton(OK).

A tertiary treatment facility was constructed in Lawton, Oklahoma, to produce an effluent which meets stringent state requirements. Among these requirements are a 21-day BOD limited to 15.0 milligrams/liter and phosphate concentrations limited to less than 1.0 milligram/liter as phosphorus. Design provisions were made for future expansion to remove nitrogen. A contract with a power generating station calls for the use of purified effluent as make-up for its cooling lake. The treatment incorporates conventional preliminary and primary treatment followed by two-stage biological treatment, chemical precipitation, and granular media filtration. Plastic media trickling filters are used to remove carbonaceous BOD. There is a nitrogeneous BOD removal system which is primarily an activated sludge process. The plant provided an adequate capacity for the treatment of all flow, including wet-weather flow peaks from infiltration and inflow into sewers; flows up to 40 mgd can be accommodated. There is a holding basin with a 15 million gallon capacity for excess flow. Another feature is a 500-acre effluent storage basin for storage of reclaimed water prior to transfer to the power station. Construction costs are $1.34 per gallon/day capacity and operating costs are expected to be about $0.25 per thousand gallons. Phosphorus removal consists of three steps: chemical feeding and clarification; recarbonation; and filtration. Planning and design allow an initial capacity of 10 mgd to be expanded by 33% with the construction of an additional trickling filter, aeration tank, and clarifier to most of the unit processes. (Collins-FIRL)
W77-07918

WHAT'S UP WITH OXYGEN,
Brown and Caldwell. Walnut Creek, Calif.
B. D. Bracken.
Water and Wastes Engineering, Vol. 14, No. 3, p 18-22, 24, 26, 44-45, March, 1977. 3 fig, 2 tab, 12 ref.

Descriptors: *Oxygen, *Cryogenics, *Activated sludge, Water quality control, Treatment facilities, Performance, Nitrogen, Equipment, Gases, Design criteria, Economics, *Waste water treatment.
Identifiers: Pressure swing adsorption, Cryogenic air separation.

Applying cryogenic oxygen generation to waste water treatment was considered. With more stringent effluent quality regulations, oxygen activated sludge systems will become more dominant in waste water treatment. The quantities of oxygen needed for treatment will depend upon waste strength, detention time, dissolution system design, waste water temperature, oxygen transfer efficiencies, and other factors. After the decision to use oxygen is made and the quantities necessary are determined, the means for providing pure oxygen must be evaluated. Gaseous oxygen is more economical to purchase than liquid oxygen if it can be piped to the treatment plant from a close generation facility. Liquid oxygen is generally employed for short-term use, oxygen plant start-up, back-up, and emergency use during generation plant failures. On-site generation can be achieved by a pressure swing adsorption (PSA) system for treatment plants using less than 30-40 tons/day of oxygen. Cryogenic air separation plants are usually best for plants exceeding this requirement. The separation plants produce oxygen by liquefaction of pressurized atmospheric air, followed by distillation to separate nitrogen and oxygen. The liquid oxygen is then delivered to a storage and vaporization system for automatic delivery of gaseous oxygen to the oxygen supply lines in response to low pipeline oxygen pressure. The standard plant produces 3-8% of its total output as liquid oxygen. The oxygen generally has a purity of 95-98 mole-percent, or percent by volume. Equipment needed for this process includes an air compressor, switching valves, a cold box, a reversing heat exchanger, a gel trap or hydrogen carbon adsorber, an oxygen superheater, and a nitrogen superheater. (Collins-FIRL)
W77-07919

JOINT MUNICIPAL CORPORATION WASTE WATER TREATMENT,
S. S. Small.
Water and Sewage Works, Vol 124, No 1, p 72-75, January, 1977. 1 fig, 2 tab.

Descriptors: *Water districts, *Rural areas, *Community development, Municipal wastes, Industrial wastes, Chemical reactions, Sludge disposal, *Waste water treatment, Treatment facilities, Performance, Costs, Sludge treatment.
Identifiers: Fort Fairfield(ME), The Great Atlantic and Pacific Tea Company, *Joint treatment.

The rural community of Fort Fairfield, Maine, is constructing a waste water treatment facility to handle municipal and industrial wastes. The Great Atlantic and Pacific Tea Company operates a nearby plant which processes potatoes, french fries, potato puffs, and peas. The Company has installed a starch recovery system, infrared peeling system, caustic and blancher solution recycle systems, and part of a silt removal process in order to reduce waste strength to levels treatable by conventional primary and secondary methods. The plant had previously operated an industrial primary treatment program. The rotating biological surfaces (RBS) secondary treatment process was selected because it meets fluctuations in industrial and domestic loads; is easily expandable for future industrial discharge; does not require sludge recycle; uses smaller secondary clarifiers; and does not flush fixed bio-mass from the reaction tank during peak flows. It also recycles municipal sludge during A and P downtime to maintain a bio-mass sufficient for treating A and P waste water upon startup, and has trouble-free winter operation and lower overall costs. Finally, it is less complex than other processes. Hypochlorite was chosen for disinfection over chlorine gas because of lower capital costs. Sludge resulting from the process could be used as fertilizer or as an animal food supplement. It was decided to use a flotation thickener for secondary sludge, and a single vacuum filter for dewatering primary sludge to be used for animal feed supplement or for secondary sludge when all sludges would be land-disposed. (Collins-FIRL)
W77-07920

CONTROLLING SLUDGE BULKING.
Water and Sewage Works, Vol 124, No 3, p 54-55, March, 1977. 1 fig.

Descriptors: *Sludge treatment, *Sedimentation, Suspended solids, Bacteria, Sphaerotilus, Sewage bacteria, Hydrogen ion concentrations, *Waste water treatment, Treatment facilities, Oxidation lagoons, Water purification.
Identifiers: Hydrogen peroxide, St Augustine(FL), *Chemical treatment.

A hydrogen peroxide treatment was used to cure sludge bulking at a treatment plant in St. Augustine, Florida. Two years after the transition to secondary treatment, sludge began rising from the bottom of two clarifiers. Sludge was first drawn off into digesters before settling was complete, lowering clarifier solids concentrations. No plant mechanisms had malfunctioned, but the pH rose steadily. The problem was found to be caused by two filamentous bacteria, sphaerotilus and thiothrix. Hydrogen peroxide was added at a rate of 20 ppm directly into the head box of the degritter at the 3 mgd facility. A foam problem developed in the clarifiers and the system was relocated to allow peroxide to enter the overflow trough of one of the aeration basins at a rate of 12 ppm. Two days after restarting the facility the clarifiers were clear, foaming was gone, and sludge flocs did not pass over the air. Even later, the filamentous bacteria began to break up. The sludge volume index lowered from a high of 580 to 178, which was well below the bulking point. (Collins-FIRL)
W77-07921

PHYSICO-CHEMICAL TREATMENT OF SEWAGE AND THE COLESHILL PROJECT,
G. F. G. Clough.
Water Pollution Control, Vol 76, No 1, p 10-29, 1977. 6 fig, 1 tab, 2 ref.

Descriptors: *Oxidation, *Separation techniques, Flocculation, Filtration, Separation techniques, Organic matter, Inorganic compounds, Activated carbon, Nitrogen, Phosphorus, Toxicity, Lime, Chlorine, Ozone, Hydrogen ion concentration, Sludge disposal, Sewage treatment, *Waste water treatment, Pilot plants, Treatment facilities, Economics, Industrial wastes, Domestic wastes.
Identifiers: Physico-chemical treatment, Coleshill(England), *Chemical treatment.

Various aspects of the physico-chemical treatment (PCT) of sewage and of the Coleshill pilot plant, in England, were considered. Some of the procedures in this treatment are flocculation using lime or other floc ballast materials, foaming, and centrifugation. Solids removal may be required, and filtration may be used when solids concentrations are low. Dissolved organic matter may be treated with chlorine, ozone, lime, or calcium compounds, and removed by using activated carbon. Dissolved inorganic matter, such as nitrogen, phosphorus, and toxic metals, may also be removed by PCT. The use of flocculants will require some sludge dewatering by filter presses, rotary vacuum presses, or filter belt presses and centrifuges. PCT can be cost-competitive if sewage contains toxic materials, phosphorus removal is necessary, space is limited, incineration is the best method for sludge disposal, or if the load changes rapidly or between wide limits. The typical PCT system includes lime addition, settlement, pH correction, and activated carbon treatment. The Coleshill pilot plant consists of fixed and mobile facilities designed to eliminate large-scale trials of various treatment systems. Each mobile unit can perform one unit process operation. The plant can provide a process stream similar to a bench-scale plant, two treatment streams, and two sewage sources, domestic and industrial, for testing. PCT will be the first treatment system tested because of the dearth of information on the performance and economics of the system. (Collins-FIRL)
W77-07922

CONTINUOUS THICKENING OF BIOLOGICAL SLUDGES, AND THE INFLUENCE OF STABILITY,
Water Pollution Research Lab., Stevenage (England).
M. J. D. White, R. C. Baskerville, and C. F. Lockyear.
Water Pollution Control, Vol 76, No 1, p 86-97, 1977. 5 fig, 5 tab, 17 ref.

Descriptors: *Sludge treatment, Physical properties, Chemical properties, *Dewatering, Biochemical oxygen demand, Chemical oxygen demand, Chemical treatment, Anaerobic digestion, Sludge digestion, Activated sludge, Sedimentation, Biological treatment, Costs, *Waste water treatment.
Identifiers: *Gravity thickening.

Gravity thickening was considered in relation to sludge treatment and disposal. The stability of various sludges in storage was studied to determine BOD and COD production, the effect on filterability, and the amount of chemicals needed to condition sludge for mechanical dewatering. Tests were conducted with a small-scale batch thickener and a pilot-scale continuous thickener. A mixed primary sludge was continuously thickened in the pilot-scale thickener with a solids retention time of 18 hours. Solids concentration in the supernatant liquor was about 0.55% dissolved solids. The volume needed for this sludge was less than 75% of the size of the equivalent batch thickener. A continuous thickener size for more dilute feeds would be much smaller than an equivalent batch thickener. Anaerobically digested sludge and sludges from low-rate and extended-aeration activated sludge plants were relatively stable in terms of BOD and COD release into the liquor, and in terms of filtration characteristics. No penalties resulted from thickening this sludge. Primary and mixxed primary sludge samples from sedimentation tanks were relatively stable. Filtration properties and the BOD and COD of the interstitial liquor revealed that significant deterioration had occurred in the sedimentation tank. High-rate biological treatment sludges were very unstable. Dewatering costs for these sludges were very high and substantial BOD and COD loadings might result from the return of their supernatant from thickeners to the head of the treatment facility. Gravity thickening was judged unsuitable for these sludges. (Collins-FIRL)
W77-07923

THE EFFECT OF TIME DELAY AND GROWTH RATE INHIBITION IN THE BACTERIAL TREATMENT OF WASTE WATER,
Teesside Polytechnic, Middlesbrough (England). Dept. of Mathematics and Statistics.
A. W. Bush, and A. E. Cook.
Journal of Theoretical Biology, Vol. 63, No. 2, p 385-395, 1976. 8 ref.

Descriptors: Model studies, *Inhibition, Mathematical models, Analysis, *Growth rates, *Bacteria, *Nutrients, *Biological treatment, *Waste water treatment, Microorganisms.
Identifiers: Monod models, Substrate concentrations.

Investigations were conducted of the Monod and similar models incorporating inhibitory effects of huge nutrient concentrations on bacterial growth rates. The behavior of continuous culture systems, with and without time delay, were studied. Biological waste water treatment is an example of a system subject to failure from shock loading resulting from the inhibitory effect. Equations were presented to determine the relationship of microorganism concentrations to substrate concentrations and to determine the inhibitory effects of high substrate concentrations. Parameters of system operation failures such as shock overloading and underloading were also developed. (Collins-FIRL)
W77-07924

EFFECTS OF POLYELECTROLYTES AND CLAY COLLOIDS ON CARBON ADSORPTION,
Missouri Univ.-Columbia.
J-C. Huang, and J. T. Garrett.
Water and Sewage Works, Vol. 124, No. 3, p 64-67, March, 1977. 8 fig, 1 tab, 5 ref.

Descriptors: *Analytical techniques, *Activated carbon, *Polyelectrolytes, *Clays, Illite, Kaolinite, Montmorillonite, Inhibition, Particle size, Phenols, Performance, Physical properties, Chemical properties, *Waste water treatment.

A study was conducted to investigate the effects of polyelectrolyte molecules and/or colloidal particles in waste water on the porous structure of activated carbon. How various types of activated carbon would be affected if blockage occurs which reduces activated carbon effectiveness was also investigated. Cationic, anionic and nonionic polyelectrolyte were used and illite, montmorillonite, and kaolinite clays were employed. Phenol was used as the adsorbate. Activated carbons tested were coal-based, petroleum-based, wood-based, and lignite-based. Results indicated that almost no inhibition of carbon adsorption was caused by the colloidal materials or the polyelectrolytes used. The lack of inhibition by the polyelectrolytes studied was attributed to the lack of activated carbon affinity for them. Failure of the clays to create any inhibition was considered to be due to a lack of affinity between carbon and clay particles and to the fact that clay particles were too large to effectively block any capillary pores. (Collins-FIRL)
W77-07926

THE ACTIVATED SLUDGE PROCESS WITHOUT PRELIMINARY PURIFICATION. RESULTS OF PILOT EXPERIMENTS IN THE PURIFICATION PLANT KARLSRUHE (DAS BELEBUNGSVERFAHREN OHNE VORREINIGUNG. ERGEBNISSE DER VERSUCHE IM HALBTECHNISCHEN MASSSTAB IM KLAERWERK KARLSRUHE),
L. Mueller.

Gas-und Wasserfach-Wasser/Abwasser, Vol. 118, No. 1, p 15-23, 1977. 10 fig, 1 tab, 9 ref.

Descriptors: *Analytical techniques, *Activated sludge, *Waste water treatment, Model studies, Municipal wastes, Aeration, Bacteria.
Identifiers: Sludge volume index, Settling properties.

The activated sludge process was studied in pilot experiments with waste water consisting of 45% municipal and 55% industrial waste water at the Karlsruhe waste water treatment plant. The waste water was admitted to the single-stage aeration tank without preliminary purification after the sand trap. Compared with activated sludge from the conventional process with preliminary purification, the sludge from the one-stage process had markedly improved settling properties. The sludge volume index was 51-80 mg/liter, compared with 100 mg/liter in the case of preliminary purification. The adaptation time was about half of that required in the two-stage process, which may be due to the rapid activation of bacterial colonies which would be removed during the preliminary purification. The solids content of the return sludge was surprisingly high compared with that in the two-stage process. Good purification efficiency was achieved even with high sludge loads (93.1-96.5% with an initial load of 0.19-1.27 kg BOD5/kg dry matter/day). (Takacs-FIRL)
W77-07927

ISRAEL'S USE OF NONIONIC SURFACTANTS,
Technion - Israel Inst. of Tech., Haifa. Environmental Engineering Labs.
For primary bibliographic entry see Field 5B.
W77-07929

COST OF HIGH QUALITY WASTE WATER TREATMENT FOR REUSE,
Envirotech Corp., Salt Lake City, Utah. Eimco BSP Div.
A. S. Anand, O. E. Albertson, and R. D. Fox.
Effluent and Water Treatment Journal, Vol. 17, No. 2, 67-73, February, 1977. 9 fig, 4 tab, 14 ref.

Descriptors: *Costs, *Water reuse, *Waste water treatment, Design criteria, Water quality, *Treatment facilities, Filtration, Activated carbon, Tertiary treatment, Industrial wastes, Water quality control.

A study was conducted to determine the cost of waste water treatment as a function of plant size, waste characteristics, and degree of treatment. The analysis was based on flow sheet combinations of the following factors: three plant sizes, two waste water strengths, and three levels of effluent quality. Cost analysis included construction costs, operational costs, equipment costs, and chemical costs. The relative costs of primary, secondary, and tertiary treatment processes were given, as were costs for dewatering and disposal methods. (Collins-FIRL)
W77-07930

DRAINAGE--WHO PAYS, RESPONSIBILITIES AFTER THE 1973 WATER ACT,
Welsh National Water Development Authority, Cardiff. Dee and Clwyd Sewage Div.
For primary bibliographic entry see Field 5G.
W77-07932

INDUSTRY MONITORS COUNTY STORM SEWER WATER,
Case (J. I.), Co., Racine, Wis.
F. Tilsner.
Water and Sewage Works, Vol. 124, No. 3, p 56-57, March, 1977. 1 fig.

Descriptors: *Storm drains, *Monitoring, Pumping plant, Filters, *Industrial wastes, Domestic wastes, Liquid wastes, Oil wastes, Chemical wastes, Flow, Separation techniques, Water purification, Pollution abatement, *Waste water treatment.

A storm sewer and its monitoring by a Wisconsin tractor plant and foundry operation were described. The system is completely open and susceptible to contamination by oil and other waste matter. An oil interceptor system was installed at the sewer outlet to a lake. It was divided into two units, a pump basin and a filter building. The pump basin is the primary monitoring and flow controlling station of water into the lake. Water passes over a baffle for the removal of heavy solids or debris, then through the pump house via a screened inlet so that flotable materials which passed the baffle are removed. Another baffle traps flotable oil or process liquid in the basin, while an oil skimming unit continuously removes surface oils. Water contaminated by matter which mixes with it is transferred to the filter house which has primary and secondary solids separators. It is then moved to a pre-filter tank or to the secondary separator if further solids removal is necessary. Solids and debris collected are transferred to an outside collection tank for pumping to the waste treatment plant grit chamber for ultimate disposal. An operator monitors the system's performance for possible pollution problems and controls the equipment. (Collins-FIRL)
W77-07933

LESS-COSTLY ACTIVATED CARBON FOR SEWAGE TREATMENT.
NASA Tech. Briefs, Vol 1, No 4, p 573, Winter, 1976. 1 fig.

Descriptors: *Carbon, *Activated carbon, *Coal, *Lignite, Heat treatment, *Sewage treatment, Sludge, Adsorption, Chemical oxygen demand, *Waste water treatment.
Identifiers: Sodium carbonate, Pyrolysis.

A process was developed to produce supplemental carbon from coal for activated carbon sewage treatment. The goal was to make the activated carbon process self-sustaining. Coal is pyrolyzed with sludge which becomes a catalyst in the activation process. Gases which may be used to reduce the energy demand are produced during pyrolysis. Laboratory pyrolysis of a 50/50 mixture of pulverized coal and sludge was conducted at 850C with a 20-minute steam application (1 pound of steam per pound of coal/sludge mixture). The resultant activated carbon was 61.7% ash with an iodine adsorption of 684 milligrams/gram of carbon. A sludge with a COD of 421 was reduced to a COD of 54 by treatment with 521 milligrams/liter of the activated carbon. Treatment with a commercial activated carbon produced a COD of 60. Lignite was the most effective coal for this purpose; sodium carbonate may be added to enhance activation. (Collins-FIRL)
W77-07934

STATE PARK GETS GOOD TREATMENT, EFFLUENTS WILL BE USED FOR IRRIGATION TO REDUCE EXTENSIVE REQUIREMENTS,
Lockwood, Andrews and Newnam, Austin, Tex.
F. A. Jay, and J. L. Kroesche.
Water and Wastes Engineering, Vol 13, No 11, p 65-66, 71, November, 1976. 1 fig.

Descriptors: *Parks, *Recreational facilities, *Aeration, *Sewerage, Piping, *Waste water treatment, Flows, Treatment facilities, Pumping plants, Irrigation, Biochemical oxygen demand, Suspended solids, Lakes, Nutrients, Sludge treatment, Design criteria, *Texas.
Identifiers: *Inks Lake State Park(TX).

A treatment system was designed for the Inks Lake State Park in Texas. Design considerations included: the handling of seasonal flow variations, a hilly and rocky terrain, a low budget, more than 250 camp and picnic units, and rest rooms. A solution comprising a pressurized collection network, a variable capacity extended-aeration treatment plant, and an effluent irrigation system was devised. Seasonal waste water flows averaged 6,000 mgd in winter, 20,000 gpd during the spring and fall, and 40,000 gpd in summer. By using the pressurized collection system costs and excavation difficulties presented by an abundance of granite in the area were avoided. Twelve grinder pumping stations with pumps mounted in 60-inch wet-wells of a 5.5-foot depth were constructed. Existing rest rooms septic tanks or 1000 gallon concrete tanks provided emergency holding capacity. The forced main network is made of two- to four-inch polyvinyl chloride pipe. An effluent quality of 20 milligrams/liter BOD and 20 milligrams/liter total suspended solids was required for irrigation. State restrictions on discharges to lakes are 5.0 milligrams/liter BOD and 5.0 milligrams/liter total suspended solids, and they often include nutrient removal. Extended aeration provides protection against biological upset and reduces sludge handling requirements. All systems can be expanded if necessary. (Collins-FIRL)
W77-07936

R AND D PROJECT PROVIDES PHYS/CHEM DATA, FOXBOROUGH (MASS) STATE HOSPITAL PLANT CAN PRODUCE 'SUPERIOR EFFLUENT QUALITY',
Cleverdon, Varney and Pike, Boston, Mass.
J. T. Gervais.
Water and Wastes Engineering, Vol 14, No 2, p 55-57, February, 1977. 1 fig, 1 tab.

Descriptors: *Treatment facilities, *Research and development, *On-site investigations, Design, Costs, Prototypes, Research facilities, Tertiary treatment, *Waste water treatment, Chemical treatment, Adsorption, Filtration, *Massachusetts, *Hospitals.
Identifiers: Foxborough State Hospital(MA).

A research and development project was instituted at Foxborough State Hospital, Massachusetts, to demonstrate physical-chemical waste water treatment processes and to train operators. Chemical clarification, dual media filtration, and carbon adsorption processes were investigated. The facility was designed to accomodate future investigations of treatment methods. It is housed by a fabric-skinned structure which is functional, portable, economical, and salvageable. All process equipment is standard and can be reused at other facilities. The facility was operated in a manner which simulated that of an actual treatment plant. Dual systems are provided for direct comparison testing. Polyvinyl chloride is used for all process lines. The facility has proven the feasibility of adding these treatment processes to secondary facilities to meet water standards. (Collins-FIRL)
W77-07937

1776-1976: NOTES ON WATER QUALITY PLANNING,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W77-07938

WATER AND WASTE WATER ENGINEERING FOR LOW INCOME COMMUNITIES IN DEVELOPING COUNTRIES,
For primary bibliographic entry see Field 5G.
W77-07939

STABILIZATION LAGOONS INCLUDING EXPERIENCE IN BRAZIL,
Balfour (D.) and Sons, Sao Paulo (Brazil).
R. M. Bradley, and M. O. S. Alvares da Silva.
Effluent and Water Treatment Journal, Vol 17, No 1, p 21-23, 26-29, January, 1977. 3 fig, 4 tab.

Descriptors: *Oxidation lagoons, *Design criteria, *Domestic wastes, *Aerated lagoons, Economics,

Effluents, Biochemical oxygen demand, Suspended solids, Algae, Climates, *Waste water treatment, Sanitary engineering.
Identifiers: *Brazil, Facultative lagoons.

Design criteria and operation data for lagoon systems treating domestic sewage in Brazil were discussed. There is no internationally accepted design procedure for stabilization lagoons since their operation efficiency depends on the climatic conditions of a given area. With adequate available land, these lagoons are an inexpensive means for reducing domestic sewage BOD. Greater efficiency, as well as land and excavation savings, result from using an anaerobic and facultative lagoon in series. In Brazil, using this method rather than a single facultative lagoon produces a 70% reduction in land area requirements, a 45% reduction in excavation volume, and a 55% detention time reduction, while yielding an effluent of the same quality. Facultative lagoons always contain algae. When 85-90% BOD removals are necessary, algal removal should be practiced. Facultative lagoons produce an effluent with substantial suspended solids, mainly algae, which are harmful to receiving streams. Aerated aerobic lagoons have a higher operational cost and produce an effluent higher in suspended solids concentrations than facultative lagoons. Brazilian practice is to accept the algae problems in order to achieve, over the widest area possible, some measure of reduction in the organic loads discharged to rivers. Basic sanitation can thus be provided to as many communities as possible, and effluent quality can be improved as financial resources increase. In densely populated areas, because land is scarce and effluent quality standards are to be raised, it is usual to use aerated lagoons which are convertible to activated sludge systems. (Collins-FIRL)
W77-07940

WASTE WATER RENOVATION BY SEWAGE ULTRAFILTRATION,
Israel Desalination Engineering Ltd., Tel Aviv.
S. B. Sachs, and E. Zisner.
Desalination, Vol 20, p 203-215, 1977. 5 fig, 8 tab, 4 ref.

Descriptors: *Membranes, *Filtration, *Reverse osmosis, *Pilot plants, Polyelectrolytes, Polymers, Oxidation lagoons, Sewage effluents, Water purification, Water reuse, Organic matter, Biochemical oxygen demand, Chemical oxygen demand, Physical properties, Chemical properties, *Waste water treatment, *Sewage treatment.
Identifiers: Hybrid ultrafiltration(HUF) membranes, *Ultrafiltration(SUF).

Pilot studies were conducted to determine the feasibility of using the newly developed Hybrid Ultra Filtration (HUF) membranes to treat municipal oxidation pond effluent. The process, Sewage Ultrafiltration (SUF), combines ultrafiltration and reverse osmosis methods and treats the entire system by separating water from many types of contaminants. These membranes are noncellulosic and resistant to hydrolysis or biological degradation; some of them withstand temperatures up to 120C. The membranes are made of a strong polyelectrolyte permanently attached to an innert polymer porous structure. They carry a fixed charge capacity over the whole pH range. Tests showed impressive performance at low operating pressure (8 atm). There was a constant product flux through the membrane of 30-40 gfd at 95% water recovery. The system was cleaned by a sponge-ball once every 24-hours. The HUF membrane substantially reduced organic contaminants from very high concentrations to a lower level than biological or physicochemical processes would under similar conditions. The test plant removed 98% of total BOD and 78% of total COD in the oxidation pond feed, which was 99.3% of BOD and 99.4% of COD from the recirculation brine. Only minor treatment is needed to use this effluent for agriculture, groundwater recharge, industrial purposes, or complete municipal recycle. (Collins-FIRL)
W77-07941

BIOLOGICAL REGENERATION OF AMMONIUM-SATURATED CLINOPTILOLITE. I. INITIAL OBSERVATIONS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
M. J. Semmens, and R. R. Goodrich, Jr.
Environmental Science and Technology, Vol 11, No 3, p 255-259, March, 1977. 5 fig, 2 tab, 12 ref.

Descriptors: Analytical techniques, *Zeolites, *Ion exchange, *Ammonium compounds, *Biological treatment, Sewage effluents, Sludge treatment, Nitrification, Salts, Chemical treatment, Brines, *Waste water treatment, *Bacteria, Nitrogen fixing bacteria, Biological treatment.
Identifiers: *Clinoptilolite regeneration, *Nitrifying bacteria.

A study was initiated to determine whether nitrifying bacteria could regenerate clinoptilolite and, if so, the degree of regeneration in different time periods with different bacterial concentrations. Known weights of ammonium saturated clinoptilolite were contacted with various concentrations of nitrifying sludge of known activity. Results indicated that regeneration was possible and that the process was very rapid. The regeneration time depended upon the nitrifying capacities of the sludges. High sludge concentrations produced as much as 80% regeneration in less than two hours of contact time. Nitrification rates during regeneration were much slower than those of free ammonium in solution. It was not clear whether the amount of available ammonium limited the rate of nitrification. However, ammonium concentrations in solution were in the range in which the nitrification rate was a function of ammonium concentration. Increasing the salt concentration in solution may improve regeneration rates if the free ammonium concentration in the solution is the controlling factor in the rate of nitrification. Clinoptilolite must be used as an ion exchanger first, and biologically regenerated, in the manner of chemical regeneration, if its exchange capacity and ammonium ion selectivity are to be fully utilized. This would produce a nitrate brine which can be denitrified in many ways, thereby representing an advantage in favor of biological regeneration. (See also W77-07943) (Collins-FIRL)
W77-07942

BIOLOGICAL REGENERATION OF AMMONIUM-SATURATED CLINOPTILOLITE. II. MECHANISM OF REGENERATION AND INFLUENCE OF SALT CONCENTRATION,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
M. J. Semmens, J. T. Wang, and A. C. Booth.
Environmental Science and Technology, Vol 11, No 3, p 260-265, March, 1977. 8 fig, 1 tab, 20 ref.

Descriptors: Analytical techniques, *Zeolites, *Nitrification, *Ion exchange, *Ammonium compounds, *Salts, *Inhibition, Performance, Sodium chloride, *Biological treatment, *Bacteria, Economics, Brines, *Waste water treatment, Brine disposal.
Identifiers: Clinoptilolite regeneration, *Nitrifying bacteria.

The influence of salt concentrations on clinoptilolite regeneration, and the mechanism thereof, were investigated. Previous studies suggested, and this one confirms, that the solution concentration of ammonium controls nitrification rates and that this is controlled by the amount of ammonium displaced by ion exchange. Increasing ion exchange rates by decreasing clinoptilolite particle size and increasing solution salt concentrations increased the rate of regeneration. Nitrifying bacteria were significantly inhibited by salt concentrations higher than 0.6 M and, at one M salt concentration, no nitrificaion was observed. Salt also stimulated nitrifying bacteria in low concentrations of 0-0.4 M. It was found that salt could produce higher regeneration levels. About 99% regeneration was achieved in less than 3 hours when 400 meq/liter of sodium chloride were added to the regeneration factor. It was concluded that nitrification in concentrated salt solutions was a prerequisite to economical operation in a biological regeneration process. This produces little excess brine for disposal. Satisfactory regeneration may be attained by using a salt brine for ammonium extraction and biologically restoring the brine for reuse. (See also W77-07942) (Collins-FIRL)
W77-07943

BACTERIAL POPULATIONS AND END PRODUCTS DURING ANAEROBIC SLUDGE FERMENTATION OF GLUCOSE,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. P. Chynoweth, and R. A. Mah.
Journal Water Pollution Control Federation, Vol 49, No 3, p 405-412, March, 1977. 4 fig, 4 tab, 12 ref.

Descriptors: *Bacteria, *Fermentation, *Anaerobic conditions, *Carbohydrates, Nutrients, *Sludge digestion, *Waste water treatment, Gases, Metabolism, Microorganisms, *Sludge treatment.
Identifiers: Glucose.

A study was performed to investigate changes in bacterial populations during anaerobic sludge fermentation of glucose to evaluate that substrate. No response was evident for 8 to 10 hours after the addition of glucose to unenriched digesting sludge. At that point, there was a sudden and rapid increase in gas production and accumulation of acetate, propionate, and ethanol. This resulted from a sudden selective growth of euryoxic bacteria. Isolates from the enriched sludge were characterized as the Escherichia genus and Providence group, and produced fermentation products identical to those in enriched sludge in high concentrations. These activities and growths indicate the imbalance which occurs when substrates added to anaerobic digesters are changed. Continued bacterial population imbalance in fermentation could lead to the accumulation of toxic products and the end of decomposition. Data indicated that digester sludge acclimatization to pure substrates causes a great change in the natural bacterial populations. (Collins-FIRL)
W77-07944

SEWAGE SLUDGE DISPOSAL: A STICKY PROBLEM WITH NO FAIL-SAFE ANSWER,
For primary bibliographic entry see Field 5E.
W77-07948

THE USE OF SEWAGE EFFLUENT AS POWER STATION COOLING WATER,
Central Electricity Generating Board, Leatherhead (England). Croydon Power Station.
For primary bibliographic entry see Field 5G.
W77-07949

SOME REFLECTIONS OF A SEWAGE WORKS MANAGER,
Severn-Trent Water Authority, Birmingham (England).
W. Batters.
The Public Health Engineer, Vol. 5, No. 2, p 51, March, 1977.

Descriptors: *Treatment facilities, *Operations, *Maintenance, *Monitoring, Equipment, Design criteria, Activated sludge, Flow, Aeration, Anaerobic bacteria, Sludge digestion, Chemical treatment, Biological treatment, Performance, Costs, *Waste water treatment.
Identifiers: Coleshill Works(Birmingham England).

Observations on sewage treatment at the Coleshill Works, Birmingham, England, were made by its manager. Communication between designers and operators of sewage treatment facilities was a prime concern. The difficulties in reacting to flow variations and in synchronizing treatment processes were considered. It was suggested that sampling should be followed through on a time basis, and not as a sequence of numbers or sampling points. The air supply to aeration tanks should be regulated based on the influent flow to and the sedimented effluent strength of the aeration tanks. It was also suggested that tank performance should not be gauged totally by the meters, and that experience was the best basis for creating a proper atmosphere for biological activity. Heated sludge digestion should be considered because it utilizes anaerobic bacteria and provides a reliable gas source for power generation, if kept under control. Chemical treatment was considered, but it has the drawback of making treatment costs dependent upon material costs rather than on plant and operator efficiency. Fear was expressed that inflation and the scarcity of chemical supplies would create a crisis similar to that in the oil industry. (Collins-FIRL)
W77-07952

PROCESS TECHNOLOGICAL BACKGROUND REGARDING NEW PROTECTIVE REGULATIONS FOR WATER BODIES-RESULTS OF EXPERIMENTS ON NITRIFICATION AND PHOSPHORUS ELIMINATION IN ZURICH AND BERN. II. PROCESS TECHNOLOGICAL BACKGROUND OF NITRIFICATION IN ACTIVATED SLUDGE PLANTS (VERFAHRENSTECHNISCHE UNTERLAGEN IM HINBLICK AUF DIE NEUEN GEWAESSERSCHUTZ-ANFORDERUNGEN-ERGEBNISSE DER VERSUCHE UEBER DIE NITRIFIKATION UND PHOSPHORELIMINATION IN ZUERICH UND BERN. II. VERFAHRENSTECHNISCHE GRUNDLAGEN DER NITRIFIKATION IN BELEBTSCHLAMMANLAGEN),
W. Gujer.
Gas-Wasser-Abwasser, Vol. 56, No. 11, p 609-614, 1976. 10 fig, 3 tab, 6 ref.

Descriptors: *Treatment facilities, *Model studies, *Activated sludge, *Nitrification, Evaluation, Pilot plants, Laboratory tests, On-site tests, Temperature, Theoretical analysis, *Waste water treatment.

Results of pilot and laboratory experiments with activated sludge were evaluated with theoretical explanations. The effects of temperature and digester supernatant on nitrification were explored. A dynamic simulation model was used to describe performance in nitrifying activated sludge plants, with good accuracy, by the hour and for longer time periods. (Collins-FIRL)
W77-07953

TRIALS ON THE OPERATION OF BIOLOGICAL FILTERS,
K. G. Pullen.
Water Pollution Control, Vol. 76, No. 1, p 75-85, 1977. 5 fig, 2 tab, 3 ref.

Descriptors: *Filters, Analytical techniques, *Filtration, *Biological treatment, Treatment facilities, Plastics, Capital costs, Waste water treatment, Pilot plants, Performance, Filters.
Identifiers: Alternating double filtration(ADF), Balanced flow, Balanced loading, *Biological filters.

The operation of biological filters was studied to aid upgrading of treatment facilities. Three full-scale trials and one pilot-scale trial were conducted. At small and medium-sized works that pump crude sewage on-site, alternating double filtration (ADF) should be used when the design capacity on single filtration of the facility has been reached. Increased loadings can be handled with no increase in capital expenditures. Plastic media can be utilized in situations where very large loadings will be treated with single filtration systems. Partial replacement of conventional media would be advantageous. When loadings are only two to three times greater than normal, the plastic media may not perform any better than conventional filters. Further investigation was suggested for balanced flow and loading methods. It is possible that capital costs can be reduced by constructing smaller filter and primary sedimentation tank capacities if increased revenue costs are acceptable for small to medium treatment plants. Too much capital should not be invested in monolithic structures if the 'throw-away' sewage treatment works stage is reached in less than 25 years. (Collins-FIRL)
W77-07954

THREE CASE STUDIES ON THE APPLICATION OF THE STORM WATER MANAGEMENT MODEL,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5B.
W77-07955

METHOD OF FILTERING OIL FROM LIQUIDS,
Hydromation Filter Co., Livonia, Mich. (Assignee).
For primary bibliographic entry see Field 5G.
W77-08011

METHOD OF FILTERING LIQUIDS CONTAINING DISSOLVED CARBON DIOXIDE,
Schlitz (Joseph) Brewing Co., Milwaukee, Wis. (Assignee).
J. E. Sawicki, and J. P. Murdock.
U.S. Patent No 3,992,293, 4 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 952, no 3, p 1209-1210, November 16, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, Water quality control, *Filtration, *Carbon dioxide, Frothing, Alkalinity, Hydrogen ion concentration.
Identifiers: Brewing process.

In the normal brewing process there are a number of different liquid residues of effluents resulting from the various operations in the overall process. When using vacuum filtration equipment to filter the liquid residue or effluent, tremendous quantities of foam are generated due to the dissolved carbon dioxide. This invention is directed to a method of reducing foam generation during processing of a carbonated liquid from brewing processing during vacuum filtration. A water soluble alkaline material, such as an alkali metal hydroxide, is added to the liquid in sufficient quantity to raise the pH to a value in the range of 6.5 to 8.0. The alkaline material will react with the dissolved carbon dioxide to form carbonates. The elimination of the dissolved carbon dioxide substantially decreases foam generation during the vacuum filtration and increases the rate of filtration. (Sinha-OEIS)
W77-08013

METHOD OF SEPARATION OF FISSION AND CORROSION PRODUCTS AND OF CORRESPONDING ISOTOPES FROM LIQUID WASTE,
Ceskoslovenska Komise pro Atomovou Energii, Prague. (Assignee).
H. Prochazka, K. Stamberg, R. Jilek, P. Hulak, and J. Katzer.
U.S. Patent No. 3,993,558, 5 p, 10 ref; Official Gazette of the United States Patent Office, Vol 952, no 4, p 1729, November 23, 1976.

Descriptors: *Patents, *Waste water treatment, Radioactive waste, Water pollution sources, Radioisotopes, Fungi, Sorption, Separation techniques, Liquid wastes, *Corrosion.
Identifiers: *Fission products.

Alkali-metals, earth alkali metals, transition elements, halogenides, rare earth elements and other groups of elements are present in the fission products. Their separation from aqueous waste requires the application of different processes and methods corresponding to the different chemical and physical properties of the fission products. Actual cleaning processes used for neutralizing radioactive waste are based on principles such as evaporation, precipitation, co-precipitation, and sorption. Mycelia of fungi are used as sorbents for retaining the products on their surface and within their pores. The invention includes methods of activation or regeneration of the sorbent. (Sinha-OEIS)
W77-08020

PROCESS FOR ELIMINATING REACTIVE CHLORINATED ORGANIC COMPOUNDS FROM AQUEOUS SOLUTIONS,
Wacker-Chemie G.m.b.H, Munich (West Germany). (Assignee).
W. Opavsky, and E. Macpherson.
U.S. Patent No. 3,993,559, 4 p, 5 ref; Official Gazette of the United States Patent Office, Vol 952, no 4, p 1729, November 23, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Organic compounds, Chemical wastes, Water pollution sources, Chlorine, Chemical reactions, Aqueous solutions.
Identifiers: *Chlorinated organic compounds.

The invention provides a method by which waste waters containing aqueous solutions, particularly chlorinated organic compounds could be treated in a simple manner in order to decrease the content of chlorine to a large degree and render an essential part of the organic compounds removable. The waters are treated at 70-300C, preferably 100-160C, with ammonia or compounds splitting off ammonia, and/or by primary amines or compounds splitting off primary amines, and separating the difficulty soluble reaction products. (Sinha-OEIS)
W77-08021

SEWAGE SLUDGE TREATMENT SYSTEM,
California Inst. of Tech., Pasadena. (Assignee).
J. J. Kalvinskas, and W. A. Mueller.
U.S. Patent No. 3,994,804, 5 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 952, No 5, p 2160-2161, November 30, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, *Water pollution control, Water quality control, Activated carbon, Sludge, Settling basins, Sewage sludge.
Identifiers: Pyrolysis.

An improved method and means in the processing of raw liquid sewage which contains suspended matter is disclosed. It has been found that the ash content of the material coming out of the pyrolyzer is quite high, as much as 75%. This consists primarily of sand and clay that comes in with the raw sewage. This excessive ash constitutes a bulk which interferes with the effective adsorption of the dissolved solids and damages the ability of the carbon to meet the BOD standards. Thus the necessary removal of ash to reduce its amount also results in the removal of a proportionate amount of carbon. By separately pyrolyzing the respective sludges from the first and second settling tanks, and returning the separately obtained pyrolyzed material to the tanks from which they came, it has been found that the adverse effects of the excessive ash buildup is minimized, the carbon yield is increased, and the sludge from the secondary tank can be pyrolyzed into activated carbon to be used as indicated many more times that was done before exhaustion occurs. (Sinha-OEIS)
W77-08030

COMPOSITION AND METHOD FOR FLOCCULATING SUSPENDED SOLIDS,
Calgon Corp., Pittsburgh, Pa. (Assignee).
E. G. Rausch, and R. A. Muia.
U.S. Patent No. 3,994,806, 5 p, 4 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 952, No 5, p 2161, November 30, 1976.

Descriptors: *Patents, *Water treatment, Water quality control, *Water purification, *Flocculation, Suspended solids, Organic compounds, *Polymers, *Waste water treatment.
Identifiers: *Cationic polymers, *Nonionic polymers.

In the flocculation and removal of suspended matter from water, combinations of cationic and nonionic water-soluble polymers are found to be more effective than equivalent concentrations of cationics alone, and significantly lower concentrations of the combination are found to be equivalent in effect to higher concentrations of cationic polymers alone. The cationic polymers useful in the inventation are high molecular weight, water-soluble, cationic polymers. These polymers are prepared by utilizing any of the well known cationic nonomers that readily undergo free radical polymerization. In addition, some of the useful cationic polymers are prepared by condensation polymerization. (Sinha-OEIS)
W77-08031

USE OF STATE ESTIMATION TECHNIQUES IN WATER RESOURCE SYSTEM MODELING, BY DENNIS P. LETTENMAIER AND STEPHEN J. BURGES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 5B.
W77-08035

SIMPLIFIED OPTIMIZATION OF ACTIVATED SLUDGE PROCESS,
Purdue Univ., Lafayette, Indiana. School of Civil Engineering.
C. P. L. Grady, Jr.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE3, Proceedings paper No. 12974, p 413-429, June 1977. 3 fig, 6 tab, 19 ref.

Descriptors: *Waste water treatment, *Activated sludge, Water quality control, *Dynamic programming, *Optimization, *Economic efficiency, Design, Suspended solids, Annual, Costs, Decision making, Mathematical models, Equations, Operations research, Waste water(Pollution).
Identifiers: *Economic analysis, *Cost minimization.

The objective function minimized is the total annual cost associated with the primary settler, aeration basin, blowers, final settler, and recycle pumps. The key to the application of dynamic programming is the proper selction of state and decision variables. The input state to the primary settler is the waste strength, and the decision variable is the removal efficiency, giving the strength of the primary effluent as the input state to the aeration basin. Both the decision variable and the output state for the aeration basin are the mixed liquor suspended solids (MLSS) concentration thus fixing the required volume. Utilizing the MLSS concentration as the input state to the final settler allows the use of the recycle ratio as the decision variable, thereby fixing the required surface area. A tabular format is presented whereby the optimization my be performed simply and efficiently without the use of a computer. It is concluded that dynamic programming is a simple and reliable procesing train of a completey mixed activated sludge system after selection of solids retention time. (Bell-Cornell)
W77-08036

BEST PRACTICABLE WASTE TREATMENT SCREENING MODEL,
Cornell Univ., Ithaca, N. Y. Dept. of Civil and Environmental Engineering.
D. A. Haith, and D. C. Chapman.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE3, Proceedings paper No. 12980, p 397-412, June 1977. 1 fig, 8 tab, 25 ref.

Descriptors: Water quality, *Sewage treatment, *Land use, *Costs, *Simulation analysis, *Dynamic programming, Optimization, Dissolved oxygen, Surface waters, Groundwater, Estimating, Alternative planning, Management, Equations, Waste disposal, Waste water(Pollution), Mathematical models, Operations research, *Waste water treatment.
Identifiers: *Screening model, Cost minimization, Sensitivity.

A mathematical model has been developed for the preliminary screening of wastewater management alternatives involving treatment and discharge to receiving waters and land application. The model, which utilizes simulation and/or dynamic programming, consists of dissolved oxygen modeling of receiving waters, mass balances of nitrogen and water at the land application site, and cost estimating equations. The model is used to assess costs amd water quality impacts on surfce and ground waters of wastewater management options. The model objective is the identification of alternatives that demonstrate 'cost-effective potential' as specified in regulations for 'best practicable waste treatment technology' (BPWTT). The screening model has been utilized to evaluate wastewater management alternatives for a hypothetical city with a wastewater flow of 10 mgd. The model is shown to be effective for screening treatment alternatives; it permits a simple inexpensive systematic evaluation of the costs and environmental impacts of large numbers of management alternatives. (Bell-Cornell)
W77-08037

WASTE WATER TREATMENT BY UPFLOW SAND FILTRATION,
Tulane Univ., New Orleans, La.
F. Ittihadieh.
PhD Thesis, 1976. 215 p.

Descriptors: *Filters, *Soil filters, Filtration, Design, Potable water, Water reuse, Flow rates, Waste water treatment, Oxygen demand, Water purification, Coagulation, Flocculation, Suspended solids, Domestic wastes.
Identifiers: Upflow filtration.

Upflow sand filtration systems were investigated to determine solutions to some design problems. Parameters tested were sand media sizes, flowrates of waste water through filters, coagulation-flocculation, pressure buildups and head losses, and removal rates of suspended and dissolved material and oxygen demands. The degree of treatment under various filtration conditions was determined and the results were evaluated. A study was conducted to test activated sludge plant effluent, trickling filter plant effluent, and primary effluent. Results indicated that the upflow method was useful as a clarification unit and for filtering activated sludge effluent. The methods for laboratory evaluation of coagulation, flocculation, and filtration were useful and necessary. When activated sludge effluent was treated in the normal manner, there was effective removal of suspended and colloidal materials. Removal was good with 44-inch No. 8-20 or No. 6-12 size media at flow rates of 6 and 8 gpm/square foot. The coagulation-filtration tests revealed that better clarification was obtained with strong waste waters than with weak waste waters. (Collins-FIRL)
W77-08087

SKIMMER APPARATUS FOR SEWAGE SETTLING TANKS AND THE LIKE,
Sybron Corp., Rochester, N.Y. (Assignee).
For primary bibliographic entry see Field 5G.
W77-08088

METHOD FOR IMPROVING THE QUALITY OF CONTAMINATED WASTE WATER,
Chemfix, Inc., Pittsburgh, Pa. (Assignee).
J. R. Connor, E. A. Zawadski, and R. J. Polosky.
United States Patent 4,012,320. Issued March 15, 1977. Official Gazette of the United States Patent Office, Vol 956, No 3, p 958, March, 1977. 1 fig.

Descriptors: *Patents, *Adsorption, *Separation techniques, Water quality, *Waste water treatment, Pollution abatement, Chemical reactions, Liquid wastes, Alkalis, Water purification.

A patent was issued for a method to improve contaminated waste water quality by removing pollutants. An aqueous solution of an alkali metal silicate and a silicate setting agent are mixed with the contaminated waste water to form an earth-like material. This material is pulverized and mixed with the waste water to react with pollutants. After a sufficient mixing time, the water is separated from the pulverized material and pollutants. (Collins-FIRL)
W77-08090

WATER WASTE TREATMENT,
F. A. Fairbanks.
United States Patent 4,011,163. Issued March 8, 1977. Official Gazette of the United States Patent Office, Vol. 956, No. 2, p 569, March, 1977. 1 fig.

Descriptors: *Patents, Equipment, *Sewage treatment, Sludge digestion, Suspended solids, Sedimentation, Liquid wastes, *Waste water treatment, Treatment, Air.

A patent was issued for a sewage treatment apparatus. The device consists of an outer tank enclosing a mixing chamber with a draft tube for sewage transport to the mixing chamber. An outer draft tube is positioned annularly about the first draft tube, and an inner tank, positioned annularly about the outer draft tube, is below and open to the mixing chamber and acts as a primary settling circuit. There are two annular passageways between the inner tank and the outer wall. A portion of the sewage solids from the primary and secondary settling circuits can be returned to the mixing chamber. The mixing chamber contains a pumping means for the introduction of air into the sewage. There is a digester compartment with a connective means to the primary and secondary settling circuits and a sewage treatment outlet. (Collins-FIRL)
W77-08092

INVESTIGATION OF DYNAMIC PERFORMANCE OF WASTE WATER TREATMENT PLANTS,
Wisconsin Univ.-Madison.
C-Y. Shih.
PhD Thesis, 1976. 411 p.

Descriptors: *Treatment facilities, *Performance, *Operation and maintenance, Pollution abatement, Model studies, Sewage treatment, Effluents, Separation, Coagulation, Filtration, Waste water treatment.

A study was conducted to determine the time-dependent performance of waste water treatment plants. The stochastic time series approach used here is based on the analysis of large amounts of collected data. Two treatment systems in Wisconsin were studied. Although existing models cannot explain such situations as internal compensating mechanisms for damping out normal diurnal variations in organic loading, this model is able to explain 42-82% of data variations. Comparing the

results from simplistic mechanistic models and stochastic models indicated the importance of this comparison in understanding the advantages and disadvantages of each model type. The performance of final clarifiers was also studied. Indications were that improved solids removal in final clarifiers, rather than improved soluble BOD5 removal in aeration basins, was more important for a higher degree of total system performance. Solids removal efficiency could be upgraded by expanding final clarifiers, adding coagulant aids, or filtering the final effluent. (Collins-FIRL)
W77-08094

KINETICS OF BREAKPOINT CHLORINATION AND DISINFECTION,
California Univ., Berkeley.
B. M. Saunier.
PhD Thesis, 1976. 395 p.

Descriptors: *Kinetics, *Chlorination, *Disinfection, Model studies, Chemical reactions, Chlorine, Lime, Municipal wastes, Nitrogen, Coliforms, Waste water treatment, Mathematical models.

A continuous flow pilot plant study was conducted to determine the kinetics of chlorine-ammonia reactions with chlorine added in excess (breakpoint chlorination) and of bacterial disinfection. Significant results were: reaction end products containing nitrogen and a lesser quantity of nitrate; nitrate production which increased directly with initial chlorine/nitrogen dose ratio; trichloride production which was less pH-dependent; and nitrate formation which was slow and not strongly pH-dependent. Nitrogen released from nitrogen trichloride was converted mainly to nitrate in the presence of free chlorine. The initial reacting stream segregation had no substantial effect on breakpoint reaction rates, but had a small effect on nitrate production. HOCl was approximately 30 times more bactericidal than OCl(-). NHCl2 was as bactericidal as HOCl. NH2Cl was practically inert in comparison. The mathematical model developed in this research can compute water pH immediately following chlorine and other chemical application, as well as the production of the aforementioned compounds, and total chlorine, free chlorine, mono-, di-, and trichloramines. Model predictions vary from reality when chlorine/ammonia dose ratio is relatively small or the contact time is short. (Collins-FIRL)
W77-08095

ANALYSIS OF ACTIVATED SLUDGE PROCESS PERFORMANCE,
California Univ., Davis.
W. H. Hovey.
PhD Thesis, 1976. 72 p.

Descriptors: *Activated sludge, *Performance, *Treatment facilities, Municipal wastes, Biological properties, Physical properties, Model studies, Economics, Evaluation, Flow, Sewage effluents, Biochemical oxygen demand, Water quality control, Waste water treatment.

A study was conducted to collect and analyze daily data on the performance of activated sludge plants. Linear and multiple regression techniques were used to evaluate effluent quality, effluent quality variation, and effluent quality as a function of flow rate and design flow rate. The predictable variation of effluent quality, when measured by BOD and suspended solids concentrations, can allow the prediction of process performance variations and the development of discharge requirements which are realistically attainable. There were no indications of any effect of process size or process performance, suggesting no real benefit from larger regional facilities insofar as stream water quality control is concerned. The net effect of larger facilities having larger flow rates may even be negative on receiving streams. (Collins-FIRL)
W77-08096

MECHANISMS AND KINETIC PARAMETERS IN GRANULAR MEDIA FILTRATION,
California Univ., Berkeley.
M. C. Kavanaugh.
PhD Thesis, 1974. 422 p.

Descriptors: *Kinetics, *Filtration, Model studies, Design criteria, Pilot plants, Separation, Suspended solids, Performance, Waste water treatment, Analytical techniques, Filters.
Identifiers: Granular media filters, Multi-media filters, Upflow filters.

Investigations were conducted to develop a process analysis methodology for particle collection in deep-bed granular media filters for optimum filter process design with minimum pilot plant experiments. Experiments indicated that straining was of small contribution to particle removal for stabilized and destabilized particles if the particle size/medium size ratio was less than .004, and the particle number flux was less than 100,000,000/sq cm/sec. Attachment was thought to be the rate limiting step under all experimental conditions. The three model parameters for a given layer of medium were the amount of solids deposited prior to the onset of effluent quality deterioration, the maximum depth-averaged single collector efficiency, and the first order proportionately constant relating head loss to specific deposit. The method was found to permit estimation of optimum process design, if the parametric dependence of the model parameters is known. (Collins-FIRL)
W77-08097

METHOD FOR ELIMINATING ORGANIC AND INORGANIC BOUND NITROGEN FROM DOMESTIC AND INDUSTRIAL WASTE WATER,
Cellulose Attisholz A. G. (Switzerland). (Assignee).
M. Duback, and A. Scherler.
United States Patent 4,011,156. Issued March 8, 1977. Official Gazette of the United States Patent Office, Vol 956, No 2, p 566-567, March, 1977. 1 fig.

Descriptors: *Patents, *Aeration, *Nitrogen, Organic matter, Inorganic compounds, Domestic wastes, Industrial wastes, *Waste water treatment, Water purification, *Denitrification.

A patent was issued for a method to eliminate organic and inorganic bound nitrogen from domestic and industrial waste water. The process involves two stages connected in series which can directly process unclarified waste water in a biological activated sludge treatment plant. Waste water is aerated in the first stage and transferred to the settling basin where a clarified effluent is transferred into the second stage aeration tank and then to the second stage settling basin. Waste water with organic and inorganic bound nitrogen is aerated in the first stage tank and the organic bound nitrogen is ammonified. The ammonified waste water is transferred to the first settling basin and nitrates are denitrified. This effluent is transferred to the second aeration tank where an oxygen level of at least 2 milligrams/liter is provided. Ammonia is nitrified to nitrates in this section and the process is continued by recirculating a portion of the clarified effluent from the second settling basin to the first aeration tank. (Collins-FIRL)
W77-08099

WASTE-WATER PROCESS,
Chevron Research Co., San Francisco, Calif. (Assignee).
T. R. Farrell, R. J. Klett, and J. A. Craig.
United States Patent 4,002,565. Issued January 11, 1977. Official Gazette of the United States Patent Office, Vol. 954, No. 2, p 777-778, January, 1977. 1 fig.

Descriptors: *Patents, *Water reuse, *Ammonia, *Acids, *Gases, *Waste water treatment, Separation, Temperature, Equipment, Water purification, Liquid wastes.

A patent was issued for a process to produce recycle water and to separate ammonia and acid gas from waste water. Waste water is passed through an acid gas-ammonia stripping column, which is maintained at a bottoms temperature of 93-149 C and a pressure of 1 to 5 atmospheres absolute, to produce a recycle water stream and an effluent gas stream of acid gas, ammonia, and water vapor. The acid gas and ammonia content is less than 15% of that in the waste water. The two streams are separately withdrawn from the stripper and a liquid aqueous concentrate of ammonia and gas are produced by decreasing the temperature of the gas stream to about 55 to 110 C. The concentrate is passed into a primary acid-gas stripping column, and is maintained at superatmospheric pressure acid-gas stripping conditions to produce an effluent acid-gas stream and an aqueous bottoms stream. The acid-gas stream and the bottoms stream are separately removed from the acid-gas stripping column to produce an effluent gas stream of ammonia, and a second recycle water stream by passing the bottoms stream through an ammonia stripping column. This column is maintained at superatmospheric pressure ammonia stripping conditions. The second stream has an acid gas ammonia content which is 15% less than that of the bottoms stream from the acid-gas stripping column. (Collins-FIRL)
W77-08100

5E. Ultimate Disposal Of Wastes

WORKSHOP PROCEEDINGS -- RESEARCH NEEDS RELATED TO RECYCLING URBAN WASTEWATER ON LAND,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W77-07607

RESULTS OF R/V YAQUINA CRUISE YALOC-74, LEG 3: SEABED DISPOSAL PROGRAM, NORTH PACIFIC STUDY AREA MPG-2, 33 DEGREES 20'N, 151 DEGREES 00'W, NOV. 30 - DEC. 21, 1974,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
G. R. Heath.
Available from the National Technical Information Service, Springfield VA 22161 as AD-A013 433, Price codes: A03 in paper copy, A01 in microfiche. Report to U. S. Energy Research and Development Administration and U. S. Office of Naval Research, Ref. No. 75-4, July 1975. 29 p, 14 fig, 2 append. ERDA-E(11-1)-2689 ONR-N00014-67-A-039-0007.

Descriptors: *Radioactive waste disposal, Water pollution sources, Sediments, Geochemistry, Sites, Oceans, Water quality, *Pacific Ocean, Sampling, *Pollutant identification.
Identifiers: *North Pacific Ocean, Geotechnical properties, Sea floor.

During 10 days in the vicinity of 33 degrees 20'N, 151 degrees 00'W (MPG-2 area), three near-bottom current meters were deployed, the bathymetry and sub-bottom acoustic structure of the surrounding seafloor were determined, and sediment cores were collected for studies of artificial radionuclide distribution, geotechnical properties, geochemical properties, and to identify the character of shallow acoustic reflectors. Large volume water samples for artificial radionuclide and suspended sediment were also collected. These samples and data will supplement earlier material to be used in the evaluation of the central North Pacific as a potential site for the ultimate disposal of high-level reactor wastes. (Sinha-OEIS)

W77-07739

WASTE MANAGEMENT FOR THE COASTAL ZONE: CONCEPTS FOR THE ASSESSMENT OF OCEAN OUTFALLS,
Assembly of Engineering Marine Board, Washington, D.C.
E. F. Gloyna, N. E. Armstrong, J. C. Geyer, M. Lang, and J. D. Parkhurst.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-023 514, Price codes: A03 in paper copy, A01 in microfiche. National Academy of Sciences-National Academy of Engineering Report, March 1976. 33 p, 2 fig, 16 ref, 2 append. ONR-N00014-67-A-0244-0002.

Descriptors: *Waste disposal, *Environmental effects, *Water pollution, Coasts, Water quality control, Federal government, Management.
Identifiers: *Ocean outfalls, *Coastal zone management, Outer Continental Shelf, Waste management.

In 1973 the Marine Board launched the study upon which this report was based in recognition of the need to address questions regarding coastal wastewater management practices and their environmental impacts. The report considers various waste materials now disposed through ocean outfalls, evaluates several waste disposal systems, and assesses federal regulations governing waste disposal. It deals particularly with the rationale for setting federal standards to protect the marine environment. (Sinha-OEIS)
W77-07747

TAR BALL DISTRIBUTION IN THE WESTERN NORTH ATLANTIC,
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W77-07757

INVENTORY OF BENTHIC ORGANISMS AND PLANKTON AT MOKAPU, OAHU,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2L.
W77-07798

DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5D.
W77-07816

INFLUENCE OF ENVIRONMENTAL FACTORS ON SELECTED AMELIORATION TECHNIQUES FOR DISCHARGES OF HAZARDOUS CHEMICALS,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5G.
W77-07828

ESTIMATING COSTS OF WASTE WATER SLUDGE DISPOSAL,
Boyle Engineering Corp., Orlando, Fla.
S. C. Helle.
Public Works, Vol 108, No 3, p 56-58, March, 1977. 5 fig.

Descriptors: *Cost analysis, *Costs, *Sludge disposal, Sludge digestion, Dewatering, Transportation, Capital costs, Maintenance costs, Electric power costs, Operating costs, Wages, Comparative costs, Equipment, Estimated costs.

A procedure for cost estimation of waste water sludge disposal was presented. The analysis was broken down according to the three phases of sludge disposal: digestion, dewatering, and hauling. Digestion costs included capital investment, power, labor, and maintenance costs. Dewatering expenses consisted of capital, power, labor and maintenance, and chemical costs. Hauling costs were truck purchase and operation, labor costs, and dumping fees. If changes in the sludge disposal operation occur, estimates need be reanalyzed for only that phase which is affected. Estimated parameters for various phase components were input into a series of simple equations to illustrate the computational format for arriving at costs. (Collins-FIRL)
W77-07861

NITRIFICATION IN SOIL TREATED WITH DOMESTIC AND INDUSTRIAL SEWAGE SLUGE,
Georgia Univ., Experiment. Dept. of Agronomy.
D. O. Wilson.
Environmental Pollution, Vol. 12, p 73-82, 1977. 3 fig, 5 tab, 15 ref.

Descriptors: *Nitrification, *Sludge disposal, Domestic wastes, Industrial wastes, Soil contamination effects, Heavy metals, Lead, Zinc, Cadmium, *Sewage disposal, *Waste water treatment, *Sewage sludge.

Experiments were conducted to determine the effects of two sewage sludges, varying in metal content, on nitrification of NH4 (+) -N added to soil. Dried domestic or industrial sewage sludge was applied to soil at rates of 0, 1, 4, or 16 milligrams/gram and the soils were incubated with or without added NH4 (+) -N at 30 C. Data was not corrected for nitrification occurring in untreated soil. Domestic sludge had no great effect on (NO3(-) + NO2(-) -N, except at 16 milligram/gram applications. Industrial sludge at 4 and 16 milligrams/gram substantially reduced the same values when compared to control values during the first few weeks. High application rates of both sludges produced appreciable amounts of NH4 (+) -N accumulated at the end of the first week. Industrial sludge reduced nitrification at the two highest rates and, at the highest rate, completely inhibited nitrification during the first two weeks. Domestic sludge had a slight effect on nitrification reduction at the highest rate. The reduced nitrification at high rates of industrial sludge was thought to be caused by zinc, cadmium, and lead. It was concluded that high rates of sewage sludge containing high metals concentrations temporarily inhibit nitrification and that extended use of such sludges may seriously interfere with important microbial nitrogen transformation in soil. (Collins-FIRL)
W77-07862

EFFECTS OF TRACE ELEMENTS ON NITROGEN MINERALIZATION IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-07864

COMMUNITY WATER SUPPLY AND EXCRETA DISPOSAL IN THE DEVELOPING COUNTRIES,
International Reference Centre for Community Water Supply, The Hague (Netherlands).
For primary bibliographic entry see Field 5G.
W77-07865

SILK FROM SOW'S EARS.
For primary bibliographic entry see Field 5D.
W77-07867

SAVE SLUDGE HANDLING COSTS BY LEVEL CONTROL,
Markland Specialty Engineering, Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5D.
W77-07868

APPLICATION OF SEWAGE SLUDGE TO CROPLAND.
Crops and Soils, Vol 29, No 7, p 5-7, April/May, 1977.

Descriptors: *Sludge disposal, *Soil amendments, Heavy metals, Nutrients, Toxicity, Fertilizers, Vegetation, Phosphorus, Cadmium, Crops, *Soil disposal fields, *Sewage sludge.

A summary was presented of an EPA report, by the Council of Agricultural Science and Technology, on the application of sewage sludge to cropland. Sludge may be a good source of plant nutrients and a good soil conditioner, but the problem of possible heavy metal contamination must be considered. About 25% of sludge is applied to land, but future economic and environmental considerations may increase its application to croplands. With increasing sludge production, industrial pretreatment of waste water could substantially reduce heavy metals in sludge. It has been suggested that the sludge quantity applied be determined by nitrogen, phosphorus, or heavy metal content. Where metal content is low, the nutrient needs of the crops could be the deciding factors. Various recommendations were made for the use of sludges containing cadmium, copper, molybdenum, nickel, and zinc. Parameters of usage included soil pH; metal residence time in soils; and effects on crops, animals, and humans. (Collins-FIRL)
W77-07869

ORGANIC MATTER AND HEAVY METAL UPTAKE,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
M. B. Kirkham.
Compost Science, Vol. 18, No. 1, p 18-21, January-February, 1977. 57 ref.

Descriptors: *Organic matter, *Heavy metals, Soil chemical properties, *Sludge disposal, Fulvic acids, Humic acids, Hydrogen ion concentration, Copper, Iron, Zinc, Manganese, Molybdenum, Toxicity.

The uptake of the organic matter and heavy metal content of sludge has become increasingly important due to the economically beneficial disposal of sludge for agricultural purposes. The greater portion of heavy metals combined with soil organic matter are insoluble, stable combination with humic substances. The presence of humus in soil is beneficial because it holds heavy elements needed for plant growth for long periods of time and releases them as needed. Deficiencies of these heavy metals are most consistently found in plants grown on peat and muck soils. Low pH causes reduced availability from organic matter relative to the same soil without organic matter; high pH causes this availability to increase. The organic matter degradation rate in soil is dependent on microbial activity. Incubation studies indicated that metal release by sludge decomposition in an alkaline soil did not make these metals available for plant uptake. Other studies indicated that plants grown on soils composted with sludge had much lower cadmium and zinc contents than those grown on plots with digested sludge. Radioisotope studies indicated that organic matter reduces plant uptake of radioisotopes. Sludge was found effective in increasing the organic matter content of soil. Research indicated that the maintenance of a high organic matter content in soil reduces plant uptake of metals added to soils treated with sludge. (Collins-FIRL)
W77-07870

'HYDIG'-ONE EXAMPLE OF CONTROLLED SLUDGE USE,
Compost Science, Vol. 18, No. 1, p 30, January-February, 1977.

Descriptors: *Sewage treatment, *Sludge disposal, *Fertilizer, Humus, Nitrogen, Phosphate, Soils, Metals, Trace metals, Organic matter, Soil disposal fields, Waste disposal, *Waste water treatment.
Identifiers: Hydig, Liquid fertilizer.

A sewage treatment plant at Rickmansworth, England, has developed a liquid fertilizer from treated sludge called 'Hydig.' It is distributed to farms in a 300 square mile area around the plant. The treated sludge becomes a fertilizer rich in humus, nitrogen, and phosphate, and it has some potassium. Instructions are provided with the product which emphasize the possible toxicity of heavy metals contained in it. It contains 60.1% of organic and volatile matter, 39.9% mineral matter, 7.84% total nitrogen, and 5.13% phosphorus. Metal content averages 0.0032% for cadmium, 0.0117% for nickel, 0.0392% for chromium, 0.1337% for zinc, and 0.0437% for lead. Various controls are used for the distributed sludge. Each field at every farm is recorded and every dressing and quantity is noted. Soil samples are analyzed before each dressing and sludge is sampled daily from the delivery tanker. (Collins-FIRL)
W77-07871

COMPOSTING--AN APPROACH TO USING SEWAGE WASTE,
Bird and Hale Ltd., Toronto (Ontario). Water Management Div.
J. D. Heaman.
Compost Science, Vol. 18, No. 1, p 28-29, January-February, 1977.

Descriptors: *Sludge disposal, *Fertilizers, Sludge digestion, Dewatering, Bacteria, *Biological treatment, Temperature, Equipment, Anaerobic conditions, Storage, Organic compounds, Oxidation, Odor, Public health, Nutrients, Nitrogen, Phosphorus, Waste disposal, *Canada.
Identifiers: *Composting.

Composting was considered as a means of using sewage wastes. The City of Windsor, Canada, has contracted with a composting firm to process sludge produced from treatment plants. Water is first removed until there is approximately 30% solids. The sludge is mixed with sawdust, inoculated with starting material, and the blend may then be oxidized to produce a stable humus. The sludge/sawdust ratio is about 80:20 by weight. Bacterial action begins at this point; the mixture is turned to prevent anaerobic conditions. After three months of this treatment, the compost is suitable for farm use. Care must be taken to provide an environment which allows the biochemical processes to continue. Temperatures of nearly 165 F destroy pathogenic bacteria and other unwanted materials. The product is odor-free, nonhazardous to health, and sterile. It is marketed in 10, 25, 50, and 80-pound bags. Blends are marketed as a potting soil, a mixture to improve aeration, and a greenhouse aid. They are also used to improve plant growth and soil fertility. The method is applicable to any waste matter with a substantial organic character for stabilization. (Collins-FIRL)
W77-07876

A NEW VACUUM SEWAGE SYSTEM BY IFO WARTSILA.
For primary bibliographic entry see Field 5D.
W77-07882

GO AHEAD FOR DRAINAGE AND OUTFALL,
Effluent and Water Treatment Journal, Vol. 17, No. 3, p 112, March, 1977.

Descriptors: *Drainage, *Outfalls, Piping, Monitoring, Waste disposal, Sewage effluents, Bacteria, Saline water, Domestic wastes, Pollution abatement, Environmental control.
Identifiers: *Ocean disposal.

The Wessex Water Authority, in England, has decided to build a proposed drainage and long sea outfall system as the most effective and economical solution for the sewage problems in the Weymouth and Portland areas. A study has been undertaken to select definite siting and outfall length. Conditions in the outfall area will be monitored before and after construction to determine the necessity of pretreatment. Tests are also to be conducted with harmless bacteria to determine the time it takes for them to move from the outfall area back to land. The long sea outfall discharging macerated and screened domestic effluent into deep water is expected to relieve present marine pollution problems. (Collins-FIRL)
W77-07889

GOLAR RUBBISH, OIL SLUDGE AND SEWAGE INCINERATOR.
Shipbuilding and Marine Engineering International, Vol. 99, No. 1204, p 680, December, 1976.

Descriptors: *Incineration, Boats, *Waste disposal, Sludge disposal, Equipment, Heat treatment, Sewage treatment, Treatment facilities, Oil wastes, Solid wastes, *Ultimate disposal.
Identifiers: *Golar GS500 incinerator, Marine sanitation.

An incinerator, the Golar GS500, was developed for shipboard wastes. The unit weighs about 4,300 kilograms; it can burn solid wastes up to 75 kilograms/hour, oil sludge at nearly 80 kilograms/hour, depending on water content, sewage at nearly 30 kilograms/hour, or any combination to a maximum of 580 kilowatts. There is a top-mounted oil burner above the combustion chamber, but not in the interconnecting rubbish chamber. Combustion is usually at 1200-1400 C. Pyrolysis in the rubbish chamber, using radiant heat from the combustion chamber, occurs at 400-800 C. The oil burner has two diesel oil burning stages, at 36 and 16 kilograms/hour, with a pressure atomizing and a steam-atomized sludge burner stage. Particles up to an 8 millimeter diameter can be processed, allowing incineration of raw sewage sludge from common treatment facilities. Sewage sludge should be directly pumped into the oil sludge tank to produce a more combustible mixture. No sludge preheating is necessary. Rubbish can be loaded through a feed hatch for distribution to the combustion chamber by a manually-operated rotating sluice. (Collins-FIRL)
W77-07911

SEWAGE SLUDGE DISPOSAL: A STICKY PROBLEM WITH NO FAIL-SAFE ANSWER,
C. V. Fluet.
Solid Wastes Management, Vol. 20, No. 2, p 38, 58-59, February, 1977.

Descriptors: *Sludge disposal, *Sewage disposal, Landfills, Solid wastes, Sludge digestion, Heavy metals, Soil contamination, Food chains, Incineration, Economics, Costs, *Waste water treatment.
Identifiers: Land disposal, Ocean dumping, Soil injection, Composting.

Methods for the disposal of sewage sludge were considered. A well and properly designed landfill can accept sludge. The usual procedure involves combining dewatered sludge, containing no more than 20-30% solids, with solid wastes or soil for bulking. Landfilling is a reasonable alternative disposal method if land is available and is environmentally acceptable. It is also economical but is only a stop-gap solution. Contaminant, leachate, and heavy metals movement present problems with landfilling. Discing, plowing or injecting digested, dewatered sludge on the soil surface and subsurface is another disposal alternative. This allows sludge to be used as an added resource. Using sludge on food crops for humans or animals is problematic because of the heavy metals pollution of the food chain. Bacteria, viruses, and persistent pesticides raise other questions regarding this disposal method, particularly because of the potential danger to groundwaters. Entrenchment of raw sewage requires substantial land areas and is very costly. Small-scale composting has received some acceptance as a disposal method. Ocean dumping is ruled out because it produces many more pollution and contamination problems. Incineration is another alternative, but produces problems of ash residues with a high metals concentration and it usually involves some land disposal. Choosing one disposal method over another will depend on the relative importance of all factors involved. (Collins-FIRL)
W77-07948

PREFABRICATED PANELS FOR SUB-SURFACE SEWAGE EFFLUENT AND WASTE WATER DISPOSAL,
R. W. Johnson.
United States Patent 4,013,559. Issued March 22, 1977. Official Gazette of the United States Patent Office, Vol 956, No 4, p 1380, March, 1977. 1 fig.

Descriptors: *Patents, *Concrete, *Underground disposal, Septic tanks, Sewage disposal, Waste water disposal, Liquid wastes, Construction materials, Ultimate disposal, Disposal.

A patent was issued for prefabricated panels to be used for underground sewage effluent and waste water disposal from septic tanks. There is at least one panel section which includes top, bottom, end, and side walls of a strong, porous cementitious material. Several elongated chambers with an upper, lower, and intermediate chamber, one above the other, are arranged within the section. These are partially separated by a web of the porous cementitious material. A pipe extends from the septic tank into the upper chamber to allow air and waste water to enter the panel section. There is also a means for overflow effluent to move through the separating webs to the lower chambers. (Collins-FIRL)
W77-08091

INCINERATION METHOD AND SYSTEM,
Envirotech Corp., Menlo Park, Calif. (Assignee).
L. A. Lambana, and J. G. Campos.
United States Patent 4,013,023. Issued March 22, 1977. Official Gazette of the United States Patent Office, Vol 956, No 4, p 1202, March, 1977. 1 fig.

Descriptors: *Patents, *Incineration, Equipment, Oxidation, Gases, Oxygen, Sludge disposal, Dewatering, Air, *Waste treatment.
Identifiers: Multiple hearth furnace, Afterburners.

A patent was issued for a method and apparatus for sludge incineration. Dewatered sludge containing organic wastes is incinerated in a multiple hearth furnace equipped with an afterburner for receiving gases and vapors from the furnace. Wastes are pyrolyzed in a regulated oxygen-deficient atmosphere so that the products of the pyrolysis are only partially oxidized. These products are then conveyed in the gases and vapors from the furnace to the afterburner, where enough air is introduced to complete their oxidation. (Collins-FIRL)
W77-08098

5F. Water Treatment and Quality Alteration

CONCENTRATION OF BACTERIA IN WATER USING THE ULTRAFILTRATION METHOD, (IN FRENCH),
Institut National de la Sante et de la Recherche Medicale, Villeneuve D'Ascq (France). Ecotoxicol. Microb. Unit.
For primary bibliographic entry see Field 5D.
W77-07860

DIRECT AND INDIRECT WASTE WATER REUSE FOR MUNICIPAL PURPOSES,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5D.
W77-07866

HOW TO DETERMINE WASTE WATER FLOW,
W. S. Foster.
The American City and County, Vol 92, No 3, p 61-62, March, 1977.

Descriptors: *Flow measurement, *Pipe flow, *Monitoring, *Sewers, *Measurement, Data collection, Equipment, Flow rates, Instrumentation, Planning, Water pollution.

A discussion was presented of various aspects of the problem of waste water flow determination. The monitoring equipment should be accurate and operable in wet or dry weather, reasonably priced and easy to install and service, capable of quick and easy installation at various manhole locations, rugged and operable in an automatic mode, reasonably vandal-proof, and should not interfere with the flow in the sewers or with sewer use. Oscillating probes, bubbler tubes, various floats, ultrasonic level detectors, and capacitance measuring probes are used for monitoring purposes. Flow velocity can be measured by using salts or radioactive tracers in the waste water, or by a chemical dilution method using a fluorescent dye. Information derived by these instruments and methods can guide engineers, planners, and administrators in developing abnd improving collection systems. (Collins-FIRL)
W77-07881

TREATING URBAN DRAINAGE AS A UTILITY,
Kramer, Chin and Mayo, Inc., Seattle, Wash.
For primary bibliographic entry see Field 5G.
W77-07947

SOME REFLECTIONS OF A SEWAGE WORKS MANAGER,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 5D.
W77-07952

COMPOSITION AND METHOD OF INHIBITING GROWTH OF SLIME IN WATER,
Betz Lab., Inc., Trevose, Pa. (Assignee).
For primary bibliographic entry see Field 5G.
W77-08027

COMPOSITION AND METHOD FOR FLOCCULATING SUSPENDED SOLIDS,
Calgon Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 5D.
W77-08031

5G. Water Quality Control

GLOSSARY OF WATER RESOURCE TERMS,
Open Lands Project, Chicago, Ill.
For primary bibliographic entry see Field 10C.
W77-07613

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. SELECTED MAJOR WATER USING INDUSTRIES AND POPULATION PROJECTIONS, APPENDIX III.
CH2M/Hill, Corvallis, Oreg.
For primary bibliographic entry see Field 6D.
W77-07624

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. WATER QUALITY CONTROL PROJECTIONS, APPENDIX VI.
Oregon State Sanitary Authority, Salem.
Prepared for the Oregon State Water Resources Board, (Salem), June 1969, 216 p, 19 fig, 108 tab.

Descriptors: Water quality, *Water quality control, *Water quality standards, *Oxygenation, *Biological oxygen demand, River basins, Stream flow, *Wastes, *Waste disposal, Hydraulic characteristics, *Projections, *Forecasting, *Irrigation, *Oregon, Municipal wastes, Waste treatment, *Columbia River, *Waste assimilative capacity.
Identifiers: Water turbulance, Recreation coefficient, Cascade Mountains, Coast Range Mountains, Willamette River Basin, Sandy River Basin(OR), Hood River and Fifteenmile Creek Basins(OR), Deschutes River Basin(OR), John Day River Basin(OR), Umatilla, Walla Walla and Willow Creek Basins(OR), Grande Ronde Basin(OR), Powder and Burnt River Basins(OR), Malheur River Basin(OR), Owyhee River Basin(OR), Malheur Lake Basin(OR), Malheur Lake Basin(OR), Goose and Summer Lakes Basin(OR), Klamath River Basin(OR), Rogue River Basin(OR), Umpqua Basin(OR), South Coast Basin(OR), Mid Coast Basin(OR), North Coast Basin(OR), *Snake River(OR).

Water quality control projections are presented for 20 river basins in Oregon. Descriptions of the condition of the receiving streams under present flow and loading conditions serve as a reference when analyzed against the framework of present and 'ultimate' development conditions. Levels of biological oxygen demand (BOD) are used as a convenient, general water quality parameter. Projections of the quality of return flows are based on projected per capita water use by month, the present production of oxygen-demanding wastes from the most efficient industrial processes now in use, and the number of times water has been reused in irrigation before entering the stream. A large variation in assimilative capacity required two sets of water quality objectives: a seasonl minimum of 85% of saturation for free flowing streams east of the Cascades, and 90% for streams west of the Coast Range. Estimates of the reaeration coefficient for each reach were developed from stream gradient data at a known flow, and cross section data. The total assimilative capacity is estimated by correlating variability of channel conditions with distance. An oxygen balance solution was computed for the year 2020 and 'ultimate development' and offered as streamflow requirements for each reach and each of 12 projected months. (Gentry-NC)
W77-07626

A LAND USE DECISION METHODOLOGY FOR ENVIRONMENTAL CONTROL,
Rocky Mountain Center on Environment, Denver, Colo.
For primary bibliographic entry see Field 6G.
W77-07629

ENVIRONMENTAL GEOLOGIC ASPECTS OF PLANNING, CONSTRUCTING, AND REGULATING RECREATIONAL LAND DEVELOPMENTS,
Wisconsin Dept. of Administration, Madison. State Planning Office.
For primary bibliographic entry see Field 6G.
W77-07630

ENVIRONMENT AND REGIONAL PLANNING, A PILOT STUDY OF THE COMMITTEE ON THE CHALLENGES OF MODERN SOCIETY,
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
For primary bibliographic entry see Field 6G.
W77-07633

EXPERIENCE OF THE PAVLODAR OBLAST PUBLIC HEALTH SERVICE IN SANITARY PROTECTION OF THE IRTYSH RIVER, (IN RUSSIAN),
V. V. Popov, P. E. Li, Y. S. Kalinin, I. I. Sain, and E. V. Sveshnikova.
Gig Sanit 5, p 98-100. 1976.

Descriptors: Public health, Rivers, Water quality control, Pollution abatement, Bacteria, Bacteriology, Ecoli, Microorganisms, Water pollution, Regulation, Sewage.
Identifiers: *Irtysh River(Kazakh-SSR), USSR.

Efforts to improve the sanitary condition of the middle course of the Irtysh River (Kazakh SSR, USSR) since the 1958 implementation of the Bukhtarma dam are reviewed. Active physical, chemical and bacteriological research, regulation of annual water flow, reduction of sewage inflow and water-protective construction resulted in arresting the further deterioration of water quality; indicators of microbe numbers and titer of Escherichia coli show the Irtysh to be still significantly polluted. Further measures are proposed, including curtailment of dumping partially treated sewage water from Pavlodar and other industrial sewage, better construction of shoreline population centers and farms, prevention of pollution from river shipping and strengthened sanitary measures further upstream.--Copyright 1977, Biological Abstracts, Inc.
W77-07686

LAW, RULES, AND REGULATIONS PERTAINING TO GROUNDWATER IN NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 4B.
W77-07695

EXPERIMENTAL DATA FOR THE HYGIENIC STANDARDIZATION OF DIPHENYLAMINE AND DIPHENYLDIETHYLUREA IN WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
A. A. Korolev, M. V. Arsen'eva, B. R. Vitbitskaya, T. A. Zakharova, and A. S. Kinzirskii.
Gig Sanit 5, p 21-25, 1976.

Descriptors: *Lethal limit, *Water quality standards, *Ureas, *Organic compounds, Toxicity, Rodents, Water pollution, Public health.
Identifiers: *Amines.

The investigated substances affect mainly the CNS, the liver and the blood (of rats). The changes noted are typical for an intoxication with nitroamino compounds. In the doses tested they had no effect on reproduction and no allergic action. The maximal permissible concentration of DPDEU (diphenyl-diethylurea) and DPA (diphenylamine) in water bodies are set at a level of 0.5 and 0.05 mg/1, respectively.--Copyright 1977, Biological abstracts, Inc.
W77-07700

RISK OF DRINKING WATER CONTAMINATION IN RURAL TENNESSEE,
Tennessee Univ., Knoxville. Dept. of Agricultural Economics and Rural Sociology.
R. H. Orr, B. R. McManus, and D. O. Baxter.
Tennessee Farm and Home Science, Vol. 100, p 10-13, December, 1976. 3 tab, 7 ref.

Descriptors: *Rural areas, *Water pollution sources, *Social aspects, Water quality, Water analysis, Septic tanks, *Tennessee, *Potable water, Water supply, Domestic water.
Identifiers: *Fecal contamination.

Recent evidence has indicated that fecal contamination is prevalent in individual water supplies

in rural Tennessee. A study of 1652 homes in 68 rural counties was undertaken in an attempt to more accurately assess the risk of contamination and uncover social factors of the problem. 21 percent of the respondents indicated that their household water supplies come from easily contaminated shallow sources (streams, ponds, dug wells) while only 12.1 percent subscribed to rural water systems, the safest possible source due to routine inspection; the remainder used water from frilled wells. One third of the respondents had neither sewage system nor septic tank. Although free water testing is available throughout the state, fewer than 15 percent of the respondents had ever had their water analyzed. Generally, the higher the educational and employment status of those contacted, the lower the risk of contamination of water supply. Higher risk situations were more likely to occur in East Tennessee than Middle or West Tennessee, and with black families or people over 65. Extensive testing, water quality education, and funding for water system improvements are recommended to alleviate these pollution hazards. (Eberle-NWWA)
W77-07701

ELIMINATING IRON-BEARING WATER FROM WELL NO. 7,
Ottawa City Engineers Office, Ill.
B. Krause.
Journal of the American Water Works Association, Vol. 69, No. 3, p 146-177, March, 1977.

Descriptors: *Iron, *Rehabilitation, Wells, Pumping, Well casings, Linings, Aquifers, Water pollution sources, Water pollution control, *Illinois, Water wells.
Identifiers: Ottawa(Illinois), *Abandoned wells(Sealing), *Iron-Bearing water, *Well sealing.

An effort to eliminate the iron problem in Well No. 7 in the Ottawa, Illinois water system was undertaken when it was determined that abandonment of the well was logistically and economically unfeasible. Television camera inspection of the borehole revealed cracks and crevicing immediately below the 12-inch casing, possibly providing an avenue for iron-bearing water from shallow aquifers to the deeper water supply source. When installation of a 10-inch liner and pumping to waste failed to solve the problem, nearby abandoned wells were investigated and subsequently found to be the source of iron contamination. Proper sealing of these wells reduced the concentration of iron in Well No. 7 considerably, but not to the 0.3 mg/l level the City had hoped. At present, a new well is being used to meet water supply demand, and additional experimentation with the rehabilitation of Well No. 7 has been postponed indefinitely. (Eberle-NWWA)
W77-07702

SALTWATER-FRESHWATER INTERFACES IN THE '2,000-' AND '2,800-FOOT' SANDS IN THE CAPITAL AREA GROUND WATER CONSERVATION DISTRICT,
Louisiana Capital-Area Ground Water Conservation Commission, Baton Rouge.
For primary bibliographic entry see Field 4B.
W77-07703

AN ANALYSIS OF THE FEASIBILITY OF USING AIR AGITATION TO REDUCE GAS SATURATIONS IN SEA WATER AT PILGRIM NUCLEAR POWER STATION,
Yankee Atomic Electric Co., Westborough Mass. Environmental Sciences Group.
M. H. Krabach, and R. A. Marcello, Jr.
Prepared for Boston Edison Company, Boston, Massachusetts, July 1976. Report 1YAEC-1109, 32 p., 2 tab., 25 *Mortalities, Sea water, Water quality, Cooling water, *Operating costs, *Capital costs, Waste disposal, Labor fig., 8 ref.

Descriptors: Laboratory studies, *Supersaturation, *Atmospheric gas, Fish disease,atory tests, *Methodology, Diffusion, Oxygen.
Identifiers: New England aquarium, *Air diffusers, *Nitrogen saturation values, Pilgrim station, *Bubbler de-aeration systems, *Gas bubble disease.

Feasibility studies on the application of a bubbler de-aeration system to reduce discharge gas saturations to an acceptable level so as to prevent or minimize the occurrence of gas bubble disease mortalities of menhaden at Pilgrim Station were conducted. Experimental results indicated that gas supersaturated seawater can be degassed by using an air bubbler system and the application of the concept for de-aeration of the Pilgrim Unit I and II combined circulating cooling water discharge was judged technically feasible. Capital and operating costs for a Pilgrim Station air bubbler were estimated. (Katz)
W77-07720

TROUT AND SALMON CULTURE (HATCHERY METHODS) HATCHERY WATER SUPPLY,
California State Dept. of Fish and Game, Sacramento.
E. Leitritz, and R. C. Lewis.
In: Fish Bulletin 164, 1976. p 9-19, 2 tab, 2 fig.

Descriptors: *Oxygen, *Nitrogen, Water quality, *Aquiculture, *Fish hatcheries, *Salmon, *Trout, *Water supply, Supersaturation, Wells, Supersaturation, California, *Aeration, Juvenile fish.
Identifiers: California fish hatcheries, *Hatchery water supplies.

A brief discussion is presented of the water quality requirements suitable for the hatchery production of salmon and trout. Chemical characteristics discussed are dissolved oxygen, carbon dioxide, alkalinity, pH, total dissolved solids, heavy metals, and hatchery treatment methods. Of particular interest in regard to gas supersaturation are photographs of devices used in California hatcheries to remedy oxygen deficient waters and to remove excess nitrogen gases from well water supplies. (Katz)
W77-07726

OIL SPILL AT DECEPTION BAY, HUDSON STRAIT,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
R. O. Ramseler, G. S. Gantcheff, and L. Colby.
Water Resources Branch, Scientific Series No. 29, 1973, 60 p., 19 fig., 10 tab, 10 ref, 7 append.

Descriptors: *Oil spills, *Ice, *Permafrost, Gasoline, Avalanches, Diurnal, Tides, Thawing, Water levels, Sea ice, Bays, *Canada, Waste disposal, Water pollution control, Environmental effects.
Identifiers: *Deception Bay, Hudson Strait, Marine environments, Land environment, Diesel oil, Oil cleanup, Tank farms.

Approximately 427,000 gallons of Arctic diesel oil and gasoline were spilled over permafrost and sea ice at Deception Bay, Quebec, when a tank farm was destroyed by a slush avalanche. A team was organized to study the spill and the objectives of this team were: 1) To discover the cause of the spill; 2) to study the interaction of oil with ice and permafrost; 3) to study the ecological effects of the spill, and 4) to advise on the clean-up and disposal of the spilled oil. Conclusions and Recommendations were: Important fundamental differences exist in the general behavior, spreading and dispersion mechanisms of oil in ice-infested waters as compared to oil in ice-free water. In the present case the ice was static except for its rise and fall due to the tides. This was a great advantage in solving the major problem of containment. Prevailing winds were also advantageous since they drove the oil towards the natural ice booms where it could easily be pumped and then burned. The procedures used to deal with pollution in open waters could easily be modified and adapted for use in ice-infested regions of the Artic. More care should be taken in the selection of sites since many phenomena occurring in remote regions are not of general knowledge. Engineers and scientists should be consulted in the site selection and planning stage. Some additional basic and applied research would provide a better understanding of and ability to control the behavior of oil in subzero climates. This would in turn, permit a faster and more effective prevention of any damage in the Artic. (WATDOC)
W77-07731

MANGROVE ECOLOGY AND DELTAIC-ESTUARINE GEOMORPHOLOGY: CAMBRIDGE GULF-ORD RIVER, WESTERN AUSTRALIA,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
For primary bibliographic entry see Field 2L.
W77-07738

CHARACTERISTICS OF THE AREAS IN WHICH FAST CURRENT OIL CONTROL IS NEEDED,
Coast Guard, Washington, D.C. Pollution Prevention Projects Branch.
W. F. Hammer, C. W. Koburger, and D. S. Jensen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-000 452 A06 in paperr copy A01 in microfiche. Coast Guard Office of Research and Development, Final Report No. CG-D-103-74, November 1973. 101 p, 7 fig, 38 ref, 6 append.

Descriptors: *Oil spills, *Water pollution effects, *Currents(Water), *Water pollution control, Oil pollution, Great Lakes, Atlantic Ocean, Pacific Ocean, Gulf of Mexico.
Identifiers: Environmental conditions.

Present oil spill control measures are effective only in currents up to between 0.8 and 1.0 knot, depending on the characteristics of the oil and ocean conditons. There are, however, a number of high oil pollution risk areas in which faster currents prevail, or where it is desirable to tow control equipment at higher speeds. The Atlantic, Pacific and Gulf Coasts, the Inland Area, and the Great Lakes were examined. Forty-four high risk areas were located, determined on the basis of a composite of oil concentration and spill frequency. These included inland rivers (12), open rivers (13), bays (5), channels (5), harbors (4), canals (3), and intracoastal waterways (2). Their specific environmental characteristics--current, tide, water and air temperature, wave heights, and wind--are identifed, discussed and analyzed. From this, the necessary environmental performance characteristics of fast current oil spill control systems are described, in relation to their expected use. (Sinha-OEIS)
W77-07741

WASTE MANAGEMENT FOR THE COASTAL ZONE: CONCEPTS FOR THE ASSESSMENT OF OCEAN OUTFALLS,
Assembly of Engineering Marine Board, Washington, D.C.
For primary bibliographic entry see Field 5E.
W77-07747

PETROLEUM OIL DETECTION BUOY SYSTEM,
Spectrogram Corp., North Haven, Conn.
For primary bibliographic entry see Field 5A.
W77-07750

HIERARCHICAL MODELING FOR THE PLANNING AND MANAGEMENT OF A TOTAL REGIONAL WATER RESOURCE SYSTEM: JOINT CONSIDERATION OF THE SUPPLY AND QUALITY OF GROUND AND SURFACE WATER RESOURCES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4B.
W77-07793

CITIZEN ATTITUDES TOWARD MANAGEMENT OF THE CHESAPEAKE BAY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-07796

DEGRADATION OF SODIUM DODECYLSULFATE BY BACTERIA IN WASTE WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. of Colloidal Chemistry and Water.
For primary bibliographic entry see Field 5B.
W77-07801

RESIDUES OF EMULSIFIED XYLENE IN AQUATIC WEED CONTROL AND THEIR IMPACT ON RAINBOW TROUT, SALMO GAIRDNERI,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
D. F. Walsh, J. G. Armstrong, T. R. Bartley, H. A. Salman, and P. A. Frank.
Report REC-ERC-76-11, January 1977. 15 p, 10 fig, 6 tab, 19 ref.

Descriptors: *Emulsifiers, Aquatic weeds, *Herbicides, *Aquatic weed control, *Irrigation canals, Fish, Mortality, *Dispersion, Environment, Water quality, Ecosystems, *Rainbow trout, Water pollution effects.
Identifiers: *Xylene.

Emulsified xylene is used to control aquatic weeds in irrigation systems which may occasionally return irrigation water to aquatic habitats that maintain trout populations. Laboratory studies were conducted to determine effects of xylene on rainbow trout, Salmo gairdneri, and to measure dissipation of xylene residues in irrigation waters as treated water flowed through canals, irrigated fields, and into return flows. Rainbow trout exposed to emulsified xylene for 2 hours survived a concentration of 7.1 p/m (parts per million), but suffered 100 percent mortality at 16.1 p/m. An off-flavor was produced in fillets of rainbow trout after exposure to 7.1 p/m of xylene for 2 hours, or to 0.36 p/m for 56 days, and was dependent on concentration and exposure. Residues of xylene in fillets of rainbow trout and off-flavor was directly related. Xylene dissipated downstream in irrigation canals, from treatment concentrations of 548 to 760 p/m to an average concentration of 100 p/m or below after the water traveled 10 miles. Xylene residues dissipated in treated irrigated field waters during furrow irrigation from 150 p/m at the head ditch to less than 0.2 p/m in return flows. The xylene residues entering aquatic habitats in return flows from irrigated fields should not seriously affect fisheries or other segments of the aquatic environment. (Bur Reclam)
W77-07805

THE ARGO MERCHANT OIL SPILL. A PRELIMINARY SCIENTIFIC REPORT,
National Oceanic and Atmospheric Administration, Washington, D. C. Center for Experiment Design and Data Analysis.
For primary bibliographic entry see Field 5C.
W77-07807

A REVIEW AND EVALUATION OF BASIC TECHNIQUES FOR PREDICTING THE BEHAVIOR OF SURFACE OIL SLICKS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 5B.
W77-07808

A DECISION SUPPORT SYSTEM FOR AREA-WIDE QUALITY PLANNING,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W77-07810

EXTENSIONS AND CORRECTIONS FOR THE CODASYL APPROACH TO DATA BASE MANAGEMENT,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W77-07811

IMPLEMENTATION OF A DECISION SUPPORT FOR REGIONAL WATER QUALITY PLANNING,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W77-07812

INFORMATION TRANSFERRAL WITHIN A DISTRIBUTED DATA BASE VIA A GENERALIZED MAPPING LANGUAGE,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W77-07813

MODELING NONPOINT POLLUTION FROM THE LAND SURFACE,
Hydrocomp Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5B.
W77-07818

INVESTIGATION OF ACID MINE DRAINAGE EFFECTS ON RESERVOIR FISHERY POPULATIONS,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5C.
W77-07827

INFLUENCE OF ENVIRONMENTAL FACTORS ON SELECTED AMELIORATION TECHNIQUES FOR DISCHARGES OF HAZARDOUS CHEMICALS,
Battelle Columbus Labs., Ohio.
S. Srinivasan, T. Thomas, A. Gezen, A. Coyle, and C. Kimm.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-011 213, Price codes: A02 in paper copy, A01 in microfiche. Department of Transportation, U.S. Coast Guard, Report No CG-D-81-75, February 1975. 109 p, 31 tab, 9 fig, 15 ref, 2 append.

Descriptors: Environment, *Environmental effects, *Hazards, Chemical properties, *Chemical wastes, Discharge(Water), Water pollution, *Water pollution sources, *Water pollution control, Water quality control, Water pollution treatment, Model studies, Floating, *Industrial wastes, Cryogenics.
Identifiers: *Hazardous chemicals, *Amelioration techniques, *Hazardous substances, Spills, Size of spills, Case studies, Model case studies, Floating chemicals, Cryogens.

The influence of environmental conditions on selected potential amelioration techniques for discharges of selected hazardous chemicals was determined. Historical discharge data was examined to establish categories of spill sizes. The range of environmental conditions (air and water) encountered in discharge situations was determined. Model case studies were performed to assess the magnitude of dispersion in air and/or water. Evaluations were then made to determine if and to what extent the selected amelioration techniques would be influenced by the pertinent environmental conditions. Favorable environmental conditions were also summarized. (Katz)
W77-07828

MATHEMATICAL PROGRAMMING WITHIN THE CONTEXT OF A GENERALIZED DATA BASE MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W77-07850

GERMAN POLLUTION CONTROL,
Environmental Science and Technology, Vol. 11, No. 2, p 134-136, February, 1977. 1 tab.

Descriptors: *Water pollution control, *Water quality control, Water quality standards, Industrial wastes, Domestic waste, Municipal wastes, *Waste water treatment, Sewage treatment, Sludge treatment, Water purification, Treatment facilities, Waste disposal, Planning, Legislation.
Identifiers: *West Germany.

A review was presented of West German efforts in water pollution control. The nation enacted a Water Resources Act in 1957, but there is no national standard for surface water quality. The government is able to establish effluent discharge standards and, in the next years, German industry will have to produce more effective effluent treatment. Sewage treatment mainly consists of the mechanical removal of suspended solids and the oxidization of dissolved solids by bacteria and other organisms. Presently, 50% of all waste water is receiving inadequate treatment or is not being purified at all. Only about 30% receives full biological treatment, but by 1985, 90% of all households are expected to be connected to biological treatment plants. There are nearly 6,000 treatment plants for about 40% of the population. If the proposed programs are instituted by 1985, 38-40 million cubic meters of sludge will have to be disposed of annually. Dewatering, drying, incineration, and pyrolysis are being considered and developed for disposal purposes. Advanced treatment processes, including physical-chemical treatment and combinations of these with biological treatment, are being included in treatment schemes to handle industrial wastes. The government is also progressing in matters of air, noise, and thermal pollution, as well as resource recycling and recovery. (Collins-FIRL)
W77-07863

COMMUNITY WATER SUPPLY AND EXCRETA DISPOSAL IN THE DEVELOPING COUNTRIES,
International Reference Centre for Community Water Supply, The Hague (Netherlands).
D. V. Subrahmanyam.
Ambio, Vol 6, No 1, p 51-54, 1977. 2 fig, 2 tab, 8 ref.

Descriptors: *Water quality control, *Planning, Disposal, Rural areas, *Urban areas, Costs, Social change, Social aspects, *Waste disposal, Sewerage, Design criteria, *Water supply.
Identifiers: *United Nations Conference on Human Settlements.

The provision of a safe water supply and hygienic waste disposal for developing nations was considered. HABITAT, the United Nations Conference on Human Settlements, proposed that

each nation set reasonable standards for achieving these goals. Fifty-seven percent of the urban population had a community water supply to house connections and an added 20% had access to piped water from public standposts. As of 1970, about 50% of these piped supplies were intermittent, causing the associated health hazards. For rural areas about 22% of the population had access to safe water. Nearly 75% of urban dwellers had access to public sewerage systems and only 15% of rural residents had similar provisions. The social and economic aspects of the problem were not covered by this WHO survey. One reason was the lack of definitive information, itself a product of underdevelopment. WHO set target goals for 1980 and HABITAT set goals for 1990. Water supply goals would call for more than a 150% increase in spending; WHO disposal goals would require a 200% increase; HABITAT's plan would require a 400% increase over 1975 cost levels. Development strategies for developing countries would include national commitment, manpower development, appropriate design criteria and technology, consultation with an participation of communities; and appropriate institutional mechanisms. (Collins-FIRL)
W77-07865

WASTE WATER PLANTS USE LESS INSTRUMENTATION THAN RELATED INDUSTRIES,
Raytheon Co., Portsmouth, R.I.
For primary bibliographic entry see Field 5D.
W77-07872

FINANCING: THERE MUST BE A BETTER WAY,
Quad-City Solid Wastes Committee, Paterson, N.J.
S. A. Lubetkin.
Water and Wastes Engineering, Vol. 14, No. 4, p 80, 82, 85, April, 1977.

Descriptors: *Financing, *Legislation, Loans, Government finance, Interest, Costs, Bond issues, Credit, Grants, *Treatment facilities, Waste water treatment.
Identifiers: Federal Financing Bank, Municipal bonds.

Ideas were presented for better financing arrangements by the government for the construction of waste water systems. An Environmental Financing Authority was created in 1972 when P.L. 92-500 was enacted. Rates were very high and borrowing was low or nonexistent. When money was 'tight' and the New York City crisis made municipal borrowing difficult, legislation was enacted which granted agencies the right to borrow from the Federal Financing Bank when they could not fund their share of eligible grants. The Bank coordinated loan programs with the government's economic and fiscal policies to reduce the costs of federally assisted borrowing. The EPA was required to guarantee payment to the FFB. Rates were the prime issue of discussion. Recommendations were suggested which would tie rate charges to the status of Treasury Securities, the Moody ratings of municipalities, and Standard and Poor ratings. It was also stated that the arrangement of temporary financing should not make a borrower ineligible for Federal loans. (Collins-FIRL)
W77-07873

APPRAISAL OF AREAWIDE WASTE WATER PLANNING,
Water Resources Engineers, Inc., Springfield, Va.
R. P. Shubinski, and W. N. Fitch.
Journal of the Water Resources Planning and Management Division-ASCE, Vol. 103, No. WR1, p 63-72, May, 1977. 2 fig.

Descriptors: *Planning, Water resources, *Legislation, *Coordination, *Water resources development, Water quality control, Water quality standards, Institutional constraints, Administration, Long-term planning, Pollutant identification, Regulation, Construction, Analysis, Data collection, Waste water treatment, Costs, Project planning.
Identifiers: P.L. 92-500(Section 208).

Basic water and planning demands created by P.L. 92-500 were discussed. Three areas were provided for: basin planning (Section 308), facilities planning (Section 201), and area-wide planning (Section 208). This study concerns area-wide planning which has multiple purposes. Municipal and industrial treatment needs, including storm runoff systems can be identified, and construction priorities can be developed. Regulatory programs can be established and the responsible agencies can be identified, along with the requirements for implementation. Plans and controls for agricultural and forestry nonpoint pollution sources, for mining-related sources, construction-related sources, and for saltwater intrusion can be identified, and residuals and land and subsurface dispositions can be controlled. Carrying out the planning process has encountered some difficulties which have altered the actual sequence of planning from that of the enabling legislation. The goals which were set for 1977, 1983, and 1985 require sharp departures from past attitudes and vast advances in technology. Technical limitations include an insufficient data base, inadequate analytical techniques, shortages of qualified manpower, and a restricted understanding of side effects. Management limitations center on the identification of public goals, jurisdictional conflicts, cost distribution equity, and problems of present institutional structures and the distribution of new powers. The program was judged quite valuable, with all the various conflicts and problems, in advancing water quality planning and may be viewed as a valid approach. (Collins-FIRL)
W77-07874

COMPOSTING--AN APPROACH TO USING SEWAGE WASTE,
Bird and Hale Ltd., Toronto (Ontario). Water Management Div.
For primary bibliographic entry see Field 5E.
W77-07876

SURVEY PREDICTS 33 PERCENT MUNICIPAL COMPLIANCE WITH 1977 DEADLINE,
S. J. Hadeed.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 360-362, March, 1977. 1 fig, 2 tab.

Descriptors: *Treatment facilities, *Cities, *Water quality standards, Environmental sanitation, Municipal wastes, Water purification, Pollution abatement, Regional analysis, Sewage effluents, Law enforcement, *Waste water treatment, *Water pollution control.
Identifiers: Public law 92-500.

A survey was undertaken to determine the number of municipal treatment facilities which would meet the secondary treatment requirements of Public Law 92-500 by the 1977 deadline. It was indicated that only 33% of the municipal facilities would be able to comply with the standards, as compared to a nearly 90% industrial compliance. A regional analysis of 12,806 facilities found only 4,244 which are either providing this level of treatment or are capable of meeting the deadline. Parameters of the analysis were facilities, sewered flow, and population served which would have the secondary treatment by the deadline date. In order to provide some impetus without penalty, the EPA will issue Enforcement Compliance Schedule Letters which will forego penalties if certain goals are met by specified dates. However, no extension would last beyond 24 months after the deadline. Municipal dischargers will have to document their need for extensions and provide schemes for compliance within the shortest possible time. Congress is considering legislation to cope with this problem. (Collins-FIRL)
W77-07877

1976 NEEDS SURVEY MARKEDLY LOWER,
P. J. Kendrick.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 365-368, March, 1977. 2 tab.

Descriptors: *Treatment facilities, *Federal Water Pollution Control Act, *Water quality standards, Regional analysis, Construction, Municipal wastes, Cities, Law enforcement, Water purification, Costs, Waste water treatment.

The EPA released its 1976 Needs Survey in February, 1977. Contained in this report was an estimate that $96 billion would be needed to build facilities in Categories I to V which would meet 1983 municipal effluent standards of the 1972 Federal Water Pollution Control Act. This is $55 billion lower than the 1974 estimate and reflects improved estimation processes. Costs for storm water pollution control were not included. This would add another $54 billion. Other reasons for this difference in estimates include: varied assumptions and less structured methodology in 1974, improved guidance procedures in 1976, more accurate 1976 estimates, completion of infiltration/inflow studies, the elimination of needs for controls of infiltration/inflow pollution into combined sewers, the elimination of non-documented state costs, more accurate reporting techniques, and reductions in sewer construction cost estimates for completed work. Independent surveys were conducted in some categories and a section on backlog costs was included. The 1978 survey will include further revisions. (Collins-FIRL)
W77-07878

LAKES WILL TAKE THE POLLUTION LOAD OFF OLD FATHER TAME,
J. Pullin.
Surveyor, Vol. 148, No. 4410, p 7-9, December, 1976. 2 fig.

Descriptors: *Lakes, *Rivers, *Water purification, *Water quality control, Pollution abatement, Water pollution effects, Water pollution control, Biochemical oxygen demand, Urban runoff, Suspended solids, Separation, Sedimentation, Pilot plants, Costs, Planning.
Identifiers: Tame River(England).

A system of lakes was proposed to eliminate the pollution problem of the river Tame, near Birmingham, England. The river is one of the most polluted in England; 86% of the flow, at one point, is effluent from a sewage treatment facility. Urban runoff from the Birmingham area greatly contributes to the problem. Situating some of the lakes at the sites of former gravel workings was seen as to providing benefits including improvement in river water quality at all flows, but especially at high flows; providing a form of tertiary treatment for sewage effluents; providing a diluting buffer for the downstream against accidental upstream pollutions; restoring fisheries in the river; providing recreation and amenity facilities; and potentially improving management of river water. A preliminary testing with a simulated scale lake indicated a reduction of suspended solids from 59 milligrams/liter to 35 and 15 milligrams/liter in winter and from 60 to 31 milligrams/liter in summer. BOD reductions were similarly impressive. Tests showed that lake one would reduce normal flow suspended solids by about 50% and storm flow suspended solids by about 75%. The completed system would dramatically reduce the pollution of the river. However, costs and financing are major problems. The first lake and related treatment facility will cost an estimated 5.9 million pounds. Evaluations will be made after completion of the project to determine the necessity of further construction. (Collins-FIRL)
W77-07913

RELATIONSHIP BETWEEN BOD5 AND FATS, OILS AND GREASE,
Environmental Protection Agency, Springfield, Ill.
D. J. Schaeffer, J. B. Park, and T. Stock.

Water and Sewage Works, Vol. 124, No. 3, p 82-83, March, 1977. 3 tab, 8 ref.

Descriptors: Analysis, *Monitoring, *Oil wastes, *Lipids, *Biochemical oxygen demand, Regulation, Water quality standards, Sewage effluents, Industrial wastes, Domestic wastes, Dissolved oxygen, Mathematical models, Model studies, Treatment facilities, *Waste water treatment, Sewers, Maintenance, *Illinois.
Identifiers: *Grease, BOD5.

Fats, oils, and grease (FOG) have been investigated in Illinois effluent discharges for the purpose of setting regulations. These substances may cause clogging of sewer systems, creating maintenance problems, and they may impede treatment processes. In addition, they may cause sheens, surface and sediment deposits, and produce long term BOD which depletes dissolved oxygen in streams. It was hoped that a linear relationship could be established between FOG and BOD5. Parameters of the defining line were used to calculate the expected BOD5/FOG ratio to obtain FOG limits so that BOD5 would be the limiting factor for readily degraded wastes. FOG limits would be reached first for slowly oxidizing wastes or those which oxidize at extreme receiving stream conditions. Data resulting from investigations revealed the existence of significant relations for the parameters. The amount of BOD5 attributable to FOG could not be inferred from the results, but BOD5 did increase linearly with FOG values. There was appreciable scatter about the regression line. There was no difference between regression lines for industrial and sewage treatment plant effluents. It was concluded that neither BOD5 nor FOG would be sufficient as a single parameter. A dual standard, using BOD5 limits for degradable FOG and FOG concentrations for poorly oxidizable wastes, was suggested. (Collins-FIRL)
W77-07925

COST OF HIGH QUALITY WASTE WATER TREATMENT FOR REUSE,
Envirotech Corp., Salt Lake City, Utah. Eimco BSP Div.
For primary bibliographic entry see Field 5D.
W77-07930

DRAINAGE--WHO PAYS, RESPONSIBILITIES AFTER THE 1973 WATER ACT,
Welsh National Water Development Authority, Cardiff. Dee and Clwyd Sewage Div.
J. Davies, and R. E. Dixon.
Chartered Municipal Engineer, Vol. 104, No. 3, p 35-38, March, 1977. 1 fig, 4 ref.

Descriptors: *Drainage, *Sewers, *Cost, *Sewer construction, Municipal wastes, Domestic wastes, Legislation, Capital costs, Water quality control, *Water treatment.
Identifiers: *Wales.

The English 1973 Water Act places the responsibility for sewerage on various water authorities and other agencies. There is a provision in the Act stating that owners or occupiers of a property, or local authorities, can requisition sewer systems for domestic purposes. The increasing costs of sewer construction present a financing problem: who is to pay for the installations. Water authorities seem likely to have funds for only essential sewer construction in the foreseeable future and will probably concentrate on making the best use of already existing facilities. There is no absolute duty for them to provide sewers for their areas. The requisitioning provision of the Water Act appears to be a useful instrument, since the requisitioner will guarantee the authority's income in uneconomical situations. (Collins-FIRL)
W77-07932

1776-1976: NOTES ON WATER QUALITY PLANNING,
Hydrocomp, Inc., Palo Alto, Calif.
D. L. Hey, and W. H. Waggy.
Simulation Network Newsletter, Vol 8, No 7, p 1-7, November, 1976. 20 ref.

Descriptors: *Water quality control, *Planning, *History, Cities, Rural areas, Domestic water, Waste water, Disposal, Waste treatment, Waste water treatment, Industrial wastes, Domestic wastes, Municipal wastes, Groundwater, Runoff, Filtration, Treatment facilities, Tertiary treatment, Legislation, Water resources, Sewerage, Diseases.

Water quality planning in the United States was chronicled from 1776 to 1976. The urban concentration of the American population has risen from about 5% in 1776 to 73% in present times. The late nineteenth century saw an increase in the awareness of a need for water quality planning. By the 1930's, typhoid fever and other waterborne diseases were under control. This was achieved by chemical disinfection of domestic water supplies, and did not include treatment of industrial, municipal, or agricultural wastes. The first basic attempt at control was through disposal; not until the 1960's was attention turned to the protection of water resources. Disposal was primarily a matter of placing untreated wastes out of sight by employing surface runoff, filtration and removal by groundwater, or the use of cesspools or privy vaults. Where this was not practical, transmission to the nearest stream was employed. The combined sewer and toilets produced the first alternatives to these methods. Water treatments developed over the years included: filtration, in 1871, and chlorine disinfection, in 1911. Advanced waste water treatment development was hindered because of the easy and economical protection of domestic water supplies by using chlorine. Presently, most municipal waste water is treated. Industrial waste water treatment is being pushed under the impetus of legislation such as PL 92-500. Future treatment problems will deal with the disposal and reuse of treated effluents and by-products. (Collins-FIRL)
W77-07938

WATER AND WASTE WATER ENGINEERING FOR LOW INCOME COMMUNITIES IN DEVELOPING COUNTRIES,
K. Ives.
Proceedings of the Institution of Civil Engineers Part 1, Vol 62, p 163-165, February, 1977.

Descriptors: *Water supply, *Rural areas, *Water quality control, Impaired water quality, Water reuse, Sanitation engineering, Environmental sanitation, Economics, Social adjustment, Social change, Social values, *Waste water treatment, Water distribution(Applied).
Identifiers: Developing nations.

More than one billion people, or 86% of the rural population in developing countries, lack adequate water supplies. The 'quantity-quality' problem is aggravated by low income and the lack of technical skills in rural areas. Arguments in favor of providing inferior water suggests that inadequate maintenance would cause a breakdown of any treatment system and that adequate untreated polluted water would be less hazardous than inadequate quantities of water. Opposing theories suggest that a piped supply would increase users of a single source, creating epidemic transmission; that water-borne health risks would increase if a piped supply of greater quantity were inferior to an existing smaller supply of better quality; and that an engineer might be legally liable if health damages resulted from his design and installation of a low quality water supply system. It was concluded, in this instance, that any improvement in water was preferable to none at all. It was also suggested that distribution, not treatment, was the major cost in water supply systems. Major considerations in developing countries were discussed in terms of economic, institutional, and technical difficulties. The problem of rural residents moving to growing towns and cities and continuing their previous sanitation habits was discussed. It was also indicated that wind, animal, or human powered systems might help to eliminate the problems incurred with the use of more technical power systems. Disposal was also considered a problem; the reuse of nightsoil and sewage effluents was suggested. (Collins-FIRL)
W77-07939

REDUCTION IN SEWAGE CONTAMINATION IN SYDNEY ROCK OYSTERS,
New South Wales Univ., Kensington (Australia). School of Food Technology.
R. B. Qadri, K. A. Buckle, and R. A. Edwards.
Food Technology in Australia, Vol. 28, No. 11, p 411, 413-416, November, 1976. 4 tab, 7 ref.

Descriptors: *Oysters, *Pollution abatement, Water pollution, *Sewage effluents, Bacteria, Water quality, Temperature, Salinity, E. coli, Costs, Economics, *Australia.
Identifiers: *Depuration(Oysters), Georges River(Australia), Botany Bay(Australia).

Results were presented of a depuration study involving oysters in the Georges River and Botany Bay area of Sydney, Australia. The depuration process investigated involves the immersion of oysters in tanks of water to allow natural elimination processes of the oysters to occur. Oyster gills act as filters of particulate matter; ingested sewage and fecal microorganisms are trapped in the gill mucus and transferred to the alimentary tract. Shellfish growing in sewage polluted waters digest, retain, and discharge microorganisms. In unpolluted waters, they should reduce the gut flora of sewage bacteria due to the change in the microbial status of the water. Depuration depends on economic factors such as the implied double handling operation for growers, the cost of tanks which would be very large, installation and operation costs, and costs of land to locate the tanks and auxiliary facilities. Results indicated that a significant fecal coliform MPN reduction occurred after one week and that this period is sufficient to clean polluted oysters if water quality, temperature, water salinity, and the season are conducive to active feeding of oysters. Oysters can be purified of heavy E. coli contamination in a short time if they are placed in unpolluted waters. Excessive pollution may require additional time for purification. The area used for depuration should not be subject to sewage or industrial pollution from weather or seasonal effects. It was noted that each species reacts a little differently to depuration processes. Freezing at -23.3 C in an air blast or at -12.2 C in still air produces significant reductions of coliforms. Both depuration in uncontaminated water and freezing and frozen storage can be used to reduce bacterial contamination of Sydney rock oysters. (Collins-FIRL)
W77-07946

TREATING URBAN DRAINAGE AS A UTILITY,
Kramer, Chin and Mayo, Inc., Seattle, Wash.
R. E. Warren.
Public Works, Vol. 108, No. 3, p 85, March, 1977.

Descriptors: *Water management(Applied), *Drainage systems, *Urban runoff, *Urban drainage, Water quality control, Construction, Government, Monitoring, Inspection, Cleaning, Storm sewers, Streams.

Water supply, domestic and industrial waste treatment, and solid waste management have attained highly effective levels. The treatment and control of urban drainage and runoff have not been so effectively handled. It was suggested that drainage be considered like a utility, and handled in the same manner as waste water treatment and quality control. Suggestions included the establishment of a separate department which would be responsible for drainage and runoff water quality. Among its responsibilities would be street sweeping/cleaning,

catch basin and storm sewer cleaning, and open stream preservation. It would also play a part in solid waste disposal and other departments to assure that these wastes would not enter drainage systems because of poor storage practices. It would handle the issuing of permits relative to development; the enforcement of rules and regulations on construction; runoff control; water quality and related issues; and inspection and monitoring. The final consideration in establishing this kind of department would be financing, which could be provided by assessing service charges. (Collins-FIRL)
W77-07947

THE USE OF SEWAGE EFFLUENT AS POWER STATION COOLING WATER,
Central Electricity Generating Board, Leatherhead (England). Croydon Power Station.
T. H. Humphris.
Water Research, Vol. 11, No. 2, p 217-223, 1977. 4 fig, 1 tab, 1 ref, 1 append.

Descriptors: *Condensers, *Cooling water, *Sewage effluents, Water reuse, Powerplants, Cleaning, Sludge, Heat transfer, Calcium, Phosphate, Nitrification, Bacteria, Ammonia, Performance, Oxidation.
Identifiers: Croydon Power Station(England).

Various aspects of the use of sewage effluent as cooling water in power stations were discussed. The Croydon Power Station has used sewage effluents for this purpose for twenty years. One problem encountered was that condenser tubes were fouled with calcium phosphate along with smaller amounts of calcium carbonate, silica, and organic matter. This produces a heat transfer loss and reduces station efficiency. Manual cleaning reduced soft sludge, and acid washing was used to remove carbonate scale. Calcium phosphate was the major source of fouling and could be controlled by limiting the concentration of calcium and/or total phosphate ions in solution, or by lowering the pH of circulating water to decrease available HP04 ions by conversion to H2P04. At power stations other than Croydon, oxidation of ammonia salts occurred in the cooling water, probably through the action of nitrifying bacteria. The production of acid waters following ammonia oxidation was also noticed. The introduction of nitrification at Croydon could provide a means of conditioning circulating water at reduced cost. Control processes have exchanged the former sludge problem for one caused by an organic film contamination. The use of hypochlorite solution overnight did not produce consistent good results. Cleaning is now accomplished by draining the water side of the condenser and opening access doors, running hot condensate from the feed system to the steam side, and drying overnight. Flaked deposit then washes out as the water circulation is restored. (Collins-FIRL)
W77-07949

WATERSHED MANAGEMENT AND WATER QUALITY,
Environmental Protection Agency, Boston, Mass. Water Supply Branch.
P. C. Karalekas, Jr.
Journal of the New England Water Works Association, Vol. 91, No. 1, p 1-11, March, 1977. 9 ref.

Descriptors: *Watershed management, *Water quality control, *Water supply, *Water yield improvement, Water utilization, Surface runoff, Pollutants, *Pollution abatement, Water pollution sources, Environmental control.

The relationship of watershed management to water quality was evaluated. Two objectives of watershed management for municipal water supplies are: to maintain or enhance water quality through the control or elimination of contamination sources, and to maintain or improve total water yields from watersheds. The former receives the greater attention. Physical contaminants, chemical containments, and microbiological contaminants are the major pollutants. There should be adequate control of turbidity, color, temperature, setteable solids, taste, and odor. Measures should be taken against municipal and industrial wastes discharges, and other chemical contaminant sources such as agricultural runoff and roadway runoff. Diversion of storm runoff can be helpful in these instances. Recreational uses of watersheds could be prohibited or limited to prevent contamination from all classes of pollutants. Primarily, frequent analysis and inspections and a knowledge of contamination sources are needed to ensure watershed water quality. (Collins-FIRL)
W77-07951

MAKING AQUATIC WEEDS USEFUL: SOME PERSPECTIVES FOR DEVELOPING COUNTRIES.
National Academy of Sciences, Washington, D.C. Commission on International Relations.
For primary bibliographic entry see Field 4A.
W77-07964

WHOLE-LAKE EUTROPHICATION EXPERIMENTS WITH PHOSPHORUS, NITROGEN AND CARBON.
For primary bibliographic entry see Field 5C.
W77-07965

EXPERIMENTAL STUDY OF THE ACTION OF PESTICIDES ON THE MICROFLORA OF BODIES OF WATER, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5B.
W77-07982

ENVIRONMENTAL POLICY CHOICE UNDER UNCERTAINTY,
Harvard Univ., Cambridge, Mass. Public Policy Program.
For primary bibliographic entry see Field 6G.
W77-08004

THE CURRENT STATE OF ENVIRONMENTAL POLICY,
Senate, Washington, D.C.
For primary bibliographic entry see Field 6G.
W77-08005

A NOTE ON THE FAIR DIVISION OF POLLUTION RIGHTS,
Siena Univ. (Italy).
For primary bibliographic entry see Field 6G.
W77-08006

RECREATIONAL USE OF SMALL STREAMS IN WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
R. A. Kalnicky.
Technical Bulletin No 95, 1976. 19 p. 19 fig, 12 tab, 6 ref.

Descriptors: *Streams, *Recreation demand, *Water pollution control, Water pollution, Recreation facilities, *Wisconsin, Surveys, Benefits, Pollution abatement, *Water quality standards, Water quality, Use rates, Stream improvement, Streamflow.

The significance of small streams as a recreational resource and the potential recreational benefits to be derived from improving the water quality of these watercourses was surveyed, in order to determine appropriate water quality standards and to set pollution abatement priorities. It was found that small streams averaged 800 hours of recreational uses per stream mile per year. The differences in recreational use between discharge-affected streams and nonaffected streams were statistically significant. Only one-fourth to one-half as much recreational use was found on discharge-affected streams as on nonaffected streams. Recreational facilities also occurred in greater numbers along nonaffected streams. The type of property along the watercourse affected the use rate, with residential households making much greater use than agricultural households. Hydrologic characteristics of streams were also shown to be related to their frequency of recreational use. Small streams which experienced continuous flow and supported fish and aquatic life had much greater recreational use. Survey results suggest that recreational use on continuous streams and streams classified as supporting fish and aquatic life would improve significantly if the water quality were improved. However, recreational use on intermittent streams and those not supporting fish or aquatic life would probably not measurably increase if the water quality were improved. (Luedtke-Wisconsin)
W77-08008

METHOD OF FILTERING OIL FROM LIQUIDS,
Hydromation Filter Co., Livonia, Mich. (Assignee).
G. Hirs.
U.S. Patent No 3,992,291, 5 p, 10 ref; Official Gazette of the United States Patent Office, Vol 952, no 3, p 1209, November 16, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Separation techniques, Filtration, Coagulation, Oil pollution, Oily water, *Oil wastes.
Identifiers: *Black walnut shells, Filter beds, Backwashing.

A method for filtering suspended oil contaminants from an aqueous-based liquid includes flowing the contaminated liquid through a bed of granulated black walnut shells which have a relatively weak affinity for oil. The suspended oil is coalesced during flow through the filter bed to form globular oil particles that are large enough to become entrapped in the interstices of the filter bed. After a substantial quantity of oil has been accumulated in the filter bed, the bed is rejuvenated by flowing backwash liquid through to provide a high velocity scrubbing to free at least a portion of the accumulated oil from the bed, the shells' weak affinity for oil facilitating such rejuvenation. Next, the bed is reformed and a subsequent filtration cycle is initiated. (Sinha-OEIS)
W77-08011

MOVING BELT-TYPE OIL SKIMMER WITH PROPULSION INDUCED FLOW, METHOD AND APPARATUS,
Marine Construction and Design Co., Seattle, Wash. (Assignee).
E. L. Grimes, and D. W. Lerch.
U.S. Patent No 3,992,292, 6 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 952, no 3, p 1207, November 16, 1976.

Descriptors: *Patents, *Water pollution treatment, *Water pollution control, Water quality control, *Oil pollution, Oil spills, *Separation techniques, *Skimming, Equipment.
Identifiers: Endless belt.

An oil spill recovery method and apparatus utilizes a low-resistance flow-through endless belt of reticular oleophilic, hydrophobic material and forced flow of water with oil through the belt through induction effected by propulsion means operating at a position immediately behind and beneath the submerged active portion of the belt. In order for a low-resistance flow-through filter belt to operate most effectively at maximum recovery rate, water bearing oil must not only

have free access to the belt but must readily pass through the belt's thickness in preference to flowing around the belt. During such passage of the water, entrained oil is attracted to and held by the myriad of belt fibers which it contacts in the process of passage. A flow enhancement means associated with the filter belt in such a manner that it does not agitate the water nor disperse or emulsify the oil, nor otherwise interfere with the filtration or separation function is devised. The oil skimmer vessel is more effective at widely varying operating speeds than heretofore. (Sinha-OEIS)
W77-08012

THE PROBLEM OF THE SANITARY PROTECTION OF THE WATERS OF PORTS AND COASTAL ZONES OF THE BLACK SEA BASIN, (IN RUSSIAN),
Black Sea-Azov Watershed Basin Sanitary Epidemiology Station, Odessa (USSR).
A. M. Voitenko, N. V. Pavlov, and P. N. Maloman.
Gig Sanit 6, p 99-100, 1976.

Descriptors: *Water pollution control, *Harbors, Sewage disposal, Bacteria, Nitrogen compounds, Coasts, *Sewage, Waste disposal.
Identifiers: Ukrainian-SSR, *Black Sea, Odessa(USSR).

The sanitary condition of port waters of the Black Sea basin was studied from 1963-1974. Data are presented on Odessa (Ukrainian SSR, USSR), the most characteristic port. On the basis of laboratory studies and sanitary improvement measures, 3 major periods within the period of study are evident: before 1963, 1963-1970, and since 1970. Efforts at more stringent control of the sewage of ships, port facilities, and the city reduced water oxidizability to 3-4 mg/l, increased transparency to 20 cm, maintained a biological O2 consumption level of 2-3 mg/l, improved the bacterial composition of the water and reduced N-containing substances to trace levels.--Copyright 1977, Biological Abstracts, Inc.
W77-08014

OIL SEPARATOR DEVICE,
E. J. Baughcom, and D. C. Lee, Sr.
U.S. Patent No. 3,992,297, 12 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 952, No 3, p 1211, November 16, 1976.

Descriptors: *Patents, *Oil pollution, *Water pollution control, Water quality control, *Separation techniques, Flow separation, Water pollution sources, Coalesence, Pollution abatement.
Identifiers: Bilge water.

A bilge oil separating system or apparatus includes a float controlled bilge pump for pumping the oil contaminated bilge water from the ship's bilge into a splatter chamber. The rather rapid downward flow of the mixed liquids out of the delivery tube changes to a hollow cylindrical downward flow against the inner cylindrical surface of the wall of a splatter chamber. The oil, after the globules are thus coalesced, moves with the water down into a diffuser and then into an upward extending channel provided internally with downward projecting baffles to collect the oil in pockets at the ceiling of the channel to effect gravitational separation of the two liquids and to dampen out any sloshing about of the two-phase liquid. The channel delivers the liquid to the top of an oil-bath water cleaner from which the oil overflows and the cleaned water passes successively through a number of superposed slanting reverse flow chambers from which, through weep holes at the upper part of each chamber, the oil that may have gotten as far as this, flows up into the overflow to be thus recovered, and the clean water is pumped overboard. (Sinha-OEIS)
W77-08015

STUDY OF FREE LIVING AMOEBAE IN THE WATERS OF STRABOURG: PRELIMINARY REPORT, (IN FRENCH),
Strasbourg Univ. (France). Inst. of Parasitology.
For primary bibliographic entry see Field 5A.
W77-08016

COMPOSITION AND METHOD OF INHIBITING GROWTH OF SLIME IN WATER,
Betz Lab., Inc., Trevose, Pa. (Assignee).
P. Swered, and D. B. Ellis.
U.S. Patent No. 3,994,772, 5 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 952, no 5, p 2151, November 30, 1976.

Descriptors: *Patents, *Water treatment, *Water quality control, Industrial water, Cooling water, *Slime, Microorganisms, Pulp and paper industry.
Identifiers: *Synergistic activity.

This invention relates to certain processes and compositions useful for inhibiting the growth of slime in water and, in particular, water used for industrial purposes; for example, in the manufacture of paper and pulp paper, in cooling water systems and in effluent water treatment. The novel processes and compositions of the invention are processes or mixtures which show unexpected synergistic activity against microorganisms, including bacteria, fungi and algae, which produce, in aqueous systems or bodies, slime which is objectionable from either an operational or aesthetic point of view. Specifically, the invention is directed to the use of compositions comprising alpha-Bromo-p-methylacetophenone and 1,3-dichloroacetone oxime acetate. (Sinha-OEIS)
W77-08027

HYGIENIC CRITERIA OF THE COMPLEX ACTION OF CHEMICAL ENVIRONMENTAL POLLUTANTS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
G. I. Sidorenko, and M. A. Pinigin.
Gig Sanit 6, p 77-80, 1976.

Descriptors: *Pollutants, *Chemical wastes, *Water quality standards, Public health, Environment, Lethal limits, Water pollution.

On the basis of values for the concentration of a given chemical in a given medium and the maximum permissible concentration of that chemical in that medium, a formula for calculating the maximum permissible load of chemical pollutants in the environment is presented. The maximum permissible load value reflects the combined (>1 chemical) and the complex (>1 medium) action of chemicl pollutants.--Copyright 1977, Biological Abstracts, Inc.
W77-08029

THE VALUATION OF AESTHETIC PREFERENCES,
Wyoming Univ., Laramie. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-08041

ADJUSTMENT COSTS AND OPTIMAL WASTE TREATMENT,
State Univ. of New York at Albany. Dept. of Economics.
J. D. Harford.
Journal of Environmental Economics and Management, Vol. 3, No. 3, p 215-225, October 1976. 1 fig, 7 ref.

Descriptors: *Economic efficiency, *Waste water treatment, *Optimization, *Water quality, *Air pollution, *Environmental control, *Standards, Effluents, Water pollution control, Costs, Taxes, Damages, Benefits, Equations, Mathematical models, Systems analysis.
Identifiers: *Cost minimization, Adjustment costs, Time path, Emissions.

Considered are various reasons for changing standards on emissions, effluents, and ambient air and water quality. These reasons include: (1) a secular upward trend in the amount of wastes being created and diffused in the absence of any preventive or treatment measures; (2) costless improvements over time in the technology of waste treatment/prevention; and (3) the rate of change of standards affects the level of costs. It is proposed that adjustment costs may be of significant practical importance in determining the optimal path of waste treatment (at least currently). The problem of minimizing the present value of the sum of treatment plus damage plus adjustment costs is placed in a calculus of variations framework and the optimal time path of waste treatment is characterized as well as the corresponding optimal tax. An example is used to illustrate features of the solution. It is concluded that the future proposed levels of standards may not be reactions to estimated future increases in waste loads or costless improvements in the technology of waste treatment, but simply a recognition that a more rapid approach to desired levels of waste treatment would entail excessive costs of adjustment. (Bell-Cornell)
W77-08045

SKIMMER APPARATUS FOR SEWAGE SETTLING TANKS AND THE LIKE,
Sybron Corp., Rochester, N.Y. (Assignee).
R. F. McGivern.
United States Patent 4,011,164. Issued March 8, 1977. Official Gazette of the United States Patent Office, Vol 956, No 2, p 569, March, 1977. 1 fig.

Descriptors: *Patents, *Sedimentation, *Settling basins, Equipment, Water purification, Waste water treatment, Treatment facilities, Municipal wastes, Pollutants, *Skimming.
Identifiers: *Skimmers.

A patent was issued for a skimmer apparatus for sewage settling tanks. The device consists of a ramp with one end below the tank liquid level and the other above this level. It is mobilized to move back and forth across the tank. A boom is attached which moves the scum towards and into a scum trough at one end of the tank. (Collins-FIRL)
W77-08088

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPERATING POLICY ADAPTATIONS FOR A RESERVOIR SYSTEMS, (PHASE I),
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07603

OPERATING POLICY SIMULATION OR A RESERVOIR SYSTEMS, (PHASE II),
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07604

SOME ARITHMETICAL RELATIONS OF A MATRIX FOR A CALCULUS OF RESERVOIRS, (QUELQUES RELATIONS ARITHMETIQUES DE MATRICE DANS LE CALCUL DES RESERVOIRS),
Direction des Eaux, Baja (Hungary).
For primary bibliographic entry see Field 4A.
W77-07682

MULTIPLE MARKOV PROCESSES IN HYDROLOGY AND THEIR IMPORTANCE FOR

STOCHASTIC ANALYSIS OF WATER ACCUMULATION PROBLEMS,
Technical Univ. of Prague (Czechoslovakia).
For primary bibliographic entry see Field 4A.
W77-07684

MODEL OF A LAKE RESERVOIR,
Wasserwirtschaftsdirektion, Halle, (East Germany).
For primary bibliographic entry see Field 4A.
W77-07687

SOME PROBLEMS OF STOCHASTIC STORAGE WITH CORRELATED INFLOW,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-07689

PENN STATE URBAN RUNOFF MODEL--USER'S MANUAL,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W77-07797

A DECISION SUPPORT SYSTEM FOR AREA-WIDE QUALITY PLANNING,
Krannert Graduate School of Management, Lafayette, Ind.
C. W. Holsapple, and A. B. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 345, Price codes: A02 in paper copy, A01 in microfiche. Socio-Economic Planning Science, Vol 10, p 265-273, 1976. 4 fig, 13 ref. Reprint No. 643-Jan 1977. OWRT-B-080-IND(2).

Descriptors: *Decision making, *Data storage and retrieval, Data processing, Data collection, *Planning, *Water quality.
Identifiers: *Data management systems, *Area-wide water quality planning, *Generalized planning system.

Factors involved in the development of a decision support system for area-wide water quality planning are discussed. In particular, the Generalized Planning System has been presented as a framework for such a system. Given data and a special group of models for analyzing the data, these can be integrated into the GPLAN framework in order to provide timely, reliable and complete information; at the same time there is recognized the need for a natural easy-to-use planner/system interface and the need for system flexibility that allows adaptation to changing conditions. The interface is provided by the GPLAN query system which allows the execution of large application models, as well as retrieval of any configuration of data (subject to any condition), in response to simple English-like queries. System flexibility is enhanced both by the extended-DML commands which enable dynamic restructuring of the data base schema and by the generalized load program which loads data values from any sequential file into a pertinent network data base.
W77-07810

EXTENSIONS AND CORRECTIONS FOR THE CODASYL APPROACH TO DATA BASE MANAGEMENT,
Krannert Graduate School of Management, Lafayette, Ind.
R. H. Bonczek, C. W. Holsapple, and A. B. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 344, Price codes: A02 in paper copy, A01 in microfiche. Information Systems, Vol 2, p 71-77, 1976. 5 fig, 11 ref. Reprint No. 640 - Jan 1977. OWRT-B-080-IND(3).

Descriptors: *Decision making, Data storage and retrieval, Data processing, Data collection, *Planning, *Water quality.
Identifiers: *Data management systems, *Generalized planning system, *CODASYL approach.

In view of the potential contribution of data base management systems as an aid to planning activities, there are certain criteria which such systems must satisfy if the potential is to be realized. Several extensions and improvements for the CODASYL approach to data base management are suggested. Special attention is devoted to the ease and efficacy of data retrieval and application execution, and to the facility and flexibility allowed with regard to data base creation and maintenance.
W77-07811

IMPLEMENTATION OF A DECISION SUPPORT FOR REGIONAL WATER QUALITY PLANNING,
Krannert Graduate School of Management, Lafayette, Ind.
R. Bonczek, C. Holsapple, and A. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 342, Price codes: A03 in paper copy, A01 in microfiche. Institute for Research in the Behavioral, Economic, and Management Sciences Paper No. 570, October 1976, 30 p, 10 fig, 7 ref. OWRT B-080-IND(4).

Descriptors: *Decision making, Data storage and retrieval, Mathematical models, Data processing, Data collection, *Planning, *Water quality, *Regional analysis.
Identifiers: *Data management systems, *Regional water quality planning, *Generalized planning systems.

The Generalized Planning System is presented as a framework for the implementation of decision support systems concerned with any of a broad variety of decision applications. The particular application treated here relates to regional water quality planning. The principal considerations are a data base facility that accomodates information in a semantic network, a technique for model formulation, and the automatic interfacing of data with models by means of an English-like, nonprocedural mapping language.
W77-07812

INFORMATION TRANSFERRAL WITHIN A DISTRIBUTED DATA BASE VIA A GENERALIZED MAPPING LANGUAGE,
Krannert Graduate School of Management, Lafayette, Ind.
R. H. Bonczek, C. W. Holsapple, and A. B. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 343, Price codes: A03 in paper copy, A01 in microfiche. Supplemental: Institute for Research in the Behavioral, Economic and Management Sciences, Paper No. 577, November 1, 1976. 20 p, 6 fig, 13 ref. OWRT B-080-IND(5).

Descriptors: *Information exchange, Data storage and retrieval, Data processing, Data collection, Planning, Water quality, Programming languages.
Identifiers: *Information transferral, *Data management, *Distributed data base, *Generalized mapping language.

An investigation was made of some of the problems encountered in the management of a data base that is logically distributed. The term logical distribution is used to connote a situation wherein users in various locales are responsible for creation and maintenance of their own portions of a data base, but a user in one locale can access data maintained by a user in another locale. An example of this situation is drawn from the realm of water quality management. A generalized mapping language is proposed as a mechanism for information transferral within a distributed data base, and a general data structure for supporting the mapping function is illustrated. The presented method accommodates a variety of user views, is independent of whether the data base is geographically distributed or centralized, furnishes a straightforward security mechanism and provides a basis for treating the contingency of uninformed or non-programming users.
W77-07813

AIDING DECISION MAKERS WITH A GENERALIZED DATA BASE MANAGEMENT SYSTEM: AN APPLICATION TO INVENTORY MANAGEMENT,
Krannert Graduate School of Management, Lafayette, Ind.
R. H. Bonczek, C. W. Holsapple, and A. B. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 306, Price codes: A03 in paper copy, A01 in microfiche. August 1976. 21 p, 7 fig, 12 ref. OWRT B-080-IND(1).

Descriptors: *Decision makers, Data storage and retrieval, Data collections, Planning, Management, Materials.
Identifiers: *Data management systems, *Generalized planning system.

The attributes are examined of a generalized data base management system with respect to its impact on managerial decision-making. The discussion focuses upon two primary considerations: (1) the organization of data within a data base such that all intricate relationships are represented; and (2) the utilization of a facile method for nonprogramming users to interrogate the data base. Examples drawn from the field of material requirements planning are used to illustrate the concepts and potential of the generalized data base management system.
W77-07814

OBSERVATIONS ON A GENERALIZED INTELLIGENT QUERY PROCESSOR FOR DECISION SUPPORT,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
R. H. Bonczek, C. W. Holsapple, and A. B. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 472, Price codes: A03 in paper copy, A01 in microfiche. (1976). 42 p, 8 fig. OWRT B-080-IND(7).

Descriptors: *Decision making, *Data storage and retrieval, *Data processing, Model studies, Computer programs.
Identifiers: *Data management systems, *Query processor.

A generalized intelligent query processor for decision support is examined. This processor is invariant to changes in the decision making context within which it operates. It utilizes both empirical and conceptual information which are retained in a single mechanism in order to understand the implications of a query, to formulate a model for the query's solution, and to execute this model with the pertinent data. The user's non-procedural, English-like query may be viewed as the specification of a program to be executed; the query processor may be viewed as a high-level compiler which automatically generates code in a procedural, programming language.
W77-07849

MATHEMATICAL PROGRAMMING WITHIN THE CONTEXT OF A GENERALIZED DATA BASE MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.

R. H. Bonczek, C. W. Holsapple, and A. B. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 454, Price codes: A03 in paper copy, A01 in microfiche. Institute for Research in the Behavioral, Economic and Management Sciences. Paper No. 578, November 1976, 30 p, 12 fig, 12 ref. OWRT B-080-IND(6).

Descriptors: *Data storage and retrieval, *Mathematical models, Data processing, Data collections, Planning, Water quality, *Programming languages, Computer programs, *Computer models, *Algorithms.
Identifiers: *Data management systems, *Generalized planning system, Mathematical programming, Statistical programs, Simulation programs, Query language.

Aspects of mathematical programming are examined within the context of a generalized data base management and query system. This system is general in the sense of its ability to support applications other than mathematical programming and its independence from the actual types of data values available. It is shown how data for mathematical programming may be organized into a network data structure which may be interrogated via non-procedural, English-like queries. Three methods are presented for interfacing math programming algorithms with this data base. Enhanced data manipulation facilities, particular to matrices and systems of equations, are also introduced. Finally a method is shown whereby programs may be integrated into a data structure, enhancing a user's ability to build alternative models for data analysis.
W77-07850

ENVIRONMENTAL POLICY CHOICE UNDER UNCERTAINTY,
Harvard Univ., Cambridge, Mass. Public Policy Program.
For primary bibliographic entry see Field 6G.
W77-08004

MATHEMATICAL MODELING OF REGIONAL WATER-SUPPLY SYSTEMS IN YUGOSLAVIA,
Energoprojekt, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 4A.
W77-08033

ENVIRONMENTAL ASSESSMENT: THE ECOLOGICAL DIMENSION,
Ecoplans Ltd., Waterloo (Ontario).
For primary bibliographic entry see Field 6G.
W77-08034

USE OF STATE ESTIMATION TECHNIQUES IN WATER RESOURCE SYSTEM MODELING, BY DENNIS P. LETTENMAIER AND STEPHEN J. BURGES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 5B.
W77-08035

SIMPLIFIED OPTIMIZATION OF ACTIVATED SLUDGE PROCESS,
Purdue Univ., Lafayette, Indiana. School of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-08036

BEST PRACTICABLE WASTE TREATMENT SCREENING MODEL,
Cornell Univ., Ithaca, N. Y. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W77-08037

OPTIMAL ENGINEERING DESIGN UNDER UNCERTAINTY BY GEOMETRIC PROGRAMMING,
Unternehmensberatung Schumann G.m.b.H., Cologne (West Germany).
For primary bibliographic entry see Field 8C.
W77-08040

A GOAL INTERVAL PROGRAMMING MODEL FOR RESOURCE ALLOCATION IN A MARINE ENVIRONMENTAL PROTECTION PROGRAM,
Texas Univ. at Austin. Center for Cybernetic Studies.
For primary bibliographic entry see Field 6G.
W77-08042

ADJUSTMENT COSTS AND OPTIMAL WASTE TREATMENT,
State Univ. of New York at Albany. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-08045

OBJECTIVE FUNCTION AND CONSTRAINTS IN WATER RESOURCES SYSTEMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. C. Kisiel.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 3. IAHS/Unesco, Paris, France, 1974, p 1283-1299 (Session XV). 3 fig, 18 ref.

Descriptors: *Water resources, *Constraints, *Decision making, *Economics, *Water policy, Social aspects, Water demand, Pricing, Groundwater resources, Simulation analysis, Aquifers, Subsurface investigations, Mathematical models, Systems analysis.
Identifiers: *Objective functions, Water restriction indices, Water deficiency, Collective utility, Negentropy.

The examination of constraints and objective functions is at the heart of collective efforts to evolve a science of decision making about water resource systems or any other system. This paper reviews and discusses a group of four articles, found in Volume 2 of the Symposium, which falls within the topic of objective function and constraints in water resources systems. To place in overall perspective this set of papers assigned to this topic, a critical survey of the subject is presented. In a lengthy introduction, system modelling and objective functions are examined and objective functions in a philosophic framework are discussed. Next, the relationship of the four papers to the survey is considered. The papers reviewed are concerned with: indices of water restriction and water deficiency tolerance; water resources and negentropy; large-scale simulation of groundwater flow systems; and water pricing policy. The review is followed by various discussions by participants. (See also W77-06708) (Bell-Cornell)
W77-08046

OPTIMAL OPERATION OF WATER RESOURCES SYSTEMS--I,
Illinois Univ. at Urbana-Champaign. Hydrosystems Lab.
For primary bibliographic entry see Field 4A.
W77-08047

OPTIMAL OPERATION OF WATER RESOURCES SYSTEMS--II,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 4A.
W77-08048

PLANNING OF SYSTEMS FOR REGIONAL DEVELOPMENT IN WATER RESOURCES,
Technion-Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
N. Buras.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland, July 1971, Volume 3. IAHS/Unesco, Paris, France, 1974, p 1334-1346 (Session XVIII). 1 fig, 4 ref.

Descriptors: *Water resources development, *Regional development, *Planning, *Optimization, *Simulation analysis, Hydrology, Evaluation, Runoff, Hydraulics, River systems, Reservoir operation, Flow, Aqueducts, Linear programming, Dynamic programming, Computer models, Equations, Systems analysis, Mathematical models.
Identifiers: Benefit maximization, Power deficit minimization, Hydro power, Spain, Sector model.

Considered are nine papers falling within the topic of the planning os systems for regional development in water resources, published in volume 2 of the Symposium. Seven of these papers are summarized in some detail. the articles refer to a broad range of problems: (1) a model designed to accomplish hydrologic and economic evaluations for any type of river basin; (2) simulation of the Llobregat River system in Spain to derive an operating policy which satisfies a set of given monthly demands for water, including economic aspects; (3) optimal water distribution in river development systems, using dynamic programming to derive the maximum benefits; (4) linear programming to minimize power deficit and optimize flow planning in multi-reservoir hydro-power systems; (5) hybrid computer analysis, based on Darcy's law, of a combined surface water-groundwater system; (6) initial conceptual planning framework for the conjuctive use of the Tajo-Segura Aqueduct surface system and aquifers of the La Mancha area in Spain; and (7) the use of a sector model for regional and national water resources planning in East Pakistan. Following the article are discussions by several of those authors whose papers were reviewed herein and by two other authors participating in the Symposium. (Bell-Cornell)
W77-08049

MODELING MULTIPLE-USE IN NATURAL AREAS: PART II - THE SANTEE SWAMP STUDY,
Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo.
D. W. York, B. C. Dysart, III, and L. W. Gahan.
Water Resources Bulletin, Vol. 13, No. 2, p 238-297, April 1977. 2 fig, 5 tab, 17 ref.

Descriptors: *Water resources development, *Planning, *Assessment, *Cost-benefit analysis, Environment, Economics, Optimization, *Swamps, *South Carolina, Management, Demand, Benefits, Computer programs, Algorithms, Mathematical models, Operations research.
Identifiers: *Multiple-use, Natural areas, *Santee Swamp(S. Carolina), Timber harvest, Penalty costs, Sensitivity analysis, Benefit maximization.

The previous paper in this two-part series (See W77-07530) presented the basic information concerning a newly developed mathematical model of multiple-use in natural areas. The model is a unified system for the assessment of cases where development is proposed for relatively natural areas. This paper presents the results of an application of the model to a study of the proposed timber harvest in the Great Santee Swamp in South Carolina. This was done in an effort to demonstrate the utility of the model as a planning and assessment tool. Four potential uses of the Swamp were investigated: logging of hardwood saw timber, hunting, fishing, and nature observation. The model system proves to be extremely useful in the evaluation of potential management schemes and in the selection of the most promising

or optimal management plan. The optimal plan is that which derives the greatest net benefits. Results show that the net benefits for the proposed timber harvest do not reflect very large penalty costs which drive net benefits negative. Penalty functions were incorporated into the model to insure the selection of a feasible solution by the optimization algorithm. The model program was run on an IBM System 370/155 computer, and sensitivity analysis was performed to identify critical parameters in the analysis. The model can play a vital role in the decision making process. Inclusion of environment-related costs and benefits, option value, and desirability enable planners to more fully describe amenity values of relatively natural areas. (Bell-Cornell)
W77-08050

6B. Evaluation Process

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. FOREST PRODUCTS PROJECTIONS AND RECREATION PROJECTIONS, APPENDICES IV AND V,
Oregon State Univ., Corvallis. Forest Research Lab.
For primary bibliographic entry see Field 6D.
W77-07625

A LAND USE DECISION METHODOLOGY FOR ENVIRONMENTAL CONTROL,
Rocky Mountain Center on Environment, Denver, Colo.
For primary bibliographic entry see Field 6G.
W77-07629

ENVIRONMENTAL GEOLOGIC ASPECTS OF PLANNING, CONSTRUCTING, AND REGULATING RECREATIONAL LAND DEVELOPMENTS,
Wisconsin Dept. of Administration, Madison. State Planning Office.
For primary bibliographic entry see Field 6G.
W77-07630

MUNICIPAL INFORMATION SYSTEMS: EVALUATION OF POLICY RELATED RESEARCH. VOLUME 2. COMPUTER UTILIZATION IN LOCAL GOVERNMENT,
California Univ., Irvine. Urban Information Systems Research Group.
K. L. Kraemer, H. C. Lucas, R. D. Hackathorn, and R. C. Emrey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 688, Price codes: A10 in paper copy, A01 in microfiche. Prepared for the National Science Foundation, September 1974, 192 p., 94 ref.

Descriptors: Computers, *Data processing, *Information retrieval, *City planning, Equipment, Data storage and retrieval, Research and Development, Design, Cost-benefit ratio, Technology, Government.
Identifiers: *Municipal Information Systems, Computer utilization, Systems design.

This volume is one of 10 volumes evaluating policy-related research on Municipal Information Systems. It discusses what is currently known about computer utilization in municipal and county governments; and provides a comprehensive review and critical evaluation of existing research and recommends goals for future studies. Research is systematically reviewed for validity and policy utility. Policy utility is determined by its contribution to information about national trends, local benchmarks, effectiveness, transferability, costs and benefits, and system design. Studies are divided into categories of stock (supply and utilization of computer resources) and need (demand for information and data processing capability). The rate of adoption, the increasing investment, and the expanding application areas show that computer utilization is growing. The research reviewed provides a few benchmarks on expenditures, computer hardware, user applications, personnel salaries, and general data needs to guide local officials. Future research should require more rigorous methodology and descriptive models from which testable hypotheses can be derived. Both the quantity and quality of research is very limited. Specific findings should be interpreted with caution pending the results of further research. Current studies have generally failed explicitly to address policy question, although some have touched on them indirectly. (Nessa-NC).
W77-07631

AN ANALYSIS OF ALTERNATIVE FLOOD MANAGEMENT PLANS IN UPSTREAM WATERSHEDS. CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY, PHASE 2,
Soil Conservation Service, Durham, N.H.
For primary bibliographic entry see Field 6F.
W77-07632

ENVIRONMENT AND REGIONAL PLANNING, A PILOT STUDY OF THE COMMITTEE ON THE CHALLENGES OF MODERN SOCIETY,
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
For primary bibliographic entry see Field 6G.
W77-07633

HIERARCHICAL MODELING FOR THE PLANNING AND MANAGEMENT OF A TOTAL REGIONAL WATER RESOURCE SYSTEM: JOINT CONSIDERATION OF THE SUPPLY AND QUALITY OF GROUND AND SURFACE WATER RESOURCES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4B.
W77-07793

IMPLEMENTATION OF NON-STRUCTURAL ALTERNATIVES IN FLOOD DAMAGE ABATEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Virginia Water Resources Research Center.
For primary bibliographic entry see Field 6F.
W77-07795

CITIZEN ATTITUDES TOWARD MANAGEMENT OF THE CHESAPEAKE BAY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
L. A. Shabman, and P. M. Ashton.
Available from the National Technical Information Service, Springfield VA 22161 as PB-267 308, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, VWRRC Bulletin 96, February 1976. 69 p, 21 tab, 16 ref, 4 append. OWRT A-059-VA(2).

Descriptors: *Chesapeake Bay, Environment, Social aspects, Attitudes, Surveys, Environmental effects, Social participation, Water quality, Waste disposal, Management, Water resources development, Planning, Pollution abatement, Social values.
Identifiers: Public envolvement, Coastal Zone Management.

A survey of Chesapeake Bay Residents was conducted to determine how a selected group of citizens felt about certain current issued facing the Bay. Compared with the general population, the survey respondents earned higher incomes, were more highly educated, were professionally employed, and seemed heavily involved in public service activities. They also tended to display an 'environmentalist' bias. Even so, respondents did not feel informed about the ongoing Corps Engineers study of the Bay or about the Maryland and Virginia Coastal zone management programs, which are the three major planning efforts now being conducted on the bay. Respondents expressed some mild dissatisfaction with current administrative, legal, and management programs, but expressed little desire for passage of new laws or creation of a single management agency for the Bay as a whole. While the respondents felt that the public did have reasonable access to the decision-making process, they indicated a fairly strong concern over what they saw as public apathy toward the problems of the bay. Thirteen specific Bay problems were ranked in importance by the respondents. In both states, waste disposal, bilge dumping, wetlands preservation, offshore oil development, dredge-material disposal, and power-plant siting were identified as issues of major importance. Several problems recieved substantially less emphasis. These included runoff of pesticides and fertilizers, shoreline erosion, population growth, and improvement of pubic access to the Bay. General implications drawn from these results include: (1) any organization of citizens probably will tend to represent only limited aspects of public concern, and (2) agencies should expect to deal with a less than representative socio-economic cross section of society in their public-participation programs.
W77-07796

AIDING DECISION MAKERS WITH A GENERALIZED DATA BASE MANAGEMENT SYSTEM: AN APPLICATION TO INVENTORY MANAGEMENT,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W77-07814

APPRAISAL OF AREAWIDE WASTE WATER PLANNING,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5G.
W77-07874

1776-1976: NOTES ON WATER QUALITY PLANNING,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5G.
W77-07938

LOCAL CONTROL OF LAND USE: PROFILE OF A PROBLEM,
Wisconsin Univ., Madison. Dept. of Rural Sociology.
For primary bibliographic entry see Field 6F.
W77-08003

METHODOLOGICAL PROBLEMS IN ESTIMATING RECREATIONAL DEMAND FUNCTIONS AND EVALUATING RECREATIONAL BENEFITS,
Highbury Technical Coll., Portsmouth (England). Dept. of Business Studies.
A. T. Flegg.
Regional Studies, Vol 10, No 3, p 353-362, 1976. 10 tab, 14 ref.

Descriptors: *Recreation demand, *Methodology, *Evaluation, Benefits, Estimating, Reservoirs, Fishing, Boating, Aesthetics, Elasticity of demand, Analysis, Recreation.
Identifiers: Aggregation, Sensitivity analysis, Clawson method.

Various methodological problems implicit in the conventional Clawson procedure for evaluating recreational benefits are discussed and illustrated using data on fishing, sailing, and visiting a Welsh

reservoir. It is shown that: (1) the conventional practice of using visits per capita as the dependent variable in demand functions is likely to result in spurious estimates of benefits as well as strongly biased estimates of the elasticity of visits with respect to the explanatory variables; (2) the traditional use of highly aggregated data is neither necessary nor desirable, as aggregation of the fishing data was found to have a negligible effect on estimated values; (3) the standard assumption that travelling time is a cost should be replaced by a zero value as shown by an iterative procedure; (4) the Clawson method is based on the questionable value judgment that households' preferences should be weighted by rates of car ownership and (5) the orthodox practice of not estimating separate demand functions for holders of daily and seasonal permits is unsound. To resolve these methodological problems in a satisfactory manner however, will require better survey data, particularly on respondents' travelling times, incomes, and use of alternative recreational sites. (Luedtke-Wisconsin)
W77-08007

RECREATIONAL USE OF SMALL STREAMS IN WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5G.
W77-08008

TOLLS: EFFICIENCY AND EQUITY ISSUES FOR INLAND WATERWAYS,
Association of American Railroads, Pittsburgh, Pa.
For primary bibliographic entry see Field 6C.
W77-08039

THE VALUATION OF AESTHETIC PREFERENCES,
Wyoming Univ., Laramie. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-08041

OBJECTIVE FUNCTION AND CONSTRAINTS IN WATER RESOURCES SYSTEMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6A.
W77-08046

MODELING MULTIPLE-USE IN NATURAL AREAS: PART II - THE SANTEE SWAMP STUDY,
Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo.
For primary bibliographic entry see Field 6A.
W77-08050

REMOTE SENSING APPLICATIONS IN WATER RESOURCES MANAGEMENT BY THE CALIFORNIA DEPARTMENT OF WATER RESOURCES,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 7B.
W77-08078

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

LAWS NEEDED TO EXPEDITE ELECTRIC GENERATION SCHEDULES FOR THE PACIFIC NORTHWEST: FINANCING, ENVIRONMENTAL LAWS AND SITING AND LICENSING PROCEDURES, VOLUME I, FINANCING PACIFIC NORTHWEST ELECTRIC GENERATION,
Kell, Alterman and Runstein, Portland, Oreg.
For primary bibliographic entry see Field 8C.
W77-07601

LAWS NEEDED TO EXPEDITE ELECTRIC GENERATION SCHEDULES FOR THE PACIFIC NORTHWEST: FINANCING, ENVIRONMENTAL LAWS AND LICENSING PROCEDURES, VOLUME II, ENVIRONMENTAL LAWS AND SITING AND LICENSING PROCEDURES,
Kell, Alterman and Runstein, Portland, Oreg.
For primary bibliographic entry see Field 6E.
W77-07602

ESTIMATING COSTS OF WASTE WATER SLUDGE DISPOSAL,
Boyle Engineering Corp., Orlando, Fla.
For primary bibliographic entry see Field 5E.
W77-07861

FINANCING: THERE MUST BE A BETTER WAY,
Quad-City Solid Wastes Committee, Paterson, N.J.
For primary bibliographic entry see Field 5G.
W77-07873

A NOTE ON THE FAIR DIVISION OF POLLUTION RIGHTS,
Siena Univ. (Italy).
For primary bibliographic entry see Field 6G.
W77-08006

TOLLS: EFFICIENCY AND EQUITY ISSUES FOR INLAND WATERWAYS,
Association of American Railroads, Pittsburgh, Pa.
L. S. Case, and L. B. Lave.
Management Science, Vol. 23, No. 8, p 811-819, April 1977. 4 tab, 9 ref.

Descriptors: *Inland waterways, *Economic feasibility, *Efficiencies, *Equity, *Evaluation, Costs, Benefits, Queueing theory, Transportation, Resource allocation, Taxes, Political aspects, Rivers, Mathematical models, Systems analysis.
Identifiers: *Tolls, *User charges, License fees, Waterway expansion, The Illinois Waterway.

Transportation requires large amounts of capital in fixed facilities such as roads, tracks, or canals, Inland waterway transport is unique among modes, since it neither owns its right-of-way nor pays taxes to support its construction and maintenance. Although user charges are widely employed to recover the costs of publicly provided investments, proper theoretical foundation has not been made for their application to inland waterway transport. In this paper, this foundation is provided, focusing on efficiency of allocation of resources, in equity of taxation, and on administration simplicity of each toll scheme. Section one of the paper presents the criteria to be used in evaluating waterway user charges. Section two appraises possible alternative tolls and estimates the rates that would be needed to recover current expenditures; stochastic distributions are assumed to be Poisson and queueing theory is utilized. A combination of toll schemes (segment tolls, locking fees, and congestion tolls) are argued to be economically and politically feasible and to dominate fuel taxes and license fees. The appendix presents an example of the benefits and costs of waterway expansion and a test of the predictive power of the queueing model. It is shown that the predictions of queueing theory correspond to reality. (Bell-Cornell)
W77-08039

THE DEVELOPMENT OF COSTS RECOVERY SCHEME: SUGGESTED APPROACHES FOR MUNICIPAL OR REGIONAL WASTE WATER TREATMENT PLANTS,
Kansas Univ., Lawrence.
A. A. Thomopulos.
PhD Thesis, 1976. 137 p.

Descriptors: *Cost repayment, *Cost allocation, Reimbursable costs, Non-reimbursable costs, Capital costs, Operating costs, Maintenance costs, Replacement costs, Interest rates, Annual costs, Treatment facilities, Use rates, Water rates.
Identifiers: Cost recovery.

An approach to costs recovery for financing waste water treatment plants was developed using some guidelines of the 1972 Federal Water Pollution Control Act Amendments. The study was based on an examination of existing cost allocation and user charge methods for waste water treatment. A charge method based on treatment costs provides a readily understandable basis for levying charges without punitive implications. The identification of recoverable costs is difficult with current methods and, in most cases, the costs of future expansion are not considered. The concept of costs recovery from industrial waste dischargers only contradicts the principle of distributing cost amongst all dischargers. The costs to be recovered should appreciably exceed the costs of borrowed money in order to avoid future borrowing. Recoverable costs should include total capital and interest costs, as well as the operation, maintenance, and replacement costs of present facilities. An incremental scheme will allow for a proportional increase in annual recoverable costs as users and waste water flows increase over time. (Collins-FIRL)
W77-08085

6D. Water Demand

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. IRRIGATION AND FOOD PRODUCTS PROJECTIONS, APPENDIX II,
Oregon State Univ., Corvallis. Cooperative Extension Service; and Oregon State Univ., Corvallis. School of Agriculture; and Oregon State Univ., Corvallis. Agricultural Experiment Station.
M. N. Shearer, R. C. Youmans, and K. Rykbost.
Prepared for Oregon Water Resources Board, (Salem), December 31, 1968, 131 p, 112 tab.

Descriptors: *Projections, *Forecasting, *Population, *Water supply, *Water demand, *Irrigation, *Irrigation water, Agriculture, *Food processing industry, *Industrial water, *Industrial water(Use), *Oregon, Crop yield, Water utilization.
Identifiers: Food product projections, North Coast River Basin(OR), Willamette-Sandy Basin(OR), Hood River Basin(OR), Deschutes Basin(OR), John Day Basin(OR), Umatilla Basin(OR), Grande Ronde Basin(OR), Powder Basin(OR), Malheur Basin(OR), Owyhee Basin(OR), Malheur Lakes Basin(OR), Goose and Summer Lakes Basin(OR), Klamath Basin(OR), Rogue Basin(OR), Umpqua Basin(OR), South Coast Basin(OR), Mid Coast Basin(OR).

Projections for the development of irrigation in the 17 river basins in Oregon are presented for the year 2020. These predictions are based on various assumptions, those which tend to encourage development of irrigation and those which substitute or replace the need for irrigation development. It is assumed that national population increase and pressure to realize increases in crop yields will encourage irrigation. The study did not consider relations of specific crops to small river basins or the ability of the area to bid for land and water for their production. It is also speculated that technological advances will enable higher crop yields on land in its present condition without requiring irrigation. Projections are based on the estimate of irrigated farm land in 1964 in the State and include analysis reflecting soil and temperature conditions. Irrigated land is expected to increase two thirds by the year 2020 and 2070 based on restrictive assumptions. Present location of production, the amount of water consumed in a plant, the ability of a firm to reduce its consumption of water given a certain incentive, and the

ability to contract or expand production were determined. Projections were generally limited in reliability. Population projections are used to approximate increased demand for food and related products. (Gentry-NC)
W77-07623

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. SELECTED MAJOR WATER USING INDUSTRIES AND POPULATION PROJECTIONS, APPENDIX III.
CH2M/Hill, Corvallis, Oreg.
Prepared for the Oregon State Water Resources Board, (Salem), June 1969. 289 p, 22 fig, 21 tab, 2 append.

Descriptors: *Projections, *Water demand, *Water supply, *Water management(Applied), *Water requirements, *Water users, *Water utilization, Population, Growth rates, *Industrial production, *Industrial(Water), *Industrial wastes, *Oregon, Water consumption, Water pollution.
Identifiers: *Population projections, North Coast Drainage Basin(OR), Willamette and Sandy Drainage Basins(OR), Hood Drainage Basin(OR), Deschutes Drainage Basin(OR), John Day Drainage Basin(OR), Umatilla Drainage Basin(OR), Grande Ronde Drainage Basin(OR), Powder Drainage Basin(OR), Malheur Drainage Basin(OR), Owyhee Drainage Basin(OR), Malheur Lake Drainage Basin(OR), Goose and Summer Lakes Drainage Basin(OR), Klamath Drainage Basin(OR), Rogue Drainage Basin(OR), Umpqua Drainage Basin(OR), South Coast Drainage Basin(OR), Mid-Coast Drainage Basin(OR).

Population and industrial projections for river basins in Oregon with which to anticipate water demand for the years 2020 and 2070 are presented. Two approaches to population projection are used. The first is a modified demographic approach: births, deaths, and immigration are projected on a national basis; on the basis of trends projected by various authorities, the proportion of national population living in the Pacific Northwest, and Oregon specifically, are estimated; populations of regions, river basins, and metropolitan areas are factored from statewide projections; projected river basin population is allocated to urban and rural areas. The second is an economic base approach: economic activity and employment and labor force participation rates are projected; ratios of population to labor force are developed, and on the basis of these factors, population projects are made. Production levels for selected industries that use relatively large quantities of water were projected and water requirements and pollutant loadings were calculated. Factors used in projecting future production of industry include resource availability, growth of national and regional markets, and special factors such as power cost and transportation. Selected industries were lumber and plywood production, petroleum refining, chemicals and petrochemical manufacturing, mining, mineral processing, and primary and rare metals manufacturing. The final section of the report presents detailed population and selected industrial water requirement projections for 18 drainage basins in the State. (Gentry-NC)
W77-07624

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. FOREST PRODUCTS PROJECTIONS AND RECREATION PROJECTIONS, APPENDICES IV AND V,
Oregon State Univ., Corvallis. Forest Research Lab.
R. Snyder, and R. O. McMahon.
Prepared for the Oregon Water Resources Board, (Salem), June 1969, 46 p, 2 fig, 8 tab, 24 ref, 2 append.

Descriptors: *Forecasting, Timber management, Population, Recreation, *Outdoor recreation, *Recreation demand, Recreation facilities, Water reuse, *Water consumption, *Water requirements, *Water sports, Pulp and paper industry, *Oregon, Economic prediction, Camping, Lakes, Reservoirs, Industrial water, Population.
Identifiers: North Coast River Basin(OR), Willamette & Sandy River(OR), Hood River Basin(OR), Deschutes River Basin(OR), John Day River Basin(OR), Umatilla River Basin(OR), Grande Ronde River Basin(OR), Powder River Basin(OR), Malheur River Basin(OR), Owyhee River Basin(OR), Malheur Lake(OR), Goose and Summer Lakes(OR), Klamath River Basin(OR), Rogue River Basin(OR), Umpqua River Basin(OR), South Coast Basin(OR), Mid Coast Basin(OR).

In Appendix IV, projections of ultimate timber harvests were calculated for each river basin in Oregon based on data supplied by the Pacific Northwest Forest and Range Experiment Station. The U.S. Forest Service method was used to calculate projections which assumed continued production of saw logs to be intensified through the use of intermediate harvests and by consolidation of forest holdings into fewer hands. Increased yields through fertilization, irrigation or genetic improvements were not considered. Projected overall cut will not drastically change, though this stability does not hold for individual basins which are presently overcut or undercut. In the year 2020, 43% of total solid wood harvest will be pulped; for 2070, the corresponding figure is 46%. Water reuse is expected to increase dramatically, from 2.39 in 1966 to 5 in 2020 and to 6 in 2070 (where rate of water use equals water use if no recirculation, minus water intake, divided by water intake). With increased water reuse, the proportion of intake water consumed will increase to 30% in 2070. In Appendix V, estimates for 2020 and 2070 are given for required lake and reservoir surface area and associated evaporation losses, and water requirements for camping and picnicking activities. These projections are based on the assumption that recreation behavior related to socio-economic conditions will parallel national characteristics; that income, mobility, leisure time, etc., will not be limiting factors; and that out-of-state recreation participants will continue to be important. Projections are presented for each of 18 river basins for individual recreation activities and water requirements. (Gentry-NC)
W77-07625

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. WATER QUALITY CONTROL PROJECTIONS, APPENDIX VI.
Oregon State Sanitary Authority, Salem.
For primary bibliographic entry see Field 5G.
W77-07626

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. PROTECTION OF AREAS OF ORIGIN, APPENDIX VII,
Wendell and Schwan, Washington, D.C.
Prepared for the Oregon State Water Resources Board, (Salem), July 15, 1968. 51 p, 1 appendix.

Descriptors: *Water demand, *Water supply, *Water transfer, *Inter-basin transfers, *Water law, *Legal aspects, *Oregon, *Water management(Applied), Imported water, Diversion, Water rights, Colorado River Basin, Pacific Northwest US, Interstate compacts.
Identifiers: Northwest State Compact, Federal-Interstate water compact.

Oregon has taken strong legal and administrative measures to protect its water from being diverted to the arid southwestern United States. Protection can take the form of prohibiting exportation of water or allowing water diversion subject to conditions of recapture, delivery of compensating supplies or other compensatory benefits. Current federal legislation, H.R.3300, designed to allow the Colorado River Basin to receive water from the Northwest, illustrates the question of whether state law and other measures can withstand the political pressure which arid states can wield in Congress to exercise Congressional power to regulate and control surface water use. Therefore proposals include political compromises and institutional innovations. Four courses of possible action are presented: (1) proposing a federal statute giving areas of water origin the protection they deem essential while at the same time asserting federal authority in the water rights field; (2) creation of a Northwest State Compact dealing with in-basin diversion and compensation, and limits on out-of-basin diversion; (3) creation of a compact encompassing water exporting and water importing states; (4) creation of a compact including only northwestern states; (5) creation of a compact including only northwestern states and the federal government. It is suggested that a federal-interstate compact with both importing and exporting states would afford greatest potential protection of areas of water origin. (Gentry-NC)
W77-07627

WATER RESOURCES AND WATER-SUPPLY DEVELOPMENT IN TRINIDAD AND TOBAGO,
Wisconsin Univ., Madison. Dept. of Civil Engineering.
L. Forde.
Journal of the American Water Works Association, Vol 69, No 4, p 188-195, April 1977. 1 fig, 10 tab, 7 ref.

Descriptors: *Water supply, *Water resources, *Water supply development, *Water demand, Industrial water, Rural areas, Sugarcane, Hydrology, Groundwater resources, Surface water availability, Water resources development, Foreign countries, Foreign research.
Identifiers: *Caribbean, *Trinidad, *Tobago.

The current demand for water in Trinidad and Tobago exceeds supply. An inventory of water resources that must be developed in a coherent long-term manner to facilitate projected growth has been compiled. Past history of water development and strategies for future demands were detailed in this article. The proposed Point Lisas development with its requirement of 2.8 cu m/sec (63 mgd) by 1985 will aggravate this situation. The present new projects will increase the water production in 1980 by 2.9 cu m/sec (67mgd). With the increased domestic demand because of increased population and standard of living, the situation will be much worse than at present. There is considerable uncertainty in the forecast of industrial demand, and most likely any revision in this figure will be downward. (Lee-ISWS)
W77-07785

OPTIMIZATION OF WATER USE FOR IRRIGATION,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-07851

METHODOLOGICAL PROBLEMS IN ESTIMATING RECREATIONAL DEMAND FUNCTIONS AND EVALUATING RECREATIONAL BENEFITS,
Highbury Technical Coll., Portsmouth (England). Dept. of Business Studies.
For primary bibliographic entry see Field 6B.
W77-08007

RECREATIONAL USE OF SMALL STREAMS IN WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5G.
W77-08008

REMOTE SENSING INPUTS TO WATER DEMAND MODELING,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
For primary bibliographic entry see Field 7B.
W77-08080

6E. Water Law and Institutions

LAWS NEEDED TO EXPEDITE ELECTRIC GENERATION SCHEDULES FOR THE PACIFIC NORTHWEST: FINANCING, ENVIRONMENTAL LAWS AND LICENSING PROCEDURES, VOLUME II, ENVIRONMENTAL LAWS AND SITING AND LICENSING PROCEDURES,
Kell, Alterman and Runstein, Portland, Oreg.
L. Jourolman, R. M. Jackson, and J. Keller.
Completion Report, 1976. 199 p, append.

Descriptors: *Electric power costs, *Capital costs, *Financing, Regulation, *Legal aspects, *Permits, *Legislation, Administrative agencies, Federal government, State government, Thermal power, Nuclear powerplants, Hydroelectric plants, Pollution abatement, Coordination, *Electric power demand, *Water law, *Pacific Northwest U.S., *Electric power production.

Volume II of the study examines environmental law as it pertains to the construction of new power plants and the facility licensing process. Legal aspects of the National Environmental Policy Act of 1969, The Clean Air Act Amendments of 1970, The Water Pollution Control Act and The Atomic Energy Act are discussed. The present licensing status of new coal-fire and nuclear facilities in the Northwes are reviewed. Recommendations on legislation to expedite the capitalization and construction of new generating facilities in the Northwest are made. (See also W77-07601).
W77-07602

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. PROTECTION OF AREAS OF ORIGIN, APPENDIX VII,
Wendell and Schwan, Washington, D.C.
For primary bibliographic entry see Field 6D.
W77-07627

ENVIRONMENT AND REGIONAL PLANNING, A PILOT STUDY OF THE COMMITTEE ON THE CHALLENGES OF MODERN SOCIETY,
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
For primary bibliographic entry see Field 6G.
W77-07633

LAW, RULES, AND REGULATIONS PERTAINING TO GROUNDWATER IN NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 4B.
W77-07695

GERMAN POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W77-07863

COMMUNITY WATER SUPPLY AND EXCRETA DISPOSAL IN THE DEVELOPING COUNTRIES,
International Reference Centre for Community Water Supply, The Hague (Netherlands).
For primary bibliographic entry see Field 5G.
W77-07865

APPRAISAL OF AREAWIDE WASTE WATER PLANNING,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5G.
W77-07874

WATER AND WASTE WATER ENGINEERING FOR LOW INCOME COMMUNITIES IN DEVELOPING COUNTRIES,
For primary bibliographic entry see Field 5G.
W77-07939

THE CURRENT STATE OF ENVIRONMENTAL POLICY,
Senate, Washington, D.C.
For primary bibliographic entry see Field 6G.
W77-08005

6F. Nonstructural Alternatives

AN ANALYSIS OF ALTERNATIVE FLOOD MANAGEMENT PLANS IN UPSTREAM WATERSHEDS. CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY, PHASE 2,
Soil Conservation Service, Durham, N.H.
Available from the National Technical Information Service, Springfield VA 22161 as PB-247 343, Price codes: A06 in paper copy, A01 in microfiche. New England River Basin Commission, Boston, Mass., June, 1975. 95 p., 23 fig., 15 tab. CRSS-2. 1C; 2. 1D; 2. 1E.

Descriptors: *Flood plains, *Flood protection, *Non-structural alternatives, *Land resources, Water resources, *Connecticut River, Flood control, Economic impact, Flood damage, Water supply, Recreation, Water quality, Air quality, Biological resources, Ecosystem, Geology, Archaeology, Land use, Zoning, Dams, Reservoirs.
Identifiers: *Connecticut River Basin, *Passumpsic River(VT), *Whetstone Brook(VT), *Mill River(MA), *Flood plain management, Land treatment, Flood plain delineation.

Results are provided of a study in which flood management plans in three upstream watersheds in the Connecticut River Basin were analyzed. Information on the formulation of alternative flood management plans, their economic and physical impacts, public responses, and guides to implementation is presented. The three watersheds studied in detail are: the Passumpsic River (VT), Whetstone Brook (VT) and Mill River (MA). Watershed planning should equally weight economic and environmental objectives. These would include factors such as: flood damage reduction, water supply, and recreation as economic considerations; and natural beauty, water quality, air quality, biological resources, ecosystems, and geological, archaeological and historical resources as environmental factors. A plan should be acceptable to those affected by the plan; it should fit into the boundaries of governmental units if the plan addresses land and water resource problems; it should consider land use and water treatment throughout the watershed; it should conform with federal, state and local guidelines; and the plan should be comprehensive. Before any measures are implemented a full inventory of existing flood management system components should be made and a flood plain delineation program carried out. This program would evaluate the impacts from present and future condition flooding with various structural and nonstructural flood management measures. (See also W77-01696 thru W77-01694) (Gentry-NC)
W77-07632

FLOOD PLAIN INFORMATION: THOMPSONS CREEK AND TRIBUTARIES, BRYAN, TEXAS,
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W77-07634

SPECIAL FLOOD HAZARD REPORT: JERSEY CREEK, KANSAS CITY, KANSAS.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W77-07636

FLOOD PLAIN INFORMATION, SOUTH ANNA RIVER, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W77-07637

FLOOD PLAIN INFORMATION, NORTH ANNA RIVER, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W77-07638

FLOOD PLAIN INFORMATION, CHERRY CREEK-CHERRY CREEK LAKE THROUGH FRANKTOWN, COLORADO.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-07639

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, WARREN COUNTY, PENNSYLVANIA,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W77-07640

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, VENANGO COUNTY, PENNSYLVANIA,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W77-07641

FLOOD PLAIN INFORMATION: NORTHWEST STREAM GROUP, STOCKTON, CALIFORNIA,
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-07642

FLOOD PLAIN INFORMATION: WICHITA RIVER AND TRIBUTARIES, WICHITA FALLS, TEXAS,
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W77-07643

FLOOD PLAIN INFORMATION: IPSWICH RIVER, NORTH READING AND WILMINGTON, MASSACHUSETTS,
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-07644

FLOOD PLAIN INFORMATION: MERRIMACK AND SOUHEGAN RIVERS, LITCHFIELD AND MERRIMACK, NEW HAMPSHIRE.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W77-07645

IMPLEMENTATION OF NON-STRUCTURAL ALTERNATIVES IN FLOOD DAMAGE ABATEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Virginia Water Resources Research Center.
Waldon R. Kerns.
Available from the National Technical Information Service, Springfield VA 22161 as PB-267 305, Price codes: A06 in paper copy, A01 in microfiche. Proceedings of a Conference on Informational and Research Needs, held May 24-25, 1976 in Durham,

N.H., co-sponsored by Northeastern Water Center Directors 112 p. Edited by W. R. Kerns and R. C. Underwood. OWRT B-061-RI(2).

Descriptors: *Non-structural alternatives, *Flood damage, Flood control, *Research priorities, Flood plains, *Conferences, Flood protection, *Land management, *Land use, *Alternative planning, Flood plain insurance.
Identifiers: *Flood insurance, *Research needs, Flood risk.

The major thrust of the conference was to identify informational and research needs which would facilitate effective implementation of feasible non-structural alternatives. Four state-of -the-art papers in the plenary session reflect the current status of non-structural implementation and provide a current assessment of informational and research needs to facilitate their implementation. Presentations and discussions in three concurrent workshops consider informational and research needs as related to: (1) flood insurance and rehabilitation programs, (2) land management alternatives, and (3) local implementation. Dave Allee and Mike Walter, Cornell University, discussed flood risk management in the northeastern United States. Douglas James, Utah Water Center, provided an overview of informational needs to facilitate implementation of non-structural alternatives. Madge Ertel, University of Massachusetts, discussed public response to non-structural flood management alternative with specific reference to the Connecticut River Basin Program, J. Ernest Flack, University of Colorado, provides and assessment of research needs on non-structural alternatives. Other papers relate specifically to the three workshoop topics. (Kerns-Va. Tech)
W77-07795

LOCAL CONTROL OF LAND USE: PROFILE OF A PROBLEM,
Wisconsin Univ., Madison. Dept. of Rural Sociology.
C. C. Geisler, and O. B. Martinson.
Land Economics, Vol. 52, No. 3, p. 371-381, 1976. 5 tab., 30 ref.

Descriptors: *Land use, *Surveys, *Attitudes, *Zoning, Shores, *Land management, Decision making, Agriculture, Planning, Comprehensive planning, *Wisconsin, Rural areas, Rural sociology, Social aspects.
Identifiers: Mobile home zoning.

Several aspects of land use regulation, particularly zoning, were examined in this survey of a population sample residing in four rural northwestern Wisconsin counties. The questions of whether: (1) land use regulation opposition centered on all encroachments on traditional property rights or merely at the government level at which the action accured; (2) there was marked variation in public opinion as to specific policy components of comprehensive legislation; (3) personal characteristics were related to variations in public attitudes; and, (4) whether an awareness of environmental problems affects land use attitudes. Survey respondents were queried as to whether they favored more zoning restrictions on private lake and riverfront property, strict zoning for mobile homes, and zoning to keep agricultural land from being shifted to other purposes. Survey results indicated that northwest Wisconsonites were generally supportive of these three zoning policies, but were almost unanimous in the view that these decisions should be made at the local level. Use of multivariate analysis of personal characteristics showed that: (1) as age increased, opposition to shoreland and mobile home zoning tended to disappear, (2) as family income increased, opposition to mobile home zoning and regulation of agricultural lands tended to diminish, and (3) the more aware of environmental problems the respondents were, the less likely they were to oppose shoreland and mobile home zoning. (Luedtke-Wisconsin)
W77-08003

6G. Ecologic Impact Of Water Development

A LAND USE DECISION METHODOLOGY FOR ENVIRONMENTAL CONTROL,
Rocky Mountain Center on Environment, Denver, Colo.
K. Wickersham, R. P. Hansen, and A. G. Melcher.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 239, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-60015-75-008, March 1975. 180 p., 7 fig., 4 append. ROAP 21AKL, R802423.

Descriptors: *Land use, *Planning, *Environment, *Alternative planning, *Comprehensive planning, *Ecology, *Decision-making, *Governmental interrelations, Analytic techniques, Institutional constraints, Jurisdiction.
Identifiers: *Land use controls, *Land use decision-making system(LUDMS), *Policy planning, Citizen participation, Information systems, Environmental resources inventory, Community programs.

The purpose of the study is to develop an environmentally responsible land use planning and control process that is based on valid technical information used in conjunction with enlightened and informed public opinion, and has legal mechanisms for controlling and implementing actions. A systematic, interdisciplinary environmental analysis and a plan implementation process utilizing the analysis is described. The basic elements of the land use decision-making system (LUDMS) are: policy planning (the system's focal point), which is a process for combining public opinion with scientific and technical information to create community policies; use of an interdisciplinary team; public participation; an environmental resources inventory and analysis; a staff which understands and communicates about ecology; positive community programs; traditional and innovative legal devices for land use control; and model state and local codes for implementing the system. A role is identified for all levels of government that is a compromise between the extreme positions on all sides of the jurisdictional controversy. The report concludes that land use decision-making does not utilize adequate information on the biophysical and sociocultural environment at all levels of government, nor does it involve rigorously constructed relationships between planning and implementation. (Nessa-NC)
W77-07629

ENVIRONMENTAL GEOLOGIC ASPECTS OF PLANNING, CONSTRUCTING, AND REGULATING RECREATIONAL LAND DEVELOPMENTS,
Wisconsin Dept. of Administration, Madison. State Planning Office.
S. M. Born, and D. A. Stephenson.
Upper Great Lakes Regional Commission, Madison, Wisc., An Inland Lake Renewal and Shoreland Management Demonstration Project, Report, January 1974. 39 p, 17 fig, 2 tab, 172 ref.

Descriptors: *Geology, Hydrology, *Recreation, *Water resources, Land, *Land management, *Land use, *Water supply, *Waste disposal, *Environmental effects, *Wisconsin, Climate, Soils, Vegetation, Wildlife, Water table, Water quality, Surface water, Runoff, Lakes, Reservoirs.
Identifiers: Site developability, Earth hazards, *Lakes of the Menominees(WI), *Lake Redstone(WI).

Earth science considerations which are applicable to land use planning in rapidly growing recreational areas are discussed. Case studies included are Lakes of the Menominees and Lake Redstone developments, both in Wisconsin. The report is based on the belief that natural scientists and engineers must contribute their knowledge and ideas to help courts and legislatures make sound decisions and to aid regulatory agencies. Resource inventories and suitability analyses should include physiography, geology, climate, water regime, soils, plant associations, wildlife, land use and unique cultural or natural sites. In site selection design and utilization attention should be given to site developabilty (meaning structural conditions of the site, availability of construction materials and earth hazards), water supply, waste disposal, water resources for recreation, feasibility of impoundment and impacts of ecological alteration. Hydrological features to be considered are water table position and fluctuation, ground water regime (aquifer characteristics, flow systems, and groundwater quality), surface water regimes (runoff, lakes and wetlands, and surface water quality), and ground water-surface water relationships. It is suggested that geologic factors should be used when regional impacts of development are studied. These studies should (1) predetermine potential sites for development, (2) evaluate aggregate economic and environmental impacts, (3) determine acceptable levels of development, and (4) formulate land-use controls to implement land development policies. (Gentry-NC)
W77-07630

ENVIRONMENT AND REGIONAL PLANNING, A PILOT STUDY OF THE COMMITTEE ON THE CHALLENGES OF MODERN SOCIETY,
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
Available from the National Technical Information Service, Springfield VA 22161 as PB-250 396, Price codes: A11 in paper copy, A01 in microfiche. Number 17, 1972. (300 p).

Descriptors: *Planning, *Regional planning, *Decision-making, *Forecasting, *Institutional constraints, *Institutions, *Environment, *Environmental control, Social impact, Regional economics, Value, Social needs, Analytical techniques, *United States.
Identifiers: *NATO, *France, *United Kingdom, *Citizen participation, *Environmental policies, Cultural history, Cultural geography, Historical geography.

Three major themes of regional planning are considered: first, the regional and local institutions responsible for the planning and implementation of environmental policies; second, the means whereby the environment can be given a more important place in national planning decisions; and third, the importance of the specific nature of geographical sites for environmental action. Eighteen case studies from three countries--France, the United Kingdom and the United States--are presented, chosen for individual interest as related to the overall pilot study. The institutional responsibility section deals with the appropriate roles of different levels of government. Citizen participation is stressed as an indicator of local values. The section on means recommends the undertaking of an on-going, accurate assessment of the relationship between the environment and economic and social development, and the establishment of a time link between these phenomena through analytical forecasting. The relationship between quantitative and qualitative analysis is questioned, as is the appropriate timing of decision-making, and the role of the decision-maker. The section on geographical sites evaluates the significance of cultural development in shaping a community's past and future growth. Natural and physical factors are identified as being important in the development of man's living condition and as being influenced by human intervention. Local natural phenomena must be integrated with relevant geographical and social projections. (Nessa-NC)
W77-07633

FLOOD PLAIN INFORMATION; SAN ANTONIO RIVER, BEXAR COUNTY, TEXAS.
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W77-07635

IMPACTS OF OFFSHORE OIL ON NORTH EAST SCOTLAND,
Massachusetts Inst. of Tech. Cambridge.
For primary bibliographic entry see Field 5C.
W77-07752

CITIZEN ATTITUDES TOWARD MANAGEMENT OF THE CHESAPEAKE BAY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-07796

THE ARGO MERCHANT OIL SPILL. A PRELIMINARY SCIENTIFIC REPORT,
National Oceanic and Atmospheric Administration, Washington, D. C. Center for Experiment Design and Data Analysis.
For primary bibliographic entry see Field 5C.
W77-07807

CHANNELIZATION: ENVIRONMENTAL, GEOMORPHIC, AND ENGINEERING ASPECTS,
North Carolina Univ. at Charlotte. Dept. of Geography and Earth Science.
For primary bibliographic entry see Field 8B.
W77-07809

ENVIRONMENTAL POLICY CHOICE UNDER UNCERTAINTY,
Harvard Univ., Cambridge, Mass. Public Policy Program.
W. K. Viscusi, and R. Zeckhauser.
Journal of Environmental Economics and Man, Vol. 3, No. 2, p. 97-112, 1976. 4 fig., 1 tab., 37 ref.

Descriptors: *Risks, *Environmental control, *Environmental effects, *Planning, *Markov processes, Probability, Stochastic processes, Discount rates, Water pollution control.

A Markovian analytical model is developed to help structure situations of environmental policy decision making in which uncertainty plays a critical role. The model is described by a Markov matrix whose entries are translation probabilities which indicate the likelihood that if a system is in a particular state at the present time it will be found in a specified state at some moment of time in the future. Markovian analysis offers great advantage when the alternatives for choice remain identical over time, and when the number of periods is large. Markov chains can be applied to situations were states, policies and time are continuous. An example is given in which Markovian analysis is used with a pollution control model which includes both uncertainty and 'reswitching' (situations in which there is a second reversal in project preference and where it is not possible to state which of two projects is favored as the discount rate is lowered and the future is in effect given greater weight). Demonstrations are also given for using Markovian decision problems involving reswitching policy vectors and policies for particular conditions, applications to irreversibilities (where specific policy choices are pre-empted once particular input decisions have been made), and for uncertainty and policy choice with cost and environmental quality as value attributes. (Harris-Wisconsin)
W77-08004

THE CURRENT STATE OF ENVIRONMENTAL POLICY,
Senate, Washington, D.C.
G. Hart.
Journal of Energy and Development, Vol 1, No 1, p 13-22, 1976. 10 ref.

Descriptors: *Environmental control, *Regulation, *Political constraints, Water pollution control, Federal Water Pollution Control Act, Pollution taxes(Charges), Energy, Economic impact, National income.
Identifiers: National Environmental Policy Act.

Whereas a national consensus at the time of the creation of the National Environmental Policy Act in 1970 dictated that 2-3% of the U.S. gross national product should be committed each year to environmental cleanup, that national committment has come under increasing attack by 1976 because of two recently-arisen problems: (1) the health of the economy and its downturn since the beginning of the environmental decade; and (2) the need to resolve our mounting energy problems. In answer to the economic argument, it is posited that environmental investment can create jobs, stimulate productivity, and yield profits, even if these investments, jobs and profits are focused on industries taking advantage of environmentally-centered technology. In answer to the energy crisis, it is argued that easing pollution control requirements would not significantly reduce energy consumption or increase domestic production and might, in the long run, result in increased energy demand. Since 1970, Congress has retreated four times under pressure from the auto industry in regard to engine emission standards. It is possible that achieving the complex goals of the 1972 Federal Water Pollution Control Act Amendments might involve the development of a large regulatory bureaucracy. A strategy is needed to replace the current regulatory approach, possibly a pollution tax system. (Harris-Wisconsin)
W77-08005

A NOTE ON THE FAIR DIVISION OF POLLUTION RIGHTS,
Siena Univ. (Italy).
L. M. Tomasini.
Journal of Public Economics, Vol 6, No 3, p 313-317, 1976. 2 ref.

Descriptors: *Regulation, *Relative rights, *Mathematical models, Water pollution control, Law enforcement, Economics, Social aspects, Value, Social values.
Identifiers: *Pollution rights.

In an assessment of what constitutes a fair allocation of pollution rights among a given number of units in a system, a model is described in which account is taken of the problem of defining a concept of fairness which is acceptable from a social point of view. The suggested model can be considered fair or at least acceptable by the units in the economy because (1) the valuation of pollution rights by each unit is subjective; (2) because each unit will obtain at least a share equal in value to the 1/nth of the total population rights; and (3) because if two or more units have different estimations of pollution rights' values, there exists an assignment scheme which gives to each unit more than its fair share. The rule of fair division used in the model can be interpreted as follows: The economy fixes a level of pollution and determines bundles of 'bads' to be allocated fairly among the polluting units. If the central authority fixes a level of pollution such that it can be absorbed into ecosystem, the problem of costs of abatement does not emerge. This does not imply that there are no current costs of pollution, but that these are only short-term costs because after a certain length of time, the ecosystem will return to a zero pollution level. An example is given to illustrate the rule of fair division described in the model. (Harris-Wisconsin)
W77-08006

THE PROBLEM OF THE BEHAVIOR OF CHEMICAL POLLUTANTS IN THE ENVIRONMENT, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W77-08028

ENVIRONMENTAL ASSESSMENT: THE ECOLOGICAL DIMENSION,
Ecoplans Ltd., Waterloo (Ontario).
R. S. Dorney.
Journal of the American Water Works Association, Vol. 69, No. 4, p 182-185, April 1977. 1 tab, 8 ref.

Descriptors: *Environment, *Assessment, *Ecology, *Systems analysis, Decision making, Methodology, Water resources, Urban development, Ecosystems, Land.
Identifiers: Historical justification.

An ecology-systems approach based on a three-point philosophy to questions of development, rather than the traditional approach of economic and political expediency and the technological fix, will dominate decision making in the future. Explored are the philosophy and process of environmental assessment. The philosophical dimension for ecology, in the form of a triad, is (1) a reverence for life; (2) a reverence for land; and (3) a reverence for diversity. This philosophical triad distinguishes the ecological approach from other more pragmatic approaches, such as economic determinism. Considered next is the conceptual dimension for ecology; it is a systems approach, that of an ecosystem, where a range of factors are related to each other through a web of relationships. Discussed is a historical justification for development of environmental assessment. A list of 11 items is presented of what an environmental assessment should accomplish. Many of the items require subjective assumptions that create a dilemma when interposed with objective ones. In the systems model or paradigm for environmental assessment, the environment is divided into three subsystems: cultural-historic, abiotic, and biotic. Discussed are organizing an assessment and selecting an appropriate methodology. Seven reasons for making an environmental assessment are given, and the effect and orientation of such an assessment are examined briefly. (Bell-Cornell)
W77-08034

THE VALUATION OF AESTHETIC PREFERENCES,
Wyoming Univ., Laramie. Dept. of Economics.
D. S. Brookshire, B. C. Ives, and W. D. Schulze.
Journal of Environmental Economics and Management, Vol. 3, No. 4, p 325-346, December 1976. 7 fig, 5 tab, 10 ref.

Descriptors: *Estimating, *Aesthetics, *Damages, *Powerplants, *Recreation, Environment Management, Economics, Methodology, Lakes, Surveys, Income distribution, Equations, Systems analysis, *Evaluation.
Identifiers: *Bidding game, *Valuation, Preferences, Theoretical issues, Individual welfare, Social welfare, Utility function, Questionnaires, Siting.

Specification of the benefits of pollution abatement for entire regions remains a difficult and controversial task. Direct costing of damages for losses in productivity, property, and health is still the most accepted methodology, while aesthetic losses associated with deterioration in environmental quality escape direct quantification. The need to quantify the potential aesthetic damage resulting from energy development has become more crucial. Such quantification has been successfully accomplished through a recently developed bidding game technique. This article describes an application of such bidding games to estimate aesthetic damages from possible construction of the Kaiparowits powerplant near Lake Powell in the Glen Canyon National Recreation Area (GCNRA) in Arizona. Emphasis is placed on theoretical problems associated with the application of bidding games as a measure of aesthetic damages in an attempt to develop and then appl

criteria for the validation of the bidding game technique. Three problems associated with the interpretation of bidding games are explored theoretically and empirically: (1) incentives for biased responses; (2) divergences between compensating and equivalent variation; and (3) problems of interpersonal comparison in the aggregation of individual bids. It is concluded that bidding games should play an important role in the future estimation of aesthetic damages. (Bell-Cornell)
W77-08041

A GOAL INTERVAL PROGRAMMING MODEL FOR RESOURCE ALLOCATION IN A MARINE ENVIRONMENTAL PROTECTION PROGRAM,
Texas Univ. at Austin. Center for Cybernetic Studies.
A. Charnes, W. W. Cooper, J. Harrald, K. R. Karwan, and W. A. Wallace.
Journal of Environmental Economics and Management, Vol. 3, No. 4, p 347-362, December 1976. 3 fig, 2 tab, 27 ref.

Descriptors: *Resource allocation, *Environmental control, *Decision making, *Linear programming, Planning, Pollution abatement, Constraints, Equations, Mathematical models, Systems analysis.
Identifiers: *Marine environment, *Goal programming, *Environmental protection programs.

A multidimensional 'goal programming' model is developed to aid resource allocation decisions in the U.S. Coast Guard's Marine Environmental Protection (MEP) program. It is then extended to a model of 'goal interval programming' (GIP) type where exact values for the indicated goals, as in ordinary goal programming, are replaced by ranges. Deviations outside these ranges are also accomodated by piecewise linear functions with slopes that vary with distance from the goal intervals. Uses and generalizations are discussed in the context of applications to allocating manhours and planning the activities of the Coast Guard's MEP program. The application provides the realization that the model has made it possible (a) to obtain a meaningful characterization of measures of effectiveness and their consequences (within limited ranges, within each activity) while also (b) providing a basis for subsequent extensions to other activities needing simultaneous study. (Bell-Cornell)
W77-08042

ADJUSTMENT COSTS AND OPTIMAL WASTE TREATMENT,
State Univ. of New York at Albany. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-08045

7. RESOURCES DATA

7A. Network Design

OPTIMAL SPATIAL INTERPOLATION AND ITS ERRORS IN THE CASE OF VARIOUS DISTANCES BETWEEN OBSERVATION POINTS OR WATERSHED CENTRES,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4D.
W77-07677

MATHEMATICAL PROGRAMMING WITHIN THE CONTEXT OF A GENERALIZED DATA BASE MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W77-07850

7B. Data Acquisition

OPERATING POLICY ADAPTATIONS FOR A RESERVOIR SYSTEMS, (PHASE I),
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07603

OPERATING POLICY SIMULATION OR A RESERVOIR SYSTEMS, (PHASE II),
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07604

14C EVIDENCE FOR THE ORIGIN OF ARID REGION GROUNDWATER, NORTHEASTERN PROVINCE, KENYA,
Geological Survey, Reston, Va. Water Resources Div.
F. J. Pearson, Jr., and W. V. Swarzenki.
In: Isotope Techniques in Groundwater Hydrology 1974, Vol II, p 95-109, 1974: International Atomic Energy Agency, Vienna, Austria, 1974. 5 fig, 2 tab, 9 ref.

Descriptors: *Groundwater, *Dating, *Carbon radioisotopes, *Hydrogeology, *Africa, Arid lands, Analytical techniques, Evaluation, Water chemistry.
Identifiers: *Kenya, *Carbon-14.

A major natural resource of the arid Northeastern Province of Kenya is a body of fresh groundwater underlying the drainage-ways of the Ewaso Ngiro River and Lagh Dera for about 200 km southeast and east of Habaswein. Twenty samples of this fresh water and surrounding saline water have been analysed for their chemical and radio and stable carbon isotopic composition to investigate mechanisms of recharge of the fresh-water body. No samples contain detectable tritium, and measured C-14 contents range from 2.8 to 87.7% modern. The higher measured C-14 values are associated with the fresher water body, but there is no strict correlation between C-14 and salinity. The different C-14 contents within each group are due to additions of varying amounts of C-14 free carbonate (by aquifer carbonate solution or mixing with older water) to water from a single recharge event. Because of lack of general knowledge about arid region carbonate chemistry and lack of samples to show chemical and isotopic variations with depth in the aquifer, no absolute ages were assigned to these waters. It is probable, though, that the recharge events recurred at intervals of a few millennia. (Woodard-USGS)
W77-07611

VERIFICATION BY REMOTE SENSING OF AN OIL SLICK MOVEMENT PREDICTION MODEL,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5B.
W77-07745

SEDIMENT MEASUREMENT IN ESTUARINE AND COASTAL AREAS,
EG and G Washington Analytical Services Center, Inc., Rockville, Md.
For primary bibliographic entry see Field 2L.
W77-07748

FRITTED GLASS BEAD MATERIALS AS TENSIOMETERS AND TENSION PLATES,
Newfoundland Forest Research Centre, St. John's.
For primary bibliographic entry see Field 2G.
W77-07760

ICE MOVEMENTS IN THE BEAUFORT SEA 1973-1975: DETERMINATION BY ERTS IMAGERY,
Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Physics Branch.
For primary bibliographic entry see Field 2C.
W77-07769

THE ERRORS INVOLVED IN INFERRING SALINITY FROM SOUND VELOCITY,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-07774

THE USE OF LYSIMETERS IN THE HYDROLOGICAL INVESTIGATION OF THE UNSATURATED ZONE,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2D.
W77-07780

ANALYSIS OF IFYGL RAWINSONDE BASELINE MEASUREMENTS,
National Oceanic and Atmospheric Administration, Washington, D.C. Environmental Data Service; National Oceanic and Atmospheric Administration. Washington, D.C. Center for Experiment Design and Data Analysis.
For primary bibliographic entry see Field 2B.
W77-07790

APPARATUS FOR PROLONGED MAINTENANCE OF SPECIFIC GAS CONCENTRATION IN THE WATER OF EXPERIMENTAL AQUARIA,
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
N. T. Kotsar.
Hydrobiological Journal, Vol 11, No 6, p 84-87, 1975. 1 fig, 3 ref.

Descriptors: Equipment, *Gases, *Design, Laboratory tests, *Methodology, *Laboratory equipment, *Dissolved oxygen, *Aeration, *Air environment, Water properties, Carbon dioxide, *Aquaria.
Identifiers: *Dissolved gases, *Partial pressure, USSR.

An apparatus is described which allows for the maintenance of specific gas concentrations in water of aquaria. The apparatus is designed according to the principle that the composition of the gas phase governs the concentration of dissolved gases in a liquid which is in equilibrium with the gas phase. It consists of a Plexiglas cover which isolates the surface water from the atmosphere and microcompressors which provide rapid circulation of the gas mixture from the air space into the water. Water samples for analysis and fish are inserted through a well. A Kipp apparatus, electrolyzer, and a system of washing and gas-metering chambers are used to fill the enclosed space with gases of specific compositions. (Katz)
W77-07841

THE APPLICATION OF ERTS-1 DIGITAL DATA TO WATER TRANSPORT PHENOMENA IN THE POINT PELEE-RONDEAU AREA,
For primary bibliographic entry see Field 2J.
W77-07981

LOW FREQUENCY TURBULENCE AND VERTICAL TEMPERATURE MICROSTRUCTURE IN LAKE TAHOE, CALIFORNIA-NEVADA,
For primary bibliographic entry see Field 2H.
W77-07984

GRAVITY-MEASURING DEVICE FOR WATER AND MINERAL DETECTION,
J. N. Preston.
U.S. Patent No. 3,991,625, 4 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 952, no 3, p 994, November 16, 1976.

Descriptors: *Patents, *Groundwater, *Groundwater availability, Gravity studies, Measurement, Physical properties, Electrical equipment.

The invention is comprised of an electric motor and generator whose moving parts are connected to each other by torque-transmitting means so that the torque of the electric motor and the resistance of the electric generator operates to lift either the electric motor or generator for a distance against the force of gravity. The distance is determined by a mercury-type electric switch and the differences in gravity at different places above the earth are measured both by a motor ampmeter and a generator ampmeter to detect minerals and water beneath the surface of the earth. (Sinha-OEIS)
W77-08010

LIQUID SAMPLER,
A. J. Czarnecki.
U.S. Patent No. 3,994,170, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 952, no 5, p 1951, November 30, 1976.

Descriptors: *Patents, *Sampling, *Water sampling, Measurement, On-site investigations, Water pollution, Water pollution control, Equipment, Automation, Bodies of water.

The object of the invention is to provide a simple, and effective liquid sampler which is capable of collecting samples of liquid from the entire cross-section, including the surface waters, of conduits or streams in a single operation and to provide a sampler which will take varying quantities of the sample stream, depending on the streams flow automatically. The liquid sampler comprises: a generally cylindrical tubular container having a closed bottom end; a longitudinal opening in its wall; a generally cylindrical tubular member mounted for rotation with respect to the container about the longitudinal axis; and a spiral opening in it extending about the periphery. The container and the tubular member are rotated so that the longitudinal opening and the spiral opening coact to provide an aperture moving longitudinally to permit the collection of liquid from varying depths of the body of water. The longitudinal slot may be rectangular or it may be increasingly tapered from the bottom of the container towards the top to compensate for the higher pressures at greater depths of the body of water so that equal volumes are collected from all depths. (Sinha-OEIS)
W77-08024

ELECTRICAL RESISTIVITY MEASUREMENTS ON THE ROSS ICE SHELF,
Wisconsin Univ. Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2C.
W77-08051

ENERGY EXCHANGE AT A GLACIER SURFACE: AN ALTERNATIVE TO AERODYNAMIC METHODS OF MEASUREMENT,
British Antarctic Survey, Cambridge (England).
For primary bibliographic entry see Field 2C.
W77-08053

A TECHNIQUE TO INDEX SOIL PORES AND AGGREGATES LARGER THAN 20 MICROMETERS,
Agricultural Research Service, Salinas, Calif.
For primary bibliographic entry see Field 2G.
W77-08059

THE MEASUREMENT OF RAINFALL AT GROUND LEVEL,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 2B.
W77-08061

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, TECHNICAL SESSION PRESENTATIONS, WATER RESOURCES, VOLUME I-D,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, September 1975 (3 Vol.). 535 p. Smistad, O., Coordinator.

Descriptors: *Conferences, *Remote sensing, *Water resources, *Surveys, Satellites(Artificial), Water quality, Land use, Groundwater resources, Surface waters, Runoff, Snow surveys, Water management(Applied), Reservoirs, Rivers, Mixing, Floods, Soil moisture.
Identifiers: LANDSAT, Skylab.

The symposium reported herein combined the utilization and results of data from NASA programs involving LANDSAT, the Skylab Earth resources experiment package, and aircraft as well as information from other data acquisition programs. The primary emphasis was on the practical applications of Earth resources survey technology of interest to a large number of potential users. Also featured were scientific and technological exploration and research investigations with potential applications. Technical sessions presentations were structured to provide governmental and private organizations with a comprehensive picture of various applications in the management and implementation of remote-sensing data use in their own programs. Volume I-D contained technical papers related to water resources and water resources management. (See W77-08063 thru W77-08084) (Humphreys-ISWS)
W77-08062

THE USE OF SKYLAB AND LANDSAT IN A GEOHYDROLOGICAL STUDY OF THE PALEOZOIC SECTION, WEST-CENTRAL BIGHORN MOUNTAINS, WYOMING,
Wyoming Univ., Laramie. Dept. of Geology.
B. J. Tomes.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2167-2182, September 1975. 9 fig, 1 tab, 11 ref.

Descriptors: *Remote sensing, *Wyoming, *Surveys, *Hydrogeology, Groundwater recharge, Natural recharge, Base flow, Satellites(Artificial), Terrain analysis, Mapping, Geologic mapping.
Identifiers: *Bighorn Mountains, LANDSAT, Skylab.

Sites of geologic structures were identified using Skylab and LANDSAT imagery, and their relationships to groundwater recharge and discharge were studied. The study area lay along the western slope of the Bighorn Mountains, Wyoming. It was found that runoff flowing from the Precambrian core of the Bighorn Mountains sinks as it flows over outcrops of the Bighorn dolomite. A comparison of photo-geologic maps prepared from Skylab and LANDSAT imagery and a geologic map compiled by Darton (1906) illustrated that photomapping, by itself, cannot supply adequate detail, but it can supplement reconnaissance mapping. Lineation maps were compiled from LANDSAT and Skylab images and compared to similar maps compiled by other investigators. Many of the lineations are expressions of tectonic activity that affect fractures and, consequently, groundwater recharge. Hydrologic features, in the form of sinks and springs, on four creeks in the study area were located on the lineation maps, and their relationships to the lineation were observed. A direct correlation exists between mapped lineations and the hydrologic features. A comparison of the interpretations of other investigators, made independently of the geohydrological study, also showed a direct correlation. This observation indicates direction of movement. The quantity of groundwater recharge and discharge, expressed as fracture concentration, may be estimated by comparing lineation maps to drainage and geologic maps in areas where groundwater movement is fracture controlled. (See also W77-08062) (Humphreys-ISWS)
W77-08063

HYDROGEOLOGICAL INVESTIGATIONS IN THE PAMPA OF ARGENTINA,
Bundesanstalt fuer Geowissenschaften und Rohstoffe, Hannover (West Germany).
W. Kruck, and W. Kantor.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2183-2197, September 1975. 6 fig, 3 ref.

Descriptors: *Hydrogeology, *Remote sensing, *Surveys, Evaluation, Terrain analysis, Water supply, Water resources, Surface waters, Soil types, Foreign countries, Foreign waters, Foreign research.
Identifiers: *Argentinian Pampa, *Bajos, LANDSAT, Skylab.

In large areas of the Argentinian Pampa, the salinization of groundwater creates water supply difficulties. Investigations of satellite imagery (Landsat-1 and Skylab), which were based on an extensive ground survey, revealed that differences in the vegetation cover are closely related to depth and salinity of groundwater. Narrow elongated depressions called 'bajos' are often the only indication of fresh groundwater. They can easily be detected on the imagery. Due to their high resolution, Skylab photos allow a quantitative estimation of fresh groundwater situated below the bajos. In general, however, Landsat-1 imagery sufficed for evaluation. In the area of the Rio Tercero, a fossil drainage pattern was discovered, and in Corriente province, soil types could be discriminated and compared to the SOIL MAP OF THE WORLD. It was concluded that the use of satellite imagery in the future will reduce the number of observation points for hydrogeological reconnaissance mapping by up to 75% in areas with similar hydrogeological conditions. (See also W77-08062) (Humphreys-ISWS)
W77-08064

URBAN LAND USE: REMOTE SENSING OF GROUNDBASIN PERMEABILITY,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
L. R. Tinney, J. R. Jensen, and J. E. Estes.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2199-2209, September 1975. 3 fig. 3 tab, 4 ref.

Descriptors: *Remote sensing, *California, *Water resources, *Groundwater, Land use, Groundwater recharge, Groundwater resources, Pervious soils, Watersheds(Basins), Groundwater availability, Urbanization, Evaluation, Aerophotgraphy, Permeability.

A remote sensing analysis of the amount and type of permeable and impermeable surfaces overlying an urban recharge basin was discussed. An effective methodology for accurately generating this data as input to a safe yield study was detailed a

compared to more conventional alternative approaches. The amount of area inventoried, approximately 10 sq miles, should provide a reliable base against which automatic pattern recognition algorithms, currently under investigation for this task, can be evaluated. If successful, such approaches can significantly reduce the time and effort involved in obtaining permeability data, an important aspect of urban hydrology dynamics. (See also W77-08062) (Humphreys-ISWS)
W77-08065

MICROWAVE REMOTE SENSING OF SOIL MOISTURE,
Kansas Univ., Lawrence.
F. T. Ulaby, P. P. Batlivala, J. Cihlar, and T. Schmugge.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2207-2232, September 1975. 24 fig, 12 ref.

Descriptors: *Remote sensing, *Soil moisture, *Vegetation effects, *Kansas, *California, Moisture content, Soil temperature, Aerial photography, Evaluation, Measurement, Satellites(Artificial), Corn(Field), Soybeans, Microwaves, Radiation.
Identifiers: Nimbus-5.

Plant growth, partitioning of rainfall into surface runoff and infiltration components, and evaporation loss to the atmosphere, among other processes, all depend on the amount of water present in the soil. This paper examined the potential application of microwave remote sensing devices in estimating soil moisture content over extended areas. Experimental measurements involving both active and passive microwave sensors acquired from a variety of platforms were presented. Evaluation of the total available experimental data acquired by microwave sensors from ground-based, airborne, and spaceborne platforms revealed that, under the majority of surface cover conditions, microwave sensors are capable of detecting soil moisture variations. The accuracy associated with a quantitative determination of moisture content is, however, subject to the choice of sensor parameters (frequency, incidence angle, and polarization) and to ground conditions (surface roughness, vegetation cover, and soil temperature). It was concluded that continued work towards an operational satellite soil moisture mapping system involves the establishment of optimum sensor (active and passive)/sensor parameter combination(s) and testing over a wide range of terrain characteristics. (See also W77-08062) (Humphreys-ISWS)
W77-08066

SOIL MOISTURE DETECTION FROM SKYLAB,
Kansas Univ., Lawrence.
J. R. Eagleman, and W. C. Lin.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2233-2241, September 1975. 8 fig, 5 ref.

Descriptors: *Remote sensing, *Soil moisture, *Satellites(Artificial), Measurement, Evaluation, Aerial photography, Microwaves, On-site investigations, Basic data collections, Surveys, Moisture content.
Identifiers: Skylab, Nimbus-5.

An investigation was designed for the Skylab satellite to determine the feasibility of remote sensing of the soil moisture content of the surface from various microwave sensors. Skylab data for the experiment were collected during passes 5, 10, 16, and 38 across the two test sites selected in eastern Kansas and western Texas. Pass 38 covered both test sites, giving five data sets for the analysis. As Skylab data were being taken, the moisture content of the soil was sampled by ground crews for each 2.5 centimeter depth from the surface to 15 centimeters at interval of about 6 kilometers along two different routes in the test sites. Skylab data were collected by passive microwave radiometers at wavelengths of 2.1 and 21 cm by the S193 and S194 microwave sensors. An active microwave system also collected scatterometer data at a wavelength of 2.1 cm. Aircraft underflights and a Nimbus-5 satellite provided additional data from microwave sensors corresponding to the Skylab passes. The analysis of microwave data revealed that the longer wavelength L-Band passive radiometer gave the best correlation with soil moisture content of the upper 2.5 cm depth of soil. These correlations were quite good and were apparently influenced very little by other factors such as terrain, vegetation, and cloud cover, with the only major disadvantage of the L-Band radiometer being the size of the resolution cell. The shorter wavelength radiometers were influenced more by cloud cover and vegetation, but they did have the advantage of a smaller size of resolution cell. The relationship between the soil moisture content and the radiometric antenna temperature was used to calculate soil moisture levels from satellite altitudes with several applications suggested by this capability. (See also W77-08062) (Humphreys-ISWS)
W77-08067

THE CORRELATION OF SKYLAB L-BAND BRIGHTNESS TEMPERATURES WITH ANTECEDENT PRECIPITATION,
Oklahoma Univ., Norman.
M. J. McFarland.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2243-2252, September 1975. 5 fig, 21 ref. NAS 9-13360.

Descriptors: *Remote sensing, *Soil moisture, *Satellites(Artificial), Measurement, Evaluation, Microwaves, Radiation, Antecedent precipitation, Antecedent moisture content, Soil moisture, Moisture content.
Identifiers: Skylab.

The S194 L-band radiometer flown on the Skylab mission measured terrestrial radiation at the microwave wavelength of 21.4 cm. The terrain emissivity at this wavelength is strongly dependent on the soil moisture content, which can be inferred from antecedent precipitation. For the Skylab data acquisition pass from the Oklahoma panhandle to southeastern Texas on 11 June 1973, the S194 brightness temperatures were highly correlated with antecedent precipitation from the preceding eleven day period, but very little correlation was apparent for the preceding five day period. The correlation coefficient between the averaged antecedent precipitation index values and the corresponding S194 brightness temperatures between 230 K and 270 K, the region of apparent response to soil moisture in the data, was -0.97. The equation of the linear least squares line fitted to the data was: API (cm) = 31.99 - 0.114 T, where API is the antecedent precipitation index and T is the S194 brightness temperature. (See also W77-08062) (Humphreys-ISWS)
W77-08068

FLOOD HAZARD STUDIES IN CENTRAL TEXAS USING ORBITAL AND SUBORBITAL REMOTE SENSING IMAGERY,
Texas Univ., Austin. Dept. of Geological Sciences.
V. R. Baker, R. K. Holz, and P. C. Patton.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2253-2294, September 1975. 27 fig, 2 tab, 30 ref, 1 append. NAS 9-13312.

Descriptors: *Remote sensing, *Mapping, *Geomorphology, *Texas, *Floods, Watersheds(Basins), Flood plains, Hydrographs, Satellites(Artificial), Small watersheds, Channel morphology, Distribution patterns, Channels, Drainage density, Topography.
Identifiers: Skylab, *Colorado River(Tex).

One approach to flood hazard evaluation in the central Texas area is a parametric model which relates flood hydrograph characteristics to quantitative geomorphic properties of the drainage basns. The study evaluted the network resolution capabilities of the following data formats: (1) large-scale (1:24,000) topographic maps, employing Strahler's method of v's,' (2) standard low altitude black and white aerial photography (1:13,000 and 1:20,000 scales), (3) NASA-generated aerial infrared photography at scales ranging from 1:48,000 to 1:123,000, and (4) Skylab Earth Resources Experiment Package S-190A and S-190B sensors (1:750,000 and 1:500,000 respectively). Resolution, measured as the number of first order streams or as the total channel length identified in small drainage areas, is strongly dependent on basin relief. High-density basins on the Edwards Plateau were poorly depicted on orbital imagery. However, the orbital network definition of low relief basins on the inner Texas Coastal Plain is nearly as accurate as results from large-scale topographic maps. The Skylab earth terrain camera (S-190B) and NASA-generated aerial infrared type 2443 imagery at 1:48,000 scale were found to be useful for botanic soils, and geomorphic flood hazard zonation. Studies of the Colorado river valley near austin, texas, easily distinguished infrequent (100 to 500 year recurrence interval), intermediate (10-30 year), and frequent (1 to 4 year) hazard zones. (See also W77-08062) (Humphreys-ISWS)
W77-08069

REMOTE SENSING OF MISSISSIPPI RIVER CHARACTERISTICS,
Colorado State Univ., Fort Collins.
J. F. Ruff, M. M. Skinner, B. R. Winkley, D. B. Simons, and D. E. Dorratcague.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2299-2315, September 1975. 9 fig, 4 ref.

Descriptors: *Remote sensing, *Mississippi River, *Hydrography, *On-site data collections, Surveys, Surface waters, Aerial photography, Mapping, On-site investigations, Hydrologic aspects, Currents(Water), Topography, Sediment distribution, Sediment transport, Discharge(Water), Channels, Flow, Evaluation, Analysis, Vegetation, Rivers, Floods.

Aerial infrared photography and thermal infrared imagery from an aircraft platform were obtained over two selected reaches of the Mississippi River. Interpretation of the photography and imagery was performed to identify river characteristics pertaining to the flow, sediment concentration, and geometry. The remotely sensed data, coupled with ground truth data, can give an overview of large rivers that can be used for maintenance and design. Subsurface phenomena can be deduced from features observed at the water surface. Surface flow patterns are evident on all types of photography, but color infrared photography is most effective where suspended material concentration differences exist. Shear zones, mixing zones, regions of high velocity flow, slack water areas, and localized flow patterns can be identified. The effect of man-made structures on the flow patterns is identifiable. Specular reflection indicates the portion of the river that has the

most turbulence, the highest velocities, and the highest sediment transport. When using specular reflection as an interpretative key, prudent judgement must be exercised. A 1:20,000 scale provided sufficient detail for interpretation of flow patterns. A qualitative evaluation of the sediment transport and flow can be made at a given stage based upon flow patterns at the surface, the local boundary geometry, and the overall geometry. Mosaics of color infrared prints for reaches of the river are very useful for establishing the planimetric characteristics of the channel, for evaluating the overall effect of structures, for observing the pool-crossing-pool sequence, for locating sources and sinks of sediment, and for documenting and evaluating the general behavior of the river. As flow stage changes, the shifting of the thalweg can be identified. (See also W77-08062) (Humphreys-ISWS)
W77-08070

APPLICATION OF THERMAL SCANNING TO THE STUDY OF TRANSVERSE MIXING IN RIVERS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5B.
W77-08071

UTILIZATION OF LANDSAT DATA FOR WATER QUALITY SURVEYS IN THE CHOPTANK RIVER,
General Electric Co., Beltsville, Md.
For primary bibliographic entry see Field 5A.
W77-08072

HYDROLOGIC LAND USE CLASSIFICATION OF THE PATUXENT RIVER WATERSHED USING REMOTELY SENSED DATA,
General Electric Co., Beltsville, Md.
W. C. Dallam, A. Rango, and L. Shima.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2351-2364, September 1975. 7 fig, 1 tab, 7 ref.

Descriptors: *Land use, *Remote sensing, *Hydrologic aspects, *Maryland, *Watersheds(Basins), Aerial photography, Surveys, *Classification, Analytical techniques, *Land classification, Forests, Surface waters, Wetlands, Pastures, Urban mapping, Evaluation, Flood plains.
Identifiers: *Patuxent River, LANDSAT, Multispectral analysis.

The Patuxent River Watershed, located in central Maryland between Baltimore and Washington, D.C. is approximately 2330 sq kn in area and 175 km long. This region is not at a critical point because of concerns such as water management and quality, flooding, and land use within the watershed. Data from the NASA-directed LANDSAT and Earth Resources Aircraft Programs have been used to provide a new dimension in information collection and processing for the management of watersheds. Digital data from LANDSAT-1, ID number 1260-15201, were analyzed along with selected IR photography from U-2 flight number 74-060B taken 28 April 1974, which was digitized in three channels. Processing of the data was accomplished using a multispectral analysis system. Land use themes consisting of surface water, wetlands, forest, residential, cropland/pasture, urban, and extractive were developed and delineated through the watershed. Area measurements of watershed themes were obtained and will serves as a calibration input to a deterministic hydrologic model on a sub-watershed. Using the derived residential and urban theme areas from LANDSAT, an estimated basin imperviousness was also calculated. Thematic maps were produced at 1:62,500 scale. Floodprone areas were also classified and delineated at a scale of 1:24,000. Comparison with standard floodprone area maps at the same scale has indicated a few areas of discrepancy. Such information can be used for updating or checking floodprone area boundaries as well as monitoring changes in floodplain areas. This cooperative study has provided participating state and local agencies with remote sensing information as applied to hydrologic problems and has resulted in a technology exchange. (See also W77-08062) (Humphreys-ISWS)
W77-08073

LAND USE CLASSIFICATION FOR HYDROLOGIC MODELS USING INTERACTIVE MACHINE CLASSIFICATION OF LANDSAT DATA,
Maryland Univ., College Park. Dept. of Civil Engineering.
T. J. Jackson, R. M. Ragan, and R. H. McCuen.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2365-2378, September 1975. 5 fig, 4 tab, 4 ref, 1 append.

Descriptors: *Land use, *Remote sensing, *Hydrologic aspects, *Maryland, Watersheds(Basins), Aerial photography, Surveys, Land classification, Analytical techniques, Forests, Wetlands, Agriculture, Land, Pastures.
Identifiers: *Anacostia River, LANDSAT, Multispectral analysis.

Models designed to simulate the hydrology of urban areas require input parameters describing the land use and degree of imperviousness of the watershed. Unfortunately, the magnitude and spatial distribution of these parameters are rather difficult to estimate when a large watershed is involved. Trade-offs between accuracy of the model parameters and the time or money available for their determination must be made. Because of the necessity of such trade-offs, a study was developed to investigate the use of computer aided analysis of LANDSAT multispectral data in estimating percent of imperviousness and associated land uses needed in urban hydrologic modeling. An interactive computer was used to delineate seven land use classifications in the 342 sq km Maryland portion of the Anacostia River Basin from LANDSAT data. These results compared favorably with those of an earlier study which obtained the same information through analysis of aerial photographs which had a scale of 1:4800. Approximately 94 man days were required to complete the land use analysis using the aerial photographs, while less than three man days were required to accomplish similar tasks using the LANDSAT data. (See also W77-08062) (Humphreys-ISWS)
W77-08074

REMOTE SENSING TECHNIQUES FOR PREDICTION OF WATERSHED RUNOFF,
Texas A and M Univ., College Station.
B. J. Blanchard.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2379-2406, September 1975. 5 fig, 1 tab, 5 ref.

Descriptors: *Remote sensing, *Runoff coefficient, *Watersheds(Basins), *Oklahoma, Runoff forecasting, Runoff, Land classification, Analytical techniques, Analysis, Aerial photography, Satellites(Artificial), Small watersheds, Agricultural watersheds.
Identifiers: *Chickasha(Okla), LANDSAT.

The advent of new remote sensing devices developed in the past decade offers the possibility that watershed characteristics, such as vegetative cover, soils, soil moisture, etc., may be quantified rapidly and economically. Experiments with visible and near infrared data from the LANDSAT-1 multispectral scanner have indicated that a simple technique for calibration of runoff equation coefficients is feasible. When tested on 10 watersheds in the Chickasha, Oklahoma area, the technique using LANDSAT data produced more accurate runoff coefficients than conventional methods. A similar approach was used to relate passive microwave antenna temperatures to runoff equation coefficients by using data from the Passive Microwave Imaging System mounted in the NASA P3A aircraft. Eight highly instrumented watersheds in the Chickasha study area were used. Study of these data and the data systems indicated that passive microwave antenna temperatures may be more effective throughout the year for calibration of watershed runoff coefficients than systems using visible and near infrared light. (See also W77-08062) (Humphreys-ISWS)
W77-08075

THE USE OF LANDSAT DCS AND IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Army Engineer District, Waltham, Mass. New England Div.
S. Cooper, P. Bock, J. Horowitz, and D. Foran.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2443-2522, September 1975. 25 fig, 5 tab, 3 ref.

Descriptors: *Remote sensing, *Water management(Applied), *New England, *Surface waters, Water resources, Floods, Instrumentation, Management, Operations, Networks, Satellites(Artificial), Hydrologic data, Data processing, Monitoring, Surveys, Mapping, Photography, Ice, Snow cover, Lakes, Rivers, Water quality, Evaluation.
Identifiers: *Data collection systems, *Data collection platforms, LANDSAT.

The New England Division (NED), Corps of Engineers has experimented with the LANDSAT-1 Data Collection and Imaging Systems for more than two years following the launch of the satellite in July 1972. The purpose of this experiment has been to evaluate the future usefulness of data products received from satellites such as LANDSAT in the day-to-day operation of the NED water resources systems used to control floods. NED concluded that data collection by orbiting satellite relay is both reliable and feasible. Using standard photo equipment, experience in this investigation has indicated that LANDSAT photo imagery may be enlarged about five times, or to a scale of 1:200,000. This is sufficient for only rather large-scale or gross feature patterns to be represented with the accuracy necessary for flood control reservoir regulation purposes. This study has indicated technological feasibility, albeit with the expectation of further advances in imaging systems and products. Pilot project test and evaluation demonstrations under quasi-operational conditions were recommended. (See also W77-08062) (Humphreys-ISWS)
W77-08076

THE APPLICATION OF REMOTE SENSING TECHNOLOGY TO THE INVENTORY OF PLAYA LAKES IN THE HIGH PLAINS OF TEXAS,
Texas Water Development Board, Austin.
A. W. Wyatt, M. L. Ellis, and A. E. Bell.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2523-2530, September 1975. 16 ref.

Descriptors: *Remote sensing, *Playas, *Texas, *Projects, Data collections, Water management(Applied), *Lakes, Surface waters, Water resources, Programs, Project planning, Water resources development, Surface water availability, Groundwater, Groundwater recharge, Satellites(Artificial).
Identifiers: *High Plains(Tx), LANDSAT.

The Texas Water Development Board is planning a project to determine the feasibility of using LANDSAT digital data to inventory the playa lakes of the High Plains region of Texas. The project will use the Detection and Mapping package developed at NASA-Johnson Space Center. The economy of the High Plains region is dependent on groundwater for irrigation, and the Ogallala aquifer is being depleted faster than it is being recharged. The playa lakes represent a potential source of artificial recharge for the aquifer, and an inventory is the first step in that direction. (See also W77-08062) (Humphreys-ISWS)
W77-08077

REMOTE SENSING APPLICATIONS IN WATER RESOURCES MANAGEMENT BY THE CALIFORNIA DEPARTMENT OF WATER RESOURCES,
California State Dept. of Water Resources, Sacramento.
B. Brown.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2531-2560, September 1975. 4 tab.

Descriptors: *Water resources, *Remote sensing, *California, *Data collections, Water resources development, Water, Planning, Mapping, Hydrologic data, Satellites(Artificial), Aerial photography, Surveys, Costs, Land use, Cost comparisons.
Identifiers: LANDSAT.

For nearly 30 years, the California Department of Water Resources has been using remote sensing techniques in all phases of planning, constructing, and operating various features of the California Water Plan. Most of this experience has been with low altitude aerial photography. Recently, the Department has initiated a program to evaluate possible applications of imagery from high altitude aircraft and satellite sensors. Results from seven applications studies, which compared the costs of using high altitude imagery for various purposes to the costs of using conventional data sources, revealed the high altitude imagery to be more cost effective in six cases and equal to conventional data sources in one case. The results also revealed that the imagery provides a level of quality not generally achievable with uncorrected, conventional imagery. Although satellite application studies are not yet complete, preliminary results indicate that some definite possibilities exist for employing satellite imagery on an operational basis within the next few years. (See also W77-08062) (Humphreys-ISWS)
W77-08078

EVALUATION OF THERMAL X/5-DETECTOR SKYLAB S-192 DATA FOR ESTIMATING EVAPOTRANSPIRATION AND THERMAL PROPERTIES OF SOILS FOR IRRIGATION MANAGEMENT,
South Dakota State Univ., Brookings. Remote Sensing Institute.
D. G. Moore, M. L. Horton, M. J. Russell, and V. I. Myers.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2561-2583, September 1975. 7 fig, 5 tab, 14 ref. NASA NAS 9-13337.

Descriptors: *Evapotranspiration, *Remote sensing, *Data processing, *Texas, Data collections, Evaluation, Analysis, Land use, Irrigated land, Soil moisture, Soil temperature, Management, Energy budget, Satellites(Artificial), Aerial photography.
Identifiers: Skylab.

An energy budget approach to evaluating the SKYLAB X/5-detector S-192 data for prediction of soil moisture and evapotranspiration rate was pursued. A test site which included both irrigated and dryland agriculture in Southern Texas was selected for the SL-4 SKYLAB mission. Both vegetated and fallow fields were included. Data for a multistage analysis, including ground, NC-130B aircraft, RB-57F aircraft, and SKYLAB altitudes, were collected. Ground data were used to characterize energy budgets and to evaluate the utility of an energy budget approach for determining soil moisture differences among twelve specific agricultural fields. It was concluded that: (1) Wavelengths greater than 1.5 micrometers were required to spectrally distinguish between wet and dry fallow surfaces. (2) The thermal data provided a better estimate of soil moisture than did the reflective bands. (3) Thermal data was dependent on soil moisture, but not on the type of agricultural land use. (4) The emittance map, when used in conjunction with existing models, did provide an estimate of evapotranspiration rates. (5) Surveys of high soil moisture areas can be accomplished with space-altitude thermal data. If both soil moisture and land use are to be surveyed, at least one reflective channel must be included in the analysis. (6) Thermal data will provide a reliable input into irrigation scheduling. (7) The thermal and spatial resolution of the S-192 X/5 detector SKYLAB data is appropriate for monitoring soil moisture and for irrigation scheduling. (8) The time of data collection for soil moisture surveys should be close to midday. (See also W77-08062) (Humphreys-ISWS)
W77-08079

REMOTE SENSING INPUTS TO WATER DEMAND MODELING,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
J. E. Estes, J. R. Jensen, L. R. Tinney, and M. Rector.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2585-2620, September 1975. 8 fig, 8 tab, 4 ref.

Descriptors: *Model studies, *Hydrologic budget, *California, *Remote sensing, Water demand, Data processing, Mapping, Crops, Land use, Water balance, Agriculture, Irrigation, Census, Saline soils, Aerial photography.
Identifiers: *Kern County(Calif), LANDSAT.

Water resource managers require timely, accurate, and cost-effective data to model hydrologic dynamics in arid agricultural environments. In an attempt to determine the ability of remote sensing techniques to economically generate data required by water demand models, a water model was developed for Kern County Water Agency (KCWA), California. The model is currently being refined. Based upon an analysis of the KCWA model, listings of all external quantities that serve as inputs to the model were compiled and analyzed in the following manner: (1) all data inputs were precisely defined; (2) related data inputs were grouped and categorized; (3) present sources of input data were identified; and (4) preliminary determinations were made as to which inputs could possibly be generated more efficiently utilizing remote sensing technology. As a result of this analysis, it was determined that agricultural cropland inventories utilizing both high altitude photography and LANDSAT imagery can be conducted cost-effectively. In addition, by using average irrigation application rates in conjunction with cropland data, estimates of agricultural water demand can be generated. Techniques developed are considered economical, accurate, and timely in comparison to conventional methods. (See also W77-08062) (Humphreys-ISWS)
W77-08080

AREAL EXTENT OF SNOW ESTIMATION IN THE NORTHERN SIERRA NEVADA MOUNTAINS USING LANDSAT-1 IMAGERY,
California Univ., Berkeley. Remote Sensing Research Program.
E. F. Katibah.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2621-2641, September 1975. 4 fig, 9 tab, 11 ref, 1 append. NASA NGL 05-003-404.

Descriptors: *Snow cover, *Remote sensing, *Nevada, *Snow surveys, Snow, Watersheds(Basins), Estimating, Satellites(Artificial), Analysis, Analytical techniques, Data processing, Areal, Distribution, Aerial photography, Census, Moisture content.
Identifiers: *Sierra Mountains(Nev), LANDSAT.

Quantification of the surface area of snow covering watersheds is believed to be a useful parameter in estimating snow water content for inclusion in water runoff prediction equations. The paper documented an operational manual interpretation technique which allows fast and accurate estimates to be made of the areal extent of snow parameter using LANDSAT-1 imagery. The analysis procedures, the statistical results, and the associated costs of this research were presented. One of the possible avenues for lowering the expense of estimating snow areal extent is to develop a library of snow cover conditions, in which the appearance of the snow pack is compared between low altitude photography and satellite LANDSAT imagery, along with other relevant data on an image sample unit basis. Scattered cloud cover over snowpack may present some difficulty to present computer analysis; however, the human has little difficulty distinguishing between the two as they appear on LANDSAT-1 imagery. The inventory methods describes for areal extent of snow estimation show great promise for providing fast, economical, and accurate inventories of snowpack extent. (See also W77-08062) (Humphreys-ISWS)
W77-08081

SNOW SURVEY FROM SPACE, WITH EMPHASIS ON THE RESULTS OF THE ANALYSIS OF SKYLAB EREP S192 MULTISPECTRAL SCANNER DATA,
Environmental Research and Technology, Inc., Concord, Mass.
J. C. Barnes, and M. D. Smallwood.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2643-2659, September 1975. 7 fig, 2 tab, 12 ref. NASA NAS 9-13305.

Descriptors: *Snow surveys, *Remote sensing, *Mapping, *Nevada, *Utah, Data processing, Snow cover, Snow, Snowmelt, Analytical techniques, Satellites(Artificial), Surveys, Reflectance.
Identifiers: *Sierra Mountains, *White Mountains, *Wasatch Mountains, Skylab.

The Skylab EREP S192 Multispectral Scanner data have provided, for the first time, an opportunity to examine the reflectance characteristics of snowcover in several spectral bands extending from the visible into the near-infrared spectral re-

gion to about 2 micrometers. The analysis of the S192 imagery and digital tape data from five EREP passes, two from the SL-2 mission and three from the SL-4 mission, indicated a sharp drop in reflectance of snow in the near-infrared, with snow becoming essentially non-reflective in Bands 11 (1.55-1.75 micrometers) and 12 (2.10-2.35 micrometers). The results were in good agreement with the results of laboratory experiments. Two potential applications to snow mapping of measurements in the near-infrared spectral region are possible: (1) the use of a near-infrared band in conjunction with a visible band to distinguish automatically between snow and water droplet clouds; and (2) the use of one or more near-infrared bands to detect areas of melting snow. (See also W77-08062) (Humphreys-ISWS)
W77-08082

FACTORS AFFECTING SNOW ASSESSMENT FROM LANDSAT DATA,
National Environmental Satellite Service, Washington, D.C.
D. F. McGinnis, Jr., M. C. McMillan, and D. R. Wiesnet.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2661-2668, September 1975. 3 fig, 31 ref.

Descriptors: *Snow, *Monitoring, *Remote sensing, Snow surveys, Snow cover, Satellites(Artificial), Mapping, Optical properties, Reflectance, Physical properties, Evaluation, Forests, Radiation, Measurement.
Identifiers: LANDSAT.

LANDSAT imagery has been used to map snow extent with great accuracy. Present orbit and sensor characteristics, however, restrict LANDSAT as a snow monitoring satellite. A better understanding of the complexities affecting the radiation reflected by a snowpack will enhance the usefulness of remote sensing of snow from aircraft and satellites. Problems of aspects and slopes may hinder thematic mapping of snow but can be resolved with available solar tables. Detection of snow in forested areas via satellite is a problem still under study. LANDSAT-1 and -2 have revealed the potential for multispectral studies of snow. With minor modifications of sensor and orbit, future spacecraft could become 'SNOWSTAT's'. Raising the detector saturation threshold and extending the upper spectral limit of the MSS will not only improve mapping of snow extent, but also will provide the likelihood of monitoring some aspects of the physical condition of the snowpack. (See also W77-08062) (Humphreys-ISWS)
W77-08083

OPERATIONAL WATER MANAGEMENT APPLICATIONS OF SNOWCOVERED AREA OBSERVATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
R. Rango, V. V. Salomonson, and J. L. Foster.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D. Report No NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 2669-2685, September 1975. 6 fig, 5 tab, 7 ref. NOAA/NESS NA-776-74.

Descriptors: *Water management(Applied), *Snow, *Remote sensing, *Wyoming, *Hydrologic aspects, Management, Organizations, Snow cover, Snowmelt, Runoff, Watersheds(Basins), Satellites(Artificial), Analytical techniques, Data processing, Streamflow forecasting, Seasonal.
Identifiers: *Wind River Mountains(Wyo), LANDSAT.

Timely and accurate prediction of snowmelt runoff has great value in the Western United States for organizations or individuals involved in power generation, irrigation, flood control, management of domestic and industrial water supplies, and recreation. An effort has been made to evaluate the utility of satellite snowcover observations for seasonal streamflow prediction. On a representative, large watershed (100,000 to 1,000,000 sq km) it was found, based on six years of data, that meteorological satellite observations of snowcover early in the snowmelt season exhibit a relationship to seasonal runoff, having a statistically significant coefficient of determination of 0.92. Analyses of LANDSAT-1 snowcover observations over the Wind River Mountains of Wyoming revealed that for areas with infrequent cloud cover, the extent of snowcover and its change with time can be monitored on watersheds as small as 10 sq km in areal extent. The change in the snowcover with time as observed from LANDSAT-1 is found to reflect major differences in seasonal runoff from high altitude (mean altitude greater than 3 km) and low altitude (less than 3 km) watersheds. There are quantitative indications that LANDSAT observations over small watersheds could be used in a manner similar to that employed for meteorological satellite observations to related the percent of a basin snowcovered on a given date to seasonal runoff. (See also W77-08062) (Humphreys-ISWS)
W77-08084

7C. Evaluation, Processing and Publication

GENERATION OF MULTIVARIATE SYNTHETIC FLOWS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-07610

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, MALHEUR LAKE DRAINAGE BASIN, APPENDIX I-12,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07617

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, GOOSE AND SUMMER LAKES DRAINAGE BASIN, APPENDIX I-13,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07618

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, KLAMATH DRAINAGE BASIN, APPENDIX I-14,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07619

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER, GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, ROGUE DRAINAGE BASIN, APPENDIX I-15,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07620

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, UMPQUA DRAINAGE BASIN, APPENDIX I-16,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07621

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, NORTH, MID-, AND SOUTH COAST DRAINAGE BASINS, APPENDIX I-17, AND 18,
Oregon State Univ., Corvallis; and Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 2G.
W77-07622

MUNICIPAL INFORMATION SYSTEMS: EVALUATION OF POLICY RELATED RESEARCH. VOLUME 2. COMPUTER UTILIZATION IN LOCAL GOVERNMENT,
California Univ., Irvine. Urban Information Systems Research Group.
For primary bibliographic entry see Field 6B.
W77-07631

FLOOD PLAIN INFORMATION: THOMPSONS CREEK AND TRIBUTARIES, BRYAN, TEXAS,
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W77-07634

FLOOD PLAIN INFORMATION; SAN ANTONIO RIVER, BEXAR COUNTY, TEXAS.
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W77-07635

SPECIAL FLOOD HAZARD REPORT: JERSEY CREEK, KANSAS CITY, KANSAS.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W77-07636

FLOOD PLAIN INFORMATION, SOUTH ANNA RIVER, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W77-07637

FLOOD PLAIN INFORMATION, NORTH ANNA RIVER, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W77-07638

FLOOD PLAIN INFORMATION, CHERRY CREEK-CHERRY CREEK LAKE THROUGH FRANKTOWN, COLORADO.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-07639

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, WARREN COUNTY, PENNSYLVANIA,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W77-07640

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, VENANGO COUNTY, PENNSYLVANIA,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W77-07641

FLOOD PLAIN INFORMATION: NORTHWEST STREAM GROUP, STOCKTON, CALIFORNIA,
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-07642

FLOOD PLAIN INFORMATION: WICHITA RIVER AND TRIBUTARIES, WICHITA FALLS, TEXAS,
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W77-07643

FLOOD PLAIN INFORMATION: IPSWICH RIVER, NORTH READING AND WILMINGTON, MASSACHUSETTS,
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-07644

FLOOD PLAIN INFORMATION: MERRIMACK AND SOUHEGAN RIVERS, LITCHFIELD AND MERRIMACK, NEW HAMPSHIRE.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W77-07645

SOME APPLICATIONS OF STOCHASTIC FLOW GENERATION,
Birmingham Univ. (England).
For primary bibliographic entry see Field 2A.
W77-07647

OBJECTIVE ANALYSIS OF SNOW COVER FIELDS,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2C.
W77-07678

DISSOLVED GAS DATA REPORT, 1975-1976,
Army Engineer District, Portland, Oreg. North Pacific Div.
For primary bibliographic entry see Field 5A.
W77-07718

CHARACTERISTICS OF THE SEVERE RAINSTORM,
Tokyo Aviation Weather Service (Japan).
For primary bibliographic entry see Field 2B.
W77-07784

WATER QUALITY STATUS AND TRENDS IN MINNESOTA--INDICES FOR WATER SUPPLY AND GROUND WATER POLLUTION,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W77-07794

PENN STATE URBAN RUNOFF MODEL--USER'S MANUAL,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W77-07797

A DECISION SUPPORT SYSTEM FOR AREA-WIDE QUALITY PLANNING,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W77-07810

EXTENSIONS AND CORRECTIONS FOR THE CODASYL APPROACH TO DATA BASE MANAGEMENT,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W77-07811

IMPLEMENTATION OF A DECISION SUPPORT FOR REGIONAL WATER QUALITY PLANNING,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W77-07812

INFORMATION TRANSFERRAL WITHIN A DISTRIBUTED DATA BASE VIA A GENERALIZED MAPPING LANGUAGE,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W77-07813

AIDING DECISION MAKERS WITH A GENERALIZED DATA BASE MANAGEMENT SYSTEM: AN APPLICATION TO INVENTORY MANAGEMENT,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W77-07814

OBSERVATIONS ON A GENERALIZED INTELLIGENT QUERY PROCESSOR FOR DECISION SUPPORT,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W77-07849

MATHEMATICAL PROGRAMMING WITHIN THE CONTEXT OF A GENERALIZED DATA BASE MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W77-07850

OPTIMIZATION OF WATER USE FOR IRRIGATION,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-07851

STUDY OF THE RIO GRANDE, BOLIVIA HIGHLIGHTS SOME BASIC QUESTIONS ABOUT SIMULATION,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2A.
W77-07945

THREE CASE STUDIES ON THE APPLICATION OF THE STORM WATER MANAGEMENT MODEL,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5B.
W77-07955

HYDROLOGIC OPTICS. VOLUME I. INTRODUCTION,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
For primary bibliographic entry see Field 1A.
W77-07956

MATHEMATICAL MODELING OF REGIONAL WATER-SUPPLY SYSTEMS IN YUGOSLAVIA,
Energoprojekt, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 4A.
W77-08033

STATISTICAL FORECASTING OF SNOW AVALANCHES, SAN JUAN MOUNTAINS, SOUTHERN COLORADO, U.S.A.,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W77-08055

PRESENT AND PAST GLACIATION THRESHOLD IN THE CASCADE RANGE, WASHINGTON, U.S.A.: TOPOGRAPHIC AND CLIMATIC CONTROLS, AND PALEOCLIMATIC IMPLICATIONS,
Washington Univ., Seattle. Dept. of Geological Sciences; and Washington Univ., Seattle. Quaternary Research Center.
For primary bibliographic entry see Field 2C.
W77-08056

8. ENGINEERING WORKS

8A. Structures

IMPROVEMENT AND EXPANSION OF THE DRAINAGE SYSTEM OF HAMBURG,
Abwassentechnische Vereinigung e. V., Bonn (West Germany).
For primary bibliographic entry see Field 5D.
W77-07890

FLOATING BREAKWATER,
Bridgestone Tire Co., Ltd., Tokyo (Japan). (Assignee).
S. Tazaki, and Y. Ishida.
U.S. Patent No 3,991,576, 16 p, 16 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 952, no 3, p 978, November 16, 1976.

Descriptors: *Patents, *Engineering structures, *Breakwaters, Floating, Shore protection, Waves(Water), Wavelengths.

A floating breakwater is provided having an excellent wave breaking efficiency which has a simple structure, can be provided at a low cost, and has a ratio of the height of wave passed through the floating body to the height of wave before passing the floating body of less than 0.5 in a length of the floating body of less than 1/2 of the wave length. It was found that the wave breaking efficiency is influenced by phase difference, reflection, friction, whirlpool action of the wave, and the like. When a floating breakwater is set on the water surface, if the floating body makes the same motion as that of the wave, the wave breaking efficiency is poor. In order to increase the wave breaking efficiency due to the phase difference the floating body is fixed at a constant position near the water level as far as possible to control the upward and downward motion against the water level effectively. The wave breaking efficiency due to the reflection and friction is enhanced by providing a projected body on the upper side of the floating body. A weighting material is added for increasing weight and specific gravity of the floating body. (Sinha-OEIS)
W77-08009

TIDEWATER POWER SYSTEM,
For primary bibliographic entry see Field 8C.
W77-08022

8B. Hydraulics

MANUEL TECHNIQUE DU VILLAGE, (VILLAGE TECHNOLOGY HANDBOOK), (VOLS. 1 AND 2).
Volunteers in Technical Assistance, Mt. Rainier, Md.
For primary bibliographic entry see Field 3F.
W77-07628

STOCHASTIC ANALYSIS OF VELOCITY FLUCTUATIONS IN A NATURAL STREAM CHANNEL,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-07648

DETERMINATION OF THE DEGREE OF PROTECTION OFFERED BY FLOOD CONTROL SYSTEMS ON THE BASIS OF DISTRIBUTION FUNCTIONS,
Water Resources Centre, Budapest (Hungary).
I. Bogardi.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 246-252, 1974. 4 fig, 3 ref.

Descriptors: *Flood protection, *Flood control, *Levees, *Model studies, Mathematical models, Flood plains, Floodproofing, Rivers, Streams, Floods, Probability, Statistical models, Earthworks, Structures, Hydraulic structures, Foreign research.

The degree of protection offered by flood levee systems varies at random along the length of the levee owing to the gradual progression of construction work, changing soil conditions, and other factors. The degree of protection was determined by statistical sampling of individual cross sections, with regard also to the cases of possible failure. Thus, one random variable is the degree of protection along the levee. At the same time, there is a probability of flood occurrence associated with every value of the degree of protection. The efficiency, i.e., the load bearing capacity of the flood protection system, can be determined from the probability distribution function influenced by the two independent variables. The method can be applied mainly to streams having flat slopes and broad flood plains, where in the case of floods the degree of protection at the weak points of the system can be enhanced by protection work. This work can be accurately defined as the area under the distribution function of the degree of protection. This is the procedure that the actual state of the degree of protection of the various systems--taken as starting data for the optimum development of flood protection--is determined. (See also W77-06708) (Sims-ISWS)
W77-07673

EMPTINESS OF A FINITE DAM--TIME DEPENDENT THEORY,
Indian Inst. of Tech., Madras. Dept. of Mathematics.
S. K. Srinivasan.
In: Mathematical Models in Hydrology, Proceedings of the Warsaw Symposium, Poland. Volume 1, July 1971. IAHS/Unesco, Paris, France, 1974, p 395-400. 10 ref.

Descriptors: *Dams, *Stochastic processes, Water levels, Probability, Equations, Mathematical models, Systems analysis.
Identifiers: *Finite dams, First emptiness, Laplace transform, Linear equations, Poisson inputs, Water releases.

A stochastic model of a finite dam governed by Poisson inputs is considered. Corresponding to unit release rate a revewal equation is set up for the probability frequency function governing the water level in the first wet period. The resulting equation is solved by the Laplace transform technique and an explicit expression for the Laplace transform of the probability frequency function governing the time to first emptiness is obtained. The probability frequency ffunction governing the water level of the dam at any arbitrary time is also deduced. (See also W77-06708) (Bell-Cornell)
W77-07683

E.L.C. WATER DEVELOPMENT PROJECT, BETUL (M.P.) INDIA: FIFTH ANNUAL REPORT, 1975-1976,
Evangelical Lutheran Church, Betul (India). Water Development Project.
(1976). 16 fig, 13 tab, 4 ref, 7 append.

Descriptors: Aquifers, *Drilling, Drilling equipment, *Pumping, *Water wells, Asia, Groundwater, *Pumps.
Identifiers: E.L.C. Water Development Project(India), *Madhya Pradesh(India).

The Evangelical Lutheran Church (E.L.C.) Water Development Project is currently based in Betul, Madhya Pradesh, India, and serves the neighboring Chhindwara and Seoni districts as well. Underlying terrain in these areas is predominantly basalt with a fair amount of crystallines, Gondwana sandstones, and shales. 90 percent of the 36-50 inches of annual rainfall occurs during the June-September monsoon season. The Project is organized as three basic departments: the Groundwater Investigation Department (Groundwater Investigation Team, Test Pumping Unit, Pump Installation and Repair Unit, and Laboratory), the Drilling Department (Tubewell Drilling and Extension Drilling), and the Base Facilities (Workshop and Stores). Since 1971, drilling has been done with two Halco 625 down-the hole hammer rigs, backed up by appropriate support equipment. Hard use and age have caused a great deal of downtime due to repairs. The addition of a new Chicago Pneumatic T-7000-3 rotary rig plus support equipment is expected to ease the drilling burden. To date, 482 successful tubewells have been drilled by the Project for a variety of purposes. Major studies of bacterial quality of water sources and utilization of tubewell installations in Betul District were also undertaken in 1976. (Eberle-NWWA)
W77-07696

SIMULATION OF IMPOUNDMENT TERRACE HYDRAULICS,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
E. W. Rochester, and C. D. Busch.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 1, p 76-78,84, January-February 1977. 5 fig, 8 ref.

Descriptors: *Terracing, *Impoundments, *Model studies, Mathematical models, Inflow, Discharge(Water), Depth, Water levels, Computer models, Pipes, Pipe flow, Drainage, Hydraulics, Agriculture, Simulation analysis.

A digital simulation predicts flow conditions associated with a series of two impoundment terraces. The simulation routes inflowing water through the impoundments and associated discharge pipes. Results of the simulation include depths of the water in each impoundment, flow rates through each discharge pipe, and hydraulic head at the junction of the pipes. (Sims-ISWS)
W77-07767

ASPECTS OF BANKFULL GEOMETRY IN A DISTRIBUTARY SYSTEM OF EASTERN AUSTRALIA,
Macquarie Univ., Ryde (Australia). School of Earth Sciences.
For primary bibliographic entry see Field 2E.
W77-07782

CHANNELIZATION: ENVIRONMENTAL, GEOMORPHIC, AND ENGINEERING ASPECTS,
North Carolina Univ. at Charlotte. Dept. of Geography and Earth Science.
E. A. Keller.
In: Environmental Geology, Chapter 7, published by John Wiley, (New York), 1976, p. 115-140. OWRT B-089-NC(3), 14-34-0001-6103.

Descriptors: *Channel morphology, *Channel improvement, *Geomorphology, Drainage engineering, Bank stability, Stream improvement, Stream stabilization, Channel erosion, Meanders.
Identifiers: *Channel restoration, *Fluvial processes, *Channelization, Stream alignment, Fluvial geomorphology.

Channelization is a controversial issue, and, although more environmental aspects are being considered today than ever before, the pressure to modify channels will increase in the future. Therefore, it is important to discover ways to modify channels that will minimize environmental degradation and maximize the overall return to man. Two types of channel work are currently being done: (1) emergency work on streams, following catastrophic events, that too often is poorly planned and executed, and (2) channelizaton that is planned but may or may not be properly engineered and include consideration of environmental impact. Several aspects of fluvial geomorphology and hydrology that are now or may eventually be helpful in designing more natural channels are (1) the concept that streams are open systems in which channel form and process evolve in harmony, (2) utilization of the convergent--divergent criterion, (3) identification of geomorphic thresholds for stream channels, and (4) recognition of the complex relationships between deposition, erosion, and sediment concentration. Engineering trends in channelization include constructing structures to provide diversity of aquatic habitat, the continuing use of river-training procedures, the construction of more natural appearing channels, and channel restoration of streams degraded by adverse land use. The state of the art of channelization still suffers from lack of understanding concerning the behavior of alluvial streams; therefore, it is recommended that future necessary channelization be confined to the shortest possible length of channel and provide the least amount of artificial control necessary to meet the desired objective of the project. (Stewart-NC State)
W77-07809

HOW TO DETERMINE WASTE WATER FLOW,
For primary bibliographic entry see Field 5F.
W77-07881

THE CONCEPTION, DESIGN, AND CONSTRUCTION OF METROPOLITAN TORONTO MID-TORONTO SEWER,
Maclaren (James F.) Ltd., Willowdale (Ontario).
L. N. Hogarth.
Canadian Journal of Civil Engineering, Vol. 4, No. 1, p 47-56, March, 1977. 3 fig, 3 ref.

Descriptors: *Sewers, *Construction, *Design criteria, *Interceptor sewers, Tunneling, Automatic controls, Engineering structures, Flow, Hydraulic design, Operation and maintenance, Performance, Construction techniques, Construction materials, Waste water treatment.
Identifiers: Toronto(Canada).

Various factors of the planning, design, and construction of an intercepting sewer in Toronto, Canada, were discussed. Considerations of flows in the Toronto area and hydraulics of the area were prime factors of the system's design. Ad

vantages of the deep sewer design used include the dewatering of existing intercepting sewers for inspection, repair, or restoration without raw sewage discharge to the lakefront. Surplus flows of present sewers will be discharged to the new interceptor sewer. Pumping station and trunk sewer connections will also allow continued maintenance of the present low and high level sewers and their pumping station, as well as that of the new system, without sewage loss to the lake. Dynamic operation measures flows in various sewers and, manually or automatically, diverts flow from sewer to sewer by the regulation of gates. This utilizes full sewer capacity while reducing overflows. Backflows into trunk sewers should be avoided and flow tributary to the interceptor sewer must be measured to achieve flow routing. Air trapped in sewage during the fall to the interceptor sewer is vented by a structure in a spur tunnel horizontal to the main interceptor sewer. Access shafts for maintenance and inspection of the interceptor sewer are located at 305-1219 meter intervals. A level sensing bubble is located at each shaft and hydraulic gradients can be accurately measured at these points. The shafts are located at points where the 150 centimeter diameter cross connections between high and low level interceptors meet the new interceptor systems. Construction, maintenance and operation data are being collected. (Collins-FIRL)
W77-07888

MATHEMATICAL MODELING OF REGIONAL WATER-SUPPLY SYSTEMS IN YUGOSLAVIA,
Energoprojekt, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 4A.
W77-08033

8C. Hydraulic Machinery

LAWS NEEDED TO EXPEDITE ELECTRIC GENERATION SCHEDULES FOR THE PACIFIC NORTHWEST: FINANCING, ENVIRONMENTAL LAWS AND SITING AND LICENSING PROCEDURES, VOLUME I, FINANCING PACIFIC NORTHWEST ELECTRIC GENERATION,
Kell, Alterman and Runstein, Portland, Oreg.
L. Jourolman, R. M. Kell, R. C. Jackson, and J. Keller.
Completion Report, 1976. 193p, 102 ref.

Descriptors: *Pacific Northwest U.S., *Electric power production, *Electric power costs, *Capital costs, *Financing, Regulation, Legal aspects, *Permits, *Legislation, Administrative agencies, Federal government, State government, Thermal power, Nuclear powerplants, Hydroelectric plants, Pollution abatement, Coordination, *Electric power demand, *Water law.

Volume I of the study investigates the changes in financing structure, administrative licensing and environmental law which are necessary to expedite future electric power generation in the Pacific Northwest. The present roles of public and private utilities, direct service industries and the federal government are reviewed. Existing areas of joint coordination, planning and financing between these groups are described. The study discusses the financing of the existing electric power facilities in the Northwest. An estimate of needed future construction capital is made and alternative methods for raising this capital, at the lowest possible cost to the consumer are proposed. The study outlines a new role for the federal government in financing new generation. (See also W77-07602)
W77-07601

LAWS NEEDED TO EXPEDITE ELECTRIC GENERATION SCHEDULES FOR THE PACIFIC NORTHWEST: FINANCING, ENVIRONMENTAL LAWS AND LICENSING PROCEDURES, VOLUME II, ENVIRONMENTAL LAWS AND SITING AND LICENSING PROCEDURES,
Kell, Alterman and Runstein, Portland, Oreg.
For primary bibliographic entry see Field 6E.
W77-07602

NWWA GROUND WATER HEAT PUMP RESEARCH IMPERATIVES,
Water Well Journal, Vol. 31, No. 4, p 60-61, April, 1977.

Descriptors: *Energy, Research facilities, Heating, Cooling, *Groundwater recharge, Thermal properties, *Pumps.
Identifiers: *Groundwater heat pumps.

Considerable research is necessary before use of ground water heat pumps can become a vital part of America's energy resource system. As federal monies become available to help support its work in heat pump research, the National Water Well Association Research Facility will concentrate on two specific areas: (1) Thermodynamic and Qualitative Effects on the Ground Water Environment, an (2) Mechanical System Development for Heat Extraction and Discharge. Essential studies under the first category would include conservation of heat energy in small domestic subdivisions (e.g., how will heat from injected water move in aquifers, what is the potential for permanent temperature alteration in local ground water systems, etc.), discharge of water used in a heat pump without concern for heat energy conservation and the consequences thereof, and legal aspects of heat pump effluent disposal. Under the second category, systems such as dual reversing wells, single location doublet wells, and 'in situ heat extraction' deserve serious investigation. Finally, NWWA desires to perform cooperative research on water-to-air heat pump machinery currently manufactured for market to determine performance under varying water temperature, water quality, and flow conditions. (Eberle-NWWA)
W77-07692

RESEARCH FOUNDATION UTILIZES GROUND WATER HEAT PUMPS,
National Water Well Association, Worthington, Ohio.
H. W. Heiss.
Water Well Journal, Vol. 31, No. 4, p 58-59, April, 1977. 1 fig.

Descriptors: *Energy, Heating, *Cooling, *Groundwater, Ohio, Iron bacteria, Fouling, *Pumps.
Identifiers: *Groundwaterheat pumps, Columbus(Ohio).

Batelle Memorial Institute installed a ground water heat pump system in 1957 as an alternative to coal and oil heating. The systems consists of two separate heat pumps used to heat and cool four buildings of Batelle's Columbus, Ohio, complex, a total area of 317,000 square feet. Batelle Facilities Manager Bill Welker and Ralph Kramer of Kramer, Comer and Pass designed the system utilizing Trane centrifugal compressors, evaporators, condensers, and coils. Fed by a field of six wells providing water at a constant 55 degrees Fahrenheit, Batelle heat pumps demostrated a coefficient of performance (BTU output/input) of 4.4 for cooling and 5.4 for heating processes. Only a few problems have occurred in the 19 years of the system's operation: iron bacteria fouling small tubes and orifaces and corrosion of coils were both corrected with additives to the well water, while breakdowns due to component vibration under low load conditions is now avoided by the limited use of a small oil-fired backup heating system during such periods. All major original equipment is still operating today. (Eberle-NWWA)
W77-07693

GROUND WATER ENERGY AND THE GROUND WATER HEAT PUMP,
National Water Well Association, Worthingon, Ohio.
For primary bibliographic entry see Field 8C.
W77-07694

GROUND WATER ENERGY AND THE GROUND WATER HEAT PUMP,
National Water Well Association, Worthingon, Ohio.
T. E. Gass, and J. H. Lehr.
Water Well Journal, Vol. 31, No. 4, p 42-47, April, 1977. 4 fig.

Descriptors: *Energy, *Heating, *Cooling, *Groundwater, Groundwater recharge, Specific heat, Thermal properties, *Pumps.
Identifiers: *Groundwater heat pumps.

A device called the heat pump can be used to convert stored energy in ground water to usable energy for heating and cooling. Because water has a very high Specific Heat, it has enormous potential to store and absorb heat energy. Ground water heat pump systems make use of gaseous refrigerant heat exchangers to either extract from or sink heat into an incoming water supply and derive a BTU output several times that of the equivalent killowatt input. Ground water temperature in the U.S. ranges between 75 degrees in the south and 40 degrees in the north, varies little throughout the year, and is thus a more stable and efficient basis than surface water or air. Recent advances in equipment design nd increases in the cost of conventional energy sources make ground water heat pumps economically practical for the future. Potential environmental consequences must, of course, be carefully examined, but the prognosis for the application of heat pumps by themselves and as adjuncts to other types of heating systems is indeed favorable. (Eberle-NWWA)
W77-07694

E.L.C. WATER DEVELOPMENT PROJECT, BETUL (M.P.) INDIA: FIFTH ANNUAL REPORT, 1975-1976,
Evangelical Lutheran Church, Betul (India). Water Development Project.
For primary bibliographic entry see Field 8B.
W77-07696

PUMPING SYSTEMS: PART II,
National Water Well Association, Worthington, Ohio.
R. B. McDannald.
Water Well Journal, Vol. 31, No. 4, p 38-39, April, 1977.

Descriptors: *Pumps, *Electric wiring, Electric wires, Plastic pipes, Valves, Wells.
Identifiers: *Submersible pumps, *Pitless adapters, Pressure tanks.

Keeping pumping systems simple and trouble-free requires quality workmanship and reliable materials, as noted in the following suggestions. Plastic insulated electric wire is preferred to neoprene insulation for greater resistance to cutting and scuffing, and for ease of stripping. Do not overlook ease of future well cleanout when selecting a pitless adapter; use a holesaw to make a hole in the casing for installation of the adapter instead of a cutting torch unless a real expert is available. Virgin polyethelene pipe is suggested for use between the pitless adapter and the basement wall to the pressure tank as it makes for a better visual impression. All systems should have a check valve at the pump discharge; a second check valve before the pressure tank tee or fittings pack acts as a safeguard and can reduce service calls. To provide the customer with uniform water flow and avoid pressure loss and waterlogging, 3/4 inch feeder plumbing lines in combination with a captivated air type tank and either gate or ball type supply valves

are all recommended to complete the system. (See also W77r06856) (Eberle-NWWA)
W77-07704

ELECTRONIC ISOLATION SIMULATOR FOR HYDRAULIC TURBINE GOVERNOR ALINEMENT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
L. E. Eilts.
Report REC-ERC-77-2, January 1977. 9 p, 8 fig, append.

Descriptors: *Governors, Regulation, Electronic equipment, Control systems, Analog computers, Dynamics, Hydroelectric powerplants, *Testing procedures.
Identifiers: *Isolation simulator, *Governor alinement testing, Servomechanisms.

This report describes the theory of governor alinement by the technique of simulated isolation. The design, assembly, circuit configuration, and external connections of an electronic isolation simulator for governor alinement testing are presented. Procedures for setting up and using the isolation simulator are outlined and typical governor responses obtained during simulated isolation tests are illustrated. The calculations and potentiometer setting determinations, prerequisite to this type of testing, are exemplified. (Bur Reclam)
W77-07804

TIDEWATER POWER SYSTEM,
S. V. Dickman.
U.S. Patent No. 3,993,913, 13 p, 20 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 952, no 4, p 1833, November 23, 1976.

Descriptors: *Patents, *Tidal energy, *Tidal powerplants, *Engineering structures, Dams, Dam design, Flow, Water level fluctuations.
Identifiers: Water wheels.

A system for extracting power from the tides includes a dam constructed in a body of water subject to tidal flow for separating the body of water from a tidal basin between the dam and the shoreline. Water wheel assemblies are mounted on the dam and include mounting saddles for rotation about a horizontal axis at a level about the high tide level and with the bottom of the water wheel at the low tide level. Each saddle includes a pair of vertical wall members, between which the water wheel is mounted for rotation, and a horizontal wall portion below the water wheel provided with a concave recess receiving the water wheel. The saddle is so constructed that the water flowing from the body of water to the tidal reservoir and vice versa will flow through the water wheels. In order to control this flow, a brake is provided to block rotation of the water wheels at the discretion of an operator. The dam is constructed from spaced vertical I-beams and horizontal slabs which extend between successive I-beams. A saddle extension mounts the saddle on the dam by fitting vertical arm members between the flanges of successive I-beams. The water wheel includes radially extending paddles and may have its ends closed by end walls; vent apertures are provided, either in the paddles adjacent the shaft or in the end walls adjacent the shaft. (Sinha-OEIS)
W77-08022

APPARATUS FOR POWER GENERATION IN DEEP SEAWATER,
Cooper Union Research Foundation, Inc., New York. (Assignee).
S. E. Molnar.
U.S. Patent No. 3,994,134, 6 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 952, no 5, p 1939, November 30, 1976.

Descriptors: *Patents, *Engineering structures, *Energy conversion, Sea water, Underwater, Electric power production, Equipment.

The apparatus consists of: pumping equipment within an angular border frame; a locomotion equipment with motor and counterbalancing system; a prime mover and a power generator. The assemblage is placed on the seabottom; and the pumping and locomotion equipment are placed in vertical position. Above the anchored base the frame encompasses a reciprocating water receiving receptacle and a congruent plunger. The receptacle with its water receiving chamber and the plunger made of pumping equipment that slides with its outer ends along the sidewalls of the angular frame, carries out diverging-converging as well as upward and downward movements, and results in reciprocal and at the same time telescopelike operation. While moving divergingly upward and apart, the receptacle and plunger create an empty space in the interior of the receptacle. Arriving at its upper filling position, the empty receptacle chamber is tightly connected with the primer mover, through opened valves. Forced to act by the admitted powerful seawater, the prime mover accomplishes its performance so that when the receptacle is filled with water, during upward movement the receptacle chamber is filled with air from the sea-surface through the connected plunger pocket avoiding a vacuum. Moving convergingly downward, the plunger expels the water from the receptacle chamber into the sea. Valves act accordingly. The cyclical movements repeat. Complementally employed and working twin pumping equipment or accumulated electric energy secure continuous operation of the apparatus. (Sinha-OEIS)
W77-08023

MECHANISM FOR TAPPING THE SURF ENERGY,
L. Tah-sun.
U.S. Patent No. 3,994,629, 5 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 952, no 5, p 2105, November 30, 1976.

Descriptors: *Patents, *Surf, *Engineering structures, *Beaches, Coasts, Waves(Water), Ocean waves, Energy, *Energy conversion.

The primary object of the invention is to provide a means to tap the energy of the surf and to store the energy in a huge energy storage tank in the form of potential energy for later usage in driving various machinery, including a generator. The uniformity of revolution is important in any case, and of particular importance in case the machinery driven is a generator, as this means the uniformity of the frequency of the output electricity. The mechanism includes a gravitational bucket with a rack on the outside. The rack engages a gear which drives a reciprocating water pump. The pump transports water to a tank for use later as a source of steady controllable energy. (Sinha-OEIS)
W77-08026

METHOD AND APPARATUS FOR OBTAINING ELECTRICAL POWER FROM SEA WATER,
Carnegie-Mellon Univ., Pittsburgh, Pa. (Assignee).
C. Zener, and J. G. Fetkovich.
U.S. Patent No. 3,995, 160, 5 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 952, No 5, p 2263, November 30, 1976.

Descriptors: *Patents, Thermal properties, *Oceans, *Sea water, *Thermal power, *Energy transfer, Enthalpy, Thermodynamics, Electric power production, Thermal powerplants.
Identifiers: Foam, Ocean water foam.

This invention relates to a method and apparatus for producing such power from the enthalpy released from a rising foam generated from the ocean water. In operation the colder deep ocean water is drawn through a conduit into a condenser at approximately sea level. Warmer surface water is drawn into the dome through inlet ports and transported to foam generating means. The higher temperature surface water and the lower temperature deep ocean water are now in proximity of each other in a closed environment. The presence of higher and lower temperature water in the closed environment results in pressure gradients within the dome and reduces the pressure of the warmer water to a value below its saturation vapor pressure. This decrease causes the warmer water to evaporate. A foam inducing medium is introduced into the warmer water and causes the formation of a foam. As a result of the pressure gradients, the foam flows toward the colder water zones of the dome and comes into contact with the foam separator means where the liquid phase and vapor phase are separated. The liquid phase is then transported by conduit means to the turbine and the vapor phase is transported to the condenser and both are pumped through exhaust ports to the ocean. Electricity is produced by using the various physical, thermodynamic and mechanical properties of ocean water foam. (Sinha-OEIS)
W77-08032

OPTIMAL ENGINEERING DESIGN UNDER UNCERTAINTY BY GEOMETRIC PROGRAMMING,
Unternehmensberatung Schumann G.m.b.H., Cologne (West Germany).
R. D. Wiebking.
Management Science, Vol. 23, No. 6, p 644-651, February 1977. 1 tab, 15 ref, append.

Descriptors: *Design, *Powerplants, *Cooling water, *Optimization, *Economic efficiency, *Stochastic processes, Condensers, Stream turbines, Operating costs, Annual, Probability, Equations, Mathematical models, Systems analysis, *Risks.
Identifiers: *Geometric programming, *Cost minimization, Objective function, Cost function, Statistical error propagation method.

The production of electrical power in a steam powerplant requires that amounts of waste heat from the generating process be rejected to a heat sink. A conventional 'once-through' condensing system is considered in which the turbine exhaust steam is condensed in a surface-type condenser and the heat of condensation is rejected to circulating water taken from a natural body of water. Presented is an application of stochastic (posynomial) geometric programming to the optimal engineering design problem of minimizing the annual costs. A theory developed by Avriel and Wilde for calculating and bounding the expected value of the objective function is summarized. A method known as the statistical error propagation method is used to calculate approximate confidence intervals for the cost function. Stochastic geometric programming is applied to the design problem in the presence of uncertainty (e.g., fuel costs can vary with market conditions). It is shown how the design engineer can extract a considerable amount of information from the solution of merely one small optimization problem. If tighter bounds on the expected cost value are desired, knowledge of discrete probability distributions for the individual random parameters is required and additional optimization problems must be solved. (Bell-Cornell)
W77-08040

8D. Soil Mechanics

A VALLEY CROSSING IN PLEISTOCENE DEPOSITS,
Saskatchewan Univ. Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8E.
W77-07778

E. Rock Mechanics and Geology

VALLEY CROSSING IN PLEISTOCENE EPOSITS,
askatchewan Univ. Saskatoon. Dept. of Civil En-neering.
K. Sauer.
ngineering Geology, Vol. 11, No. 1, p 1-21, arch 1977. 15 fig, 1 tab, 13 ref.

escriptors: *Valleys, *Canada, *Engineering ructures, *Dam foundations, Bridges, ighways, Boulers, Geologic investigations, Ro-ry drilling, Excavation, Melt water, Channels.
entifiers: *Saskatchewan, *Arm River(Canada), Valley crossings, Proglacial channels, Meltwater osion, Pleistocene deposits, Geophysical gging.

roglacial meltwater channels are of considerable nportance in geotechnical engineering in outhern Saskatchewan. Dams, roads, bridges, nd urban development are major projects involv-g these channels. The Arm River crossing illus-ates the types of problems that can occur in ghways constructed across these channels, in-uding instability, groundwater control, and ex-vation through a boulder pavement. The report emonstrated how these problems can be resolved establishing the geology of the sites and by esigning to preclude geotechnical problems. The vestigation involved rotary drilling, geophysical gging, installation of piezometers, and engineer-g analysis. (Lee-ISWS)
77-07778

ECHANICAL AND HYDRAULIC PROPER-IES OF ROCKS RELATED TO INDUCED EISMICITY,
alifornia Univ., Berkeley. Lawrence Berkeley ab.; and California Univ., Berkeley. Dept. of ivil Engineering.
. A. Witherspoon, and J. E. Gale.
ngineering Geology, Vol. 11, No. 1, p 23-55, larch 1977. 21 fig, 96 ref.

escriptors: *Rock properties, *Mechanical pro-erties, *Hydraulic properties, *Model studies, eismic studies, Stability, Fractures(Geologic), ailure(Mechanics), Earthquakes, Deformation, lathematical models, Porosity, Numerical analy-s.
dentifiers: *Continuum models, *Discrete odels, Two-porosity models, Parallel-plate con-uits, Stick slip.

he mechanical and hydraulic properties of frac-ured rocks were considered in connection with ne role they play in induced seismicity. In many ases, the mechanical properties of fractures etermine the stability of a rock mass. Stick slip as been proposed as the failure mechanism in arthquake events. In considering the hydraulic roperties, it has been customary to treat a frac-ure as a parallel-plate conduit, and a number of athematical models of fracture systems have dopted this approach. In most of this work, the ssumption has been made that the fractures are igid. However, it is clear from a review of the echanical and hydraulic properties that not only re fractures easily deformed, but also they con-titute the main flow paths in many rock masses. wo approaches were used in attempting to nu-erically model such behavior: (1) continuum odels, and (2) discrete models. The continuum pproach only needs information as to average alues of fracture spacing and material properties. he discrete approach, on the other hand, requires etails of the fracture geometry and material pro-erties of both fractures and rock matrix. The pos-ibility of extending these methods to deeper frac-ure systems needs more investigation. (Visocky-SWS)
W77-07779

8F. Concrete

CEMENTING OIL AND GAS WELLS, INCLUDING CASING HANDLING PROCEDURES: PART 1,
Completion Technology Co., Houston, Tex.
G. O. Suman, Jr., and R. C. Ellis.
World Oil, Vol. 184, No. 4, p 43-51, March, 1977. 13 fig, 2 tab, 33 ref.

Descriptors: *Well casing, *Cement grouting, Welded joints, Drilling, Drilling fluids, Joints(Connections), Oil wells.
Identifiers: Zone isolation, Cement-casing bond, Cement-foundation bond, Mud wetting, Well casing performation, Well casing failure.

Since an improper cementing job can lead to almost any well completion or production problem imaginable, close attention to the cementing process should be the drilling operator's vital concern. Cement used in primary cementing is normally designed to support axial load of the casing string, for zone isolation, to protect casing from damage or failure, and to support the borehole during the productive interval. The success of the cement-casing and cement-formation bonds, however, depends upon the type of casing surface, type of fluid wetting (or its absence), presence or absence of a mud cake against the borehole wall, and various other downhole conditions. Salt flow and fault slippage place stresses on casing which must be dealt with using specialized cementing techniques, or in the case of fault, possible omission of cementing altogether. Precautions taken while drilling and during casing movement can help prevent the casing sticking at critical phases of well completion. Additional precautions with respect to drilling speed, use of plugs, and in the joining of pipe are essential in minimizing casing joint loss. (Eberle-NWWA)
W77-07697

OPEN-HOLE POROSITY LOGS CAN BE USED IN CASED HOLES,
Dresser Atlas Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W77-07698

SLURRY AND PUMPING GUIDELINES SMOOTH CASING-CEMENTING JOBS,
Western Co., Corpus Christi, Tex.
C. Clement, and P. Parker.
Oil and Gas Journal, Vol. 75, No. 15, p 54-59, April 11, 1977. 3 fig, 5 tab.

Descriptors: *Well casings, *Cement grouting, *Slurries, *Drilling fluids, Drilling, *Oil wells.
Identifiers: Circulation loss, Mud additives, Cement additives.

Cementing well casing may be achieved in a number of ways, but a few basic principles prevail. There are six types of casing cemented in oil and gas wells: (1) Conductor casing, used at the top of the hole to return drilling fluid to the pit and prevent cave-in; (2) Surface casing, which prevents hole caving and protects surface waters; (3) Intermediate casing, which seals off weak zones; (4) Produuction casing, which isolates production zones and houses equipment; (5) Liner, sometimes used in lieu of production casing, and; (6) Tieback casing, connecting the liner to the surface. As drilling proceeds into deeper and deeper zones, more steps are involved in the cementing process. Spacer and filler cements may be necessary in addition to completion cements. More complicated combinations of plugs, guide shoes, float shoes, and float collars are employed in feeding cement slurries to intermediate and production casings than are required for the conductor and surface casing strings. Specifications for slurry mixtures for different types of casing and detailed procedures for placing the cement are given. (Eberle-NWWA)
W77-07699

ELIMINATING IRON-BEARING WATER FROM WELL NO. 7,
Ottawa City Engineers Office, Ill.
For primary bibliographic entry see Field 5G.
W77-07702

CONCRETE-POLYMER MATERIALS--FINAL REPORT (USBR-BNL-AEC-OSW COOPERATIVE PROGRAM),
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
G. W. DePuy, J. T. Dikeou, W. T. Lockman, and M. C. Redmond.
Report REC-ERC-76-10, August 1976. 79 p.

Descriptors: *Concrete technology, Concrete testing, Research and development, Materials engineering, Construction materials, Composite materials, *Polymers, Monomers, *Concretes, Durability.
Identifiers: *Concrete-polymer materials, *Polymer-impregnated concrete, Polymer-cement concrete, Composite materials.

The Bureau of Reclamation and Brookhaven National Laboratory conducted a joint research program on development of concrete-polymer materials under the sponsorship of the then U.S. Atomic Energy Commission, the then Office of Saline Water, and the Bureau of Reclamation. The program began in 1967 and continued to June 1973. Five topical reports have been published on the work performed through June 1972. Test results presented were conducted at the Bureau during the final year of the cooperative program, and include: (1) work on monomer and composites surveys, (2) process technology development for PIC (polymer-impregnated concrete), (3) test results on PIC at ambient and elevated temperatures, (4) examination of PIC after exposure to brine at elevated temperatures, (5) nondestructive testing of PIC, and (6) a brief summary of applications development. The purpose of this report is to record final data from the testing program. Detailed analyses of these data are not included. (Bur Reclam)
W77-07803

TELESCOPING FORM SYSTEM SPEEDS SEWER CONCRETING.
Water and Sewage Works, Vol. 124, No. 3, p 68, March, 1977.

Descriptors: *Sewers, *Concrete construction, *Concrete technology, *Formwork(Construction), Concrete placing, Concrete structures, Equipment, Engineering structures, Tunnel construction, Interceptor sewers, Ohio.
Identifiers: Cleveland(OH).

A telescoping two-section concrete form system was used for sewer construction in Cleveland, Ohio. Concrete is poured around a steel form to make a 9-foot diameter tube. While the concrete sets behind one of the two-piece sections, the other is stripped from a completed sewer wall portion, threaded through the first set of forms, and placed for the next pouring. An overhead beam moves the forms which, with the hydraulic traveler, comprise a self-contained unit. The small crew needed for the system an pour 100 linear feet of concrete every two ays, using the alternate days to strip, move and place the forms. The hydraulic system of the traveler is utilized for stripping and setting the form panels. The advantages realized from this system included the efficient and rapid movement of the forms, an excellent concrete finish, and a single clean-up which would be possible by using separate systems for floor and sidewall sections. (Collins-FIRL)
W77-07879

MOVEMENT JOINT FOR CONCRETE SEWER BRIDGE.
New Zealand Engineering, Vol 31, No 15, p 261, November 15, 1976. 1 fig.

Descriptors: *Sewerage, *Bridges, *Concrete, *Construction joints, Bridge design, Construction materials, Prestressed concrete, Sealants, Corrosion, Engineering structures, Design criteria.
Identifiers: Hamilton City(New Zealand).

Hamilton City, New Zealand, has built a concrete bridge for transporting sewage across a river for treatment. The prestressed concrete bridge has two 1.34 square meter ducts, is 165 meters between abutments, and 15 meters above river level. Flexible duct pins provide longitudinal earthquake protection. A leak-proof, elastic jointing system (Transflex Type 200A) was used for earthquake deflection, temperature movement, shrinkage, and creep shortening. The seal also resists the chemicals in raw sewage and hydraulic pressures. (Collins-FIRL)
W77-07885

PREFABRICATED PANELS FOR SUB-SURFACE SEWAGE EFFLUENT AND WASTE WATER DISPOSAL,
For primary bibliographic entry see Field 5E.
W77-08091

8G. Materials

NWWA GROUND WATER HEAT PUMP RESEARCH IMPERATIVES,
For primary bibliographic entry see Field 8C.
W77-07692

RESEARCH FOUNDATION UTILIZES GROUND WATER HEAT PUMPS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 8C.
W77-07693

OPEN-HOLE POROSITY LOGS CAN BE USED IN CASED HOLES,
Dresser Atlas Co., Houston, Tex.
W. H. Fertl, and P. A. Wichmann.
Oil and Gas Journal, Vol. 75, No. 14, p 84-86, April 4, 1977. 5 fig, 1 ref.

Descriptors: *Logging(Recording), *Radioactive well logging, *Porosity, Well casings, Petrography, Borehole geophysics, Oil wells.
Identifiers: Acoustic well logging, Densilog, Neutron well logging.

Standard open-hole logging devices can be used successfully for porosity determinations behind pipe, provided that the proper borehle environment, such as good cement bond, absence of severe washouts, etc., is present in the well under consideration. For situations such as the recompletion or redevelopment of old wells for which original open hole logs are unavailable, cased hole logs can be an accurate and invaluable information source. Acoustic logging for cement bond testing has been used for many years, and when good bonding is present, adequate readings for the lithology and porosity of the formation may be obtained. A combination logging system consisting of the simultaneously run scattered gamma ray density curve (compensated Densilog) and compensated neutron curve is being successfully used worldwide in open hole situations, and recent cased applications have proved quite successful as well; plots of open hole and cased hole conditions in the same well show close agreement for both the Densilog and the compensated neutron techniques. (Eberle-NWWA)
W77-07698

A VALLEY CROSSING IN PLEISTOCENE DEPOSITS,
Saskatchewan Univ. Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8E.
W77-07778

MECHANICAL AND HYDRAULIC PROPERTIES OF ROCKS RELATED TO INDUCED SEISMICITY,
California Univ., Berkeley. Lawrence Berkeley Lab.; and California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8E.
W77-07779

CONCRETE-POLYMER MATERIALS--FINAL REPORT (USBR-BNL-AEC-OSW COOPERATIVE PROGRAM),
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8F.
W77-07803

ELECTRONIC ISOLATION SIMULATOR FOR HYDRAULIC TURBINE GOVERNOR ALINEMENT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8C.
W77-07804

INCREASING SEWER CAPACITY BY POLYMER DOSING,
Bristol Univ., (England). Dept. of Civil Engineering.
R. H. J. Sellin.
Proceedings of the Institution of Civil Engineers, Part 2, Vol 63, p 49-67, March, 1977. 9 fig, 3 tab, 10 ref.

Descriptors: *Polymers, *Sewers, *Flow, Performance, Costs, Chemical treatment, Chemical reactions, Sewage treatment, Economics, Waste water treatment.

An evaluation was conducted to determine the various factors involved in using polymer dosing to increase sewer flow discharge capacities. An increase of about 25% could be expected with 20-50 ppm polymer additions by weight. An increase of 140% was obtained in a 150 millimeter, 30 meters long pipe with a dose of 300 ppm. No pollution or toxicity problems occurred, except in the immediate area of an accidental bulk spill, which would be naturally cleared in a short time. Comparisons with sewer construction costs indicated that polymer injection would be a cheaper alternative. There was a clear financial advantage in most cases. A minimum sewer length is necessary to make polymer addition economically viable. Other advantages of polymer treatment include its ease of use and transport in emergency situations and its ability to prolong the life of sewer systems prone to overloads during the planning and construction of new sewers. Drag reduction in large or rough pipes will be determined by future testing. (Collins-FIRL)
W77-07883

STUDY OF IN-SERVICE BITUMINIZED FIBER SEWER PIPE,
University of South Florida, Tampa. Dept. of Structures, Materials, Fluids.
T. E. Brumagin, J. A. Colwell, and W. H. Skelton, Jr.
Transportation Engineering Journal of ASCE, Vol 103, No TE2, p 257-267, March, 1977. 10 fig, 2 tab, 2 ref.

Descriptors: *Sewers, *Pipes, Physical properties, Evaluation, Conveyance structures, Chemical reactions, Waste water treatment, Equipment, Conduits, Engineering structures.
Identifiers: Tampa(FL), Bitumized fiber sewer pipe.

Used bitumized fiber sewer pipes were recovered and tested to determine in-service changes which had occurred. Pipes used in the City of Tampa and Hillsborough County, Florida, were studied. Pipe strength had rapidly decreased according to time in service and the amount of water absorbed. Rotary knife cleaning, surface blisters, and root penetration also decreased pipe strength. Beam strength test results indicated that rigidity was less than one-third that of the original specifications. Wet conditions produced greater strength deterioration than dry conditions. This pipe was considered inappropriate for the Tampa or Hillsborough areas because of the rapid loss of needed pipe properties. (Collins-FIRL)
W77-07884

HANDLING SMALL AMOUNTS OF CRUDE SEWAGE.
Water and Waste Treatment, Vol 20, No 2, p 41, February, 1977.

Descriptors: *Sewers, Equipment, *Sewage treatment, *Sewage disposal, Pumps, Automatic controls, Maintenance, Design, Performance, Waste water treatment.
Identifiers: Middle East.

An English company has marketed specialized sewage handling equipment in the Middle East. Most applications involve sewage pumping and sewage disposal. Equipment is constructed to handle flows up to 115 liters/second, especially in cases where low and constant delivery rates are necessary. Gravity filled sewage ejectors are provided, as are fully automatic sewage pumping systems. These systems are designed to handle small crude sewage flows. (Collins-FIRL)
W77-07886

PIPES FOR SEWERAGE AND SURFACE WATER.
Pipes and Pipelines International, Vol 22, No 1, p 39, February, 1977.

Descriptors: *Pipes, Sewage treatment, Physical properties, Sanitary engineering, Mechanical engineering, Treatment facilities, Waste water treatment, Conduits, Cities, Surface water, Industrial wastes, Mine wastes.

Piping for an English scheme to improve sewerage and surface water facilities was described. The purpose was to accommodate new development and avoid sewer and drain damage by mine wastes. The village of Riccall is very near a coal field and mine wastes must be sewered to a treatment facility which replaced the older municipal plant. The work involved a sewage pumping main and the laying of 710 meters of 200 millimeter diameter pipe and 1,985 meters of 225 millimeter diameter pipe. The pipes, constructed with Widnes joints, were laid on a granular bed with normal cover. Pipes were laid at a depth of 3 meters in the section crossing under an aqueduct. (Collins-FIRL)
W77-07887

THE CONCEPTION, DESIGN, AND CONSTRUCTION OF METROPOLITAN TORONTO MID-TORONTO SEWER,
Maclaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 8B.
W77-07888

PLASTIC SEWER PIPE MATERIALS.
American Society of Civil Engineers, New York. Committee on Water Pollution Management.
Journal of the Environmental Engineering Division, ASCE, Vol. 103, No. EE2, p 177-180, April, 1977.

Descriptors: *Plastic pipes, *Construction materials, *Sewers, Physical properties, Pipes, Plastics, Temperature, Flow, Corrosion control, Structural engineering.

Identifiers: Acrylonitrile-Butadiene-Styrene, *Fiberglass reinforced plastic, Polyvinyl chloride.

Recent information on plastic sewer pipe materials was presented. The two types of plastics are thermosetting, which is irrevocably set into shape once molded, and thermoplastic, which may be reheated, refabricated, and reshaped. The following pipe materials are most commonly used. Acrylonitrile-Butadiene-Styrene (ABS) plastic pipe is used for gravity, nonpressure sanitary, and storm and drainage installations. This is available as composite pipe (Plastic shell plus filler), and as solid plastic wall pipe. The advantages of these pipes are their light weight, long laying lengths, reduced infiltration and exfiltrations, corrosion resistance, higher flow characteristics, and lower installation costs. They are, however, susceptible to ultra-violet rays which affect shape and impact strength, and they are available only in limited sizes. Continuous lateral support is necessary for structural stability. Fiberglass reinforced plastic (FRP) pipe can be used for both gravity and pressure sanitary, and storm and drainage installations. This is a Reinforced Thermosetting Resin Pipe (RTRP); various reinforcements include glass-fibers and asbestos. The thermosetting resins used are epoxy, polyester, and phenolics. Fillers, such as sand, are used in some pipes to improve stiffness and abrasion properties, but they are available for gravity service only. The RFP pipe provides high strength at a light weight, corrosion resistance, and the ability to make field connections. Polyethylene pipe has a high density and is suitable for many applications. Its life expectancy depends upon time, temperature, pressure, and wall thickness. Polyvinyl chloride (PCV) pipes are used for both gravity sewer and pressure pipe applications. It has a light weight, long laying lengths and low fraction resistance. It requires special bedding, softens at 140+ F, and is sensitive to some solvents. Specifications were listed for all the above pipe types. (Collins-FIRL)
W77-07931

STRUCTURAL POLYMER, ADIPRENE REPLACES IRON PIPE FITTINGS ON NEW LIGHTWEIGHT AERATION ASSEMBLY.
Elastomers Notebook, No 194, p 540, February, 1977.

Descriptors: *Piping, *Plastics, *Polymers, Chemical properties, Physical properties, Aeration, Corrosion prevention, Construction materials, Equipment, Waste water treatment, Activated sludge, Rubber.
Identifiers: Polyurethane, Reinforced fiberglass.

Piping of reinforced fiberglass joined by glass-filled polyurethane fittings have been developed for use with the activated sludge aerator. Metal piping and fittings required corrosion protection and were heavy to support and manipulate. Adiprene urethane rubber by DuPont forms fittings which adhesively bond to fiberglass downpipes and diffusion headers. The smoother wall surfaces and larger internal diameter are added advantages, providing lower head loss and power costs at any given rate of air flow. Other features of this material are long-term water resistance, physical strength, chemical inertness, and abrasion resistance which allow urethane pipe fittings to complement fiberglass piping. (Collins-FIRL)
W77-07935

8I. Fisheries Engineering

PASSING FISH THROUGH HYDRAULIC TURBINES,
Army Engineer District, Walla Walla, Wash.
F. K. Cramer, and R. C. Oligher.
Transactions of The American Fisheries Society, Vol. 93(3), 1964, p. 243-250, 7 tab., 16 fig., 6 ref.

Descriptors: *Fish migrations, *Anadromous fish, *Hydroelectric plants, Dams, Dam sites, Salmon, *Fish passage, *Mortality, On-site investigations, *Turbines, Turbine blades, *Hydraulic turbines, Tailwater, Efficiencies.
Identifiers: *Kaplan turbines, *Francis turbines, *Turbine operating conditions, *Shasta Dam.

The U.S. Army Corps of Engineers has conducted extensive tests on downstream passage of fish through hydraulic turbines, utilizing both model and prototype installations. Purposes of the tests were (1) to establish design criteria for high-head Francis-type turbines that will provide optimum fish passage, and (2) to establish the best method for operating existing Kaplan- and Francis-type turbines that will provide maximum survival of fish under prevailing conditions. Tests at Allis-Chalmers' Hydraulic Laboratory, York, Pennsylvania, using 12-inch-diameter model turbines, demonstrated that mortality among fish passing through a model was of appropriate magnitude to allow comparative studies of mortality in various model installation, that mortality was greatly influenced by turbine operating conditions (efficiency) and relationship of tailwater-elevation to runner setting, and that increased clearances in the water passageways reduced mortality if turbine efficiency could be maintained. Prototype tests at Cushman No. 2 hydroelectric plant, Skokomish River, Washington, and Shasta hydroelectric plant of Sacramento River, California, verified model findings, with survival rates ranging from 45 to 77 percent at Cushman and reaching 91 percent in some instances at Shasta, depending upon turbine operating conditions and tailwater levels. (Katz)
W77-07713

DISSOLVED GAS DATA REPORT, 1975-1976,
Army Engineer District, Portland, Oreg. North Pacific Div.
For primary bibliographic entry see Field 5A.
W77-07718

MOBILE FISH CAGE AND DEPTH DISTRIBUTION STUDIES, COLUMBIA AND SNAKE RIVERS,
Seattle Marine Labs., Seattle, Wash.
For primary bibliographic entry see Field 5C.
W77-07723

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

MERCURY IN WATER, A BIBLIOGRAPHY, VOLUME 3,
Office of Water Research and Technology. Washington, D. C.
For primary bibliographic entry see Field 5A.
W77-07605

GLOSSARY OF WATER RESOURCE TERMS,
Open Lands Project, Chicago, Ill.
O. A. Titelbaum.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 156, Price codes: A03 in paper copy, A01 in microfiche. Federal Water Pollution Control Administration, Chicago, Illinois, April 1970. 39 p, 12 ref.

Descriptors: *Thesauri, Indexing, Documentation, *Water resources, Classification, *Water pollution control, Water pollution.
Identifiers: *Glossaries, *Terminology.

The rapidly developing field of water pollution control already has stimulated its own special language through origination of new terminology and popularization of other vocabulary formerly reserved for highly technical study. Understanding of this language is necessary for all those wishing to participate both in scientific inquiries and social action designed to solve the world-wide crisis of water pollution today. To help meet this need, the Federal Water Pollution Control Administration of the United States Department of the Interior, in cooperation with the Open Lands Project of Chicago, Illinois, a private conservation and environmental planning organization, has published this glossary of water pollution control terminology. (FWPCA)
W77-07613

GAS DISEASE IN FISHES - A REVIEW,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-07727

ENZYME KINETICS--A REVIEW WITH EMPHASIS ON INHIBITION OF ENZYMES,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 05B.
W77-07732

TOXICITY TO AQUATIC ORGANISM AND CHEMISTRY OF NINE SELECTED WATER-BORNE POLLUTANTS FROM MUNITIONS MANUFACTURE- A LITERATURE EVALUATION,
Army Medical Bioengineering Research and Development Lab. Fort Detrick, Md.
For primary bibliographic entry see Field 05C.
W77-07821

SUBJECT INDEX

ABANDONED WELLS (SEALING)
Eliminating Iron-Bearing Water from Well No. 7,
W77-07702 5G

ABIOTIC ENVIRONMENT
The Problem of the Behavior of Chemical Pollutants in the Environment, (In Russian),
W77-08028 5B

ABSORPTION
The Influence of Temperature and Bacterial Numbers on the Heterotrophic Uptake of C14 Glucose in West Blue Lake, Manitoba,
W77-07995 5C

ACID MINE WATER
Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

Aquatic Insect Diversity and Biomass in a Stream Marginally Polluted by Acid Strip Mine Drainage,
W77-07846 5C

ACID STREAMS
Aquatic Insect Diversity and Biomass in a Stream Marginally Polluted by Acid Strip Mine Drainage,
W77-07846 5C

ACIDIC WATER
Aquatic Insect Diversity and Biomass in a Stream Marginally Polluted by Acid Strip Mine Drainage,
W77-07846 5C

ACIDS
Waste-Water Process,
W77-08100 5D

ACTINOMYCETES
Heterotrophic Nitrification in Soils and Aquatic Environments, (In Russian),
W77-07754 5C

ACTIVATED CARBON
Studies on Adsorption with Activated Carbon,
W77-07855 5D

Control of Aerobic Biological Growth in Activated Carbon Waste Treatment,
W77-07897 5D

Process Could Save Millions of Pounds on Sewage Treatment Plants,
W77-07904 5D

Effects of Polyelectrolytes and Clay Colloids on Carbon Adsorption,
W77-07926 5D

Less-Costly Activated Carbon for Sewage Treatment.
W77-07934 5D

ACTIVATED SLUDGE
Factors Affecting Nitrification,
W77-07854 5D

Process Stability of Activity Sludge Processes,
W77-07857 5D

Experiences in Evaluating and Specifying Aeration Equipment,
W77-07899 5D

Air V. Oxygen in Dorset,
W77-07910 5D

What's Up with Oxygen,
W77-07919 5D

The Activated Sludge Process Without Preliminary Purification. Results of Pilot Experiments in the Purification Plant Karlsruhe (Das Belebungsverfahren ohne Vorreinigung. Ergebnisse der Versuche im halbtechnischen Massstab im Klaerwerk Karlsruhe),
W77-07927 5D

Process Technological Background Regarding New Protective Regulations for Water Bodies-Results of Experiments on Nitrification and Phosphorus Elimination in Zurich and Bern. II. Process Technological Background of Nitrification in Activated Sludge Plants (Verfahrenstechnische Unterlagen im Hinblick auf die neuen Gewaesserschutz-Anforderungen-Ergebnisse der Versuche ueber die Nitrifikation und Phosphorelimination in Zuerich und Bern. II. Verfahrenstechnische Grundlagen der Nitrifikation in Belebtschlammanlagen),
W77-07953 5D

Simplified Optimization of Activated Sludge Process,
W77-08036 5D

Analysis of Activated Sludge Process Performance,
W77-08096 5D

ADAPTATION
Effect of Salinity on the Fresh-Water Shrimp Dikerogammarus Haemobaphes (Eichwald) from the Mouth of the Dnepr,
W77-07848 5C

ADENOSINE TRIPHOSPHATE
Microbial ATP Studies,
W77-07978 5C

ADSORPTION
Transport of Reactive Solutes Through Multilayered Soils,
W77-07758 2G

Studies on Adsorption with Activated Carbon,
W77-07855 5D

Process Could Save Millions of Pounds on Sewage Treatment Plants,
W77-07904 5D

Hygenic Assessment of Tertiary Adsorption Treatment of Domestic Sewage and Industrial Effluents (Gigienicheskaya Otsenka Tretichnoyi Adsorbtsionnoyi Ochistki Bytovykh I Promyshlennikh Stochnykh Vod),
W77-07906 5D

Oxygen Uptake of Sediments in Castle Lake, California,
W77-07976 5C

Method for Improving the Quality of Contaminated Waste Water,
W77-08090 5D

AERATED LAGOONS
Stabilization Lagoons Including Experience in Brazil,
W77-07940 5D

AERATION
Trout and Salmon Culture (Hatchery Methods) Hatchery Water Supply,
W77-07726 5G

Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

Experiences in Evaluating and Specifying Aeration Equipment,
W77-07899 5D

State Park Gets Good Treatment, Effluents Will Be Used for Irrigation to Reduce Extensive Requirements,
W77-07936 5D

Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W77-08099 5D

AEROBACTER-AEROGENES
Degradation of Sodium Dodecylsulfate by Bacteria in Waste Waters, (In Russian),
W77-07801 5B

AEROBIC DIGESTION
Autothermal Aerobic Digestion,
W77-07898 5D

AEROBIC TREATMENT
Autothermal Aerobic Digestion,
W77-07898 5D

AERODYNAMIC METHOD
Energy Exchange at a Glacier Surface: An Alternative to Aerodynamic Methods of Measurement,
W77-08053 2C

AESTHETICS
The Valuation of Aesthetic Preferences,
W77-08041 6G

AFRICA
14C Evidence for the Origin of Arid Region Groundwater, Northeastern Province, Kenya,
W77-07611 7B

AGRICULTURAL CHEMICALS
Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges, Volume 4, (Analytical Methods for Sewage Sludge Analysis),
W77-07614 5A

AGRICULTURAL WATER
Optimization of Water Use for Irrigation,
W77-07851 3F

AGRICULTURAL WATER DEMAND
Optimization of Water Use for Irrigation,
W77-07851 3F

AIR DIFFUSERS
An Analysis of the Feasibility of Using Air Agitation to Reduce Gas Saturations in Sea Water at Pilgrim Nuclear Power Station,
W77-07720 5G

AIR-EARTH INTERFACES
The Use of Lysimeters in the Hydrological Investigation of the Unsaturated Zone,
W77-07780 2D

AIR ENVIRONMENT
Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

AIR POLLUTION
Adjustment Costs and Optimal Waste Treatment,
W77-08045 5G

AIR POLLUTION EFFECTS
Effect of Air Pollution on Pinus Strobus L. and Genetic Resistance - A Literature Review,
W77-07829 5C

AIR-WATER INTERFACES
Hydrologic Optics. Volume VI. Surfaces,
W77-07961 1A

ALGAE
Degradation of Petroleum by an Alga, Prototheca Zopfii,
W77-07737 5C

Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

ALGORITHMS
Operating Policy Simulation or a Reservoir Systems, (Phase II),
W77-07604 4A

Stochastic Difference Equation Modelling of Hydrological Processes,
W77-07663 2E

Mathematical Programming within the Context of a Generalized Data Base Management System,
W77-07850 6A

ALKALINITY
Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

ALLEGHENY RIVER
Flood Plain Information: Allegheny River, Warren County, Pennsylvania,
W77-07640 4A

Flood Plain Information: Allegheny River, Venango County, Pennsylvania,
W77-07641 4A

ALLOCHTHONOUS MATTER
The Contribution of Autochthonous and Allochthonous Matter to the Trophy of a River in the Barbel Region,
W77-07986 5C

ALTERNATIVE PLANNING
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

Implementation of Non-Structural Alternatives in Flood Damage Abatement,
W77-07795 6F

AMAZON RIVER
Tidal and Current Prediction for the Amazon's North Channel Using a Hydrodynamical-Numerical Model,
W77-07743 2L

AMELIORATION TECHNIQUES
Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

AMINES
Experimental Data for the Hygienic Standardization of Diphenylamine and Diphenyldiethylurea in Water Bodies, (In Russian),
W77-07700 5G

AMMONIA
Effects of Chlorine and Chloramine on Uptake of Inorganic Nitrogen by Phytoplankton,
W77-07843 5C

Coal Distn. Waste Liquor Purificn. to Remove Phenols, Ammonia- and Hydrogen Sulphide by 2-Stage Solvent Extn. and Distn.,
W77-07892 5D

Waste-Water Process,
W77-08100 5D

AMMONIUM COMPOUNDS
Biological Regeneration of Ammonium-Saturated Clinoptilolite. I. Initial Observations,
W77-07942 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

AMOEBAE
Study of Free Living Amoebae in the Waters of Strabourg: Preliminary Report, (In French),
W77-08016 5A

AMPHIBIANS
Effects of Pollutants on Eggs, Embryos and Larvae of Amphibian Species,
W77-07820 5C

ANACOSTIA RIVER
Land Use Classification for Hydrologic Models using Interactive Machine Classification of Landsat Data,
W77-08074 7B

ANADROMOUS FISH
Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

Passing Fish Through Hydraulic Turbines,
W77-07713 8I

ANAEROBIC CONDITIONS
Bacterial Populations and End Products During Anaerobic SLudge Fermentation of Glucose,
W77-07944 5D

ANAEROBIC DIGESTION
Survey of Anaerobic Digestion Supernatant Treatment Alternatives,
W77-07903 5D

ANALYTICAL TECHNIQUES
Objective Analysis of Snow Cover Fields,
W77-07678 2C

Extraction and Separation of Polychlorinated Biphenyls from Pesticide Monitoring Samples,
W77-07826 5A

Effects of Polyelectrolytes and Clay Colloids on Carbon Adsorption,
W77-07926 5D

The Activated Sludge Process Without Preliminary Purification. Results of Pilot Experiments in the Purification Plant Karlsruhe (Das Belebungsverfahren ohne Vorreinigung. Ergebnisse der Versuche im halbtechnischen Massstab im Klaerwerk Karlsruhe),
W77-07927 5D

Easier Identification with MPN Procedure,
W77-07928 5A

Microbial ATP Studies,
W77-07978 5C

Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

Electron Transport Analysis as an Indicator of Biological Oxidation in Freshwater Sediments,
W77-07992 5C

Planktonic Microbial Heterotrophy: Its Significance to Community Biomass Production,
W77-07993 5C

Optimal Operation of Water Resources Systems--1,
W77-08047 4A

Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

ANIMAL PATHOLOGY
Preliminary Studies of Menhaden and Their Mass Mortalities in Long Island and New Jersey Waters,
W77-07724 5C

Ultrastructural Study of Lesions in Gills of a Marine Shrimp Exposed to Cadmium,
W77-07845 5C

ANNUAL MORTALITY
Preliminary Studies of Menhaden and Their Mass Mortalities in Long Island and New Jersey Waters,
W77-07724 5C

ANTARCTIC
Electrical Resistivity Measurements on the Ross Ice Shelf,
W77-08051 2C

Energy Exchange at a Glacier Surface: An Alternative to Aerodynamic Methods of Measurement,
W77-08053 2C

A Snow-Bank Push Mechanism for the Formation of Some 'Annual' Moraine Ridges,
W77-08054 2C

ANTIBODY PRODUCTION
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

AQUARIA
Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

AQUATIC ALGAE
Reductions in Biomass and Diversity Resulting from Exposure to Mercury in Artificial Streams,
W77-07838 5C

The Availability of Chlorophyllide in Hydrophytes and Algas of Lake Trasimeno and the Variability of Pigment Content in Spirogyra, (In Italian),
W77-08044 5C

AQUATIC DRIFT
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

AQUATIC FUNGI
Heterotrophic Nitrification in Soils and Aquatic Environments, (In Russian),
W77-07754 5C

AQUATIC INSECTS
Aquatic Insect Diversity and Biomass in a Stream Marginally Polluted by Acid Strip Mine Drainage,
W77-07846 5C

AQUATIC MACROPHYTES
Hydrophyte Biomass and Community Structure in a Small Oligotrophic New Hampshire Lake,
W77-07969 5C

AQUATIC PLANTS
Hydrophyte Biomass and Community Structure in a Small Oligotrophic New Hampshire Lake,
W77-07969 5C

AQUATIC PRODUCTIVITY
Reductions in Biomass and Diversity Resulting from Exposure to Mercury in Artificial Streams,
W77-07838 5C

AQUATIC WEED CONTROL
Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

Making Aquatic Weeds Useful: Some Perspectives for Developing Countries.
W77-07964 4A

AQUICULTURE
Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

Trout and Salmon Culture (Hatchery Methods) Hatchery Water Supply,
W77-07726 5G

AQUIFERS
Use of Cross-Correlation Techniques for Determining the Relationship Between Groundwater Levels and Sources in the Nile Delta Area,
W77-07679 2F

Determination of Salt-Water Interface by Electric Resistivity Depth Soundings,
W77-07783 2F

ARABLE LAND
An Integrated Model-Approach to the Effect of Water Management on Crop Yield,
W77-08038 3F

ARCTIC
Ice Movements in the Beaufort Sea 1973-1975: Determination by ERTS Imagery,
W77-07769 2C

AREA-WIDE WATER QUALITY PLANNING
A Decision Support System for Area-Wide Quality Planning,
W77-07810 6A

ARGENTINIAN PAMPA
Hydrogeological Investigations in the Pampa of Argentina,
W77-08064 7B

ARGO MERCHANT OIL SPILL
The ARGO MERCHANT Oil Spill. A Preliminary Scientific Report,
W77-07807 5C

ARM RIVER (CANADA)
A Valley Crossing in Pleistocene Deposits,
W77-07778 8E

AROCLORS
Extraction and Separation of Polychlorinated Biphenyls from Pesticide Monitoring Samples,
W77-07826 5A

ARTESIAN WELLS
Some Experiments on the Gas-Disease in Freshwater Fishes, (In Japanese),
W77-07714 5C

ARTIFICIAL PROPAGATION
Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

ARTIFICIAL STREAMS
Reductions in Biomass and Diversity Resulting from Exposure to Mercury in Artificial Streams,
W77-07838 5C

ASSESSMENT
Environmental Assessment: The Ecological Dimension,
W77-08034 6G

Modeling Multiple-Use in Natural Areas: Part II - The Santee Swamp Study,
W77-08050 6A

ATLANTIC OCEAN
Tar Ball Distribution in the Western North Atlantic,
W77-07757 5B

Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

ATMOSPHERIC GAS
An Analysis of the Feasibility of Using Air Agitation to Reduce Gas Saturations in Sea Water at Pilgrim Nuclear Power Station,
W77-07720 5G

ATOMIC ADSORPTION STUDIES
Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges, Volume 4, (Analytical Methods for Sewage Sludge Analysis),
W77-07614 5A

ATTITUDES
Local Control of Land Use: Profile of a Problem,
W77-08003 6F

AUSTRALIA
Mangrove Ecology and Deltaic-Estuarine Geomorphology: Cambridge Gulf-Ord River, Western Australia,
W77-07738 2L

Aspects of Bankfull Geometry in a Distributary System of Eastern Australia,
W77-07782 2E

Rum Jungle Environmental Studies, Summary Report,
W77-07822 5B

Reduction in Sewage Contamination in Sydney Rock Oysters,
W77-07946 5G

AUTOCHTHONOUS MATTER
The Contribution of Autochthonous and Allochthonous Matter to the Trophy of a River in the Barbel Region,
W77-07986 5C

AUTOMATIC CONTROL
Waste Water Plants Use Less Instrumentation than Related Industries,
W77-07872 5D

AUTOMATIC CONTROLS
Save Sludge Handling Costs by Level Control,
W77-07868 5D

AUTOMOTIVE EMISSIONS
Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

AUTOMOTIVE WASTES
Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

AUTORADIOGRAPHY
Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

AVAILABLE WATER-HOLDING CAPACITY (AWHC)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

AVAILABLE WATERHOLDING CAPACITY (AWHC)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

AVALANCHES
Statistical Forecasting of Snow Avalanches, San Juan Mountains, Southern Colorado, U.S.A.,
W77-08055 2C

AVERAGE FLOW
Stochastic Structure of a Process of Average Monthly Flows,
W77-07651 2E

BACTERIA
Mutagenic Potential of Petroleum Byproducts in Chesapeake Bay Waters,
W77-07606 5B

Effect of South Louisiana Crude Oil and No. 2 Fuel Oil on Growth of Heterotrophic Microorganisms, Including Proteolytic, Lipolytic, Chitinolytic and Celluloytic Bacteria,
W77-07736 5C

Utilization of Mixed Hydrocarbon Substrate by Petroleum-Degrading Microorganisms,
W77-07749 5C

Heterotrophic Nitrification in Soils and Aquatic Environments, (In Russian),
W77-07754 5C

Degradation of Sodium Dodecylsulfate by Bacteria in Waste Waters, (In Russian),
W77-07801 5B

Studies of the Benthic Environment of Twin Lakes.
W77-07806 5C

Factors Affecting Nitrification,
W77-07854 5D

Concentration of Bacteria in Water Using the Ultrafiltration Method, (In French),
W77-07860 5D

The Effect of Time Delay and Growth Rate Inhibition in the Bacterial Treatment of Waste Water,
W77-07924 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. I. Initial Observations,
W77-07942 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

Bacterial Populations and End Products During Anaerobic SLudge Fermentation of Glucose,
W77-07944 5D

Planktonic Primary and Bacterial Productivity in Shallow Waters Within a Large Phragmites Community (Neusiedlersee, Austria),
W77-07977 5C

Microbial ATP Studies,
W77-07978 5C

Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

Bacterial Decomposition of Different Polysaccharides in a Eutrophic Lake,
W77-07991 5C

Optimal Growth Temperatures and Media Parameters of Bacterial Communities from Lakes of Different Trophic States,
W77-07994 5C

The Influence of Temperature and Bacterial Numbers on the Heterotrophic Uptake of C14 Glucose in West Blue Lake, Manitoba,
W77-07995 5C

Extracellular Release in Planktonic Bacteria,
W77-07996 5C

BACTERIAL CLEARANCE
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

BAJA CALIFORNIA
Flooding Frequence of Hypersaline Coastal Environments Determined by Orbital Imagery: Geologic Implications,
W77-07751 2L

BAJOS
Hydrogeological Investigations in the Pampa of Argentina,
W77-08064 7B

BALTIC SEA
A Theoretical Framework for the Description of Estuaries,
W77-08057 2L

BAMBOO CONSTRUCTION
Manuel Technique Du Village, (Village Technology Handbook), (Vols. 1 and 2).
W77-07628 3F

BANKS LAKE
Dissolved Gas Supersaturation, Grand Coulee Dam Project, 1973,
W77-07722 5B

BARBADOS (WEST INDIES)
Observations of Wave Height and Wave Celerity in the Surf Zone,
W77-07770 2L

BASELINE STUDIES
Biological Long-Term Investigations of Swedish Lakes,
W77-07998 5C

BASINS
Representative and Experimental Basins - Where Next,
W77-07781 2A

A Theoretical Framework for the Description of Estuaries,
W77-08057 2L

BASS
Notes on the Exposure of Several Species of Fish to Sudden Changes in the Hydrogen Ion Concentration of the Water and to an Atmosphere of Pure Oxygen,
W77-07725 5C

BATHYTHERMOGRAPHS
Low Frequency Turbulence and Vertical Temperature Microstructure in Lake Tahoe, California-Nevada,
W77-07984 2H

BATON ROUGE (LOUISIANA)
Saltwater-Freshwater Interfaces in the '2,000-' and '2,800-Foot' Sands in the Capital Area Ground Water Conservation District,
W77-07703 4B

BAY OF QUINTE (LAKE ONTARIO)
Phosphorus Regeneration by Natural Populations of Limnetic Zooplankton,
W77-07972 5C

BAY OF QUINTE (ONTARIO)
Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

Sedimentation: Measurements in Experimental Enclosures,
W77-07990 5C

BAYS
The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

BEACHES
Observations of Wave Height and Wave Celerity in the Surf Zone,
W77-07770 2L

Mechanism for Tapping the Surf Energy,
W77-08026 8C

BEAUFORT SEA
Ice Movements in the Beaufort Sea 1973-1975: Determination by ERTS Imagery,
W77-07769 2C

BEDFORD BASIN (CANADA)
Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

BEDFORD BAY BASIN (NOVA SCOTIA)
Stability in Structure and Function of the Mud-Water Interface,
W77-07985 5C

BELT FILTERS
Sludge Dewatering by Belt Filter.
W77-07905 5D

BENTHIC FAUNA
Studies of the Benthic Environment of Twin Lakes.
W77-07806 5C

Population Ecology and Production of Benthic Detritivores,
W77-07979 5C

BENTHOS
The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

Biological Assessment of the Water Quality of the Small Rivers Sora and Byurya (Yenisei Basin), (In Russian),
W77-07755 5C

Oxygen Uptake of Sediments in Castle Lake, California,
W77-07976 5C

The Invertebrates on Submerged Macrophytes in Three Masurian Lakes,
W77-07987 5C

On the Relation of the Diatiom FLora and Water Quality in the Uji River Kyoto, (In Japanese),
W77-08089 5

BENZENE
Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

BIBLIOGRAPHIES
Mercury in Water, a Bibliography, Volume 3,
W77-07605 5A

Gas Disease in Fishes - A Review,
W77-07727 5C

Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

BIDDING GAME
The Valuation of Aesthetic Preferences,
W77-08041 6G

BIGHORN MOUNTAINS
The Use of Skylab and LANDSAT in a Geohydrological Study of the Paleozoic Section, West-Central Bighorn Mountains, Wyoming,
W77-08063 7B

BIOASSAY
Mobile Fish Cage and Depth Distribution Studies, Columbia and Snake Rivers,
W77-07723 5C

Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

Protective Effect of Chloride on Nitrite Toxicity to Coho Salmon (Oncorhynchus Kisutch),
W77-07840 5C

Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

Egg Hatchability and Tolerance of Brook Trout (Salvelinus fontinalis) Fry at Low pH,
W77-07844 5C

Nutrient Limitation in a Small Oligotrophic Lake in New Hampshire,
W77-07974 5C

BIOASSAYS
Notes on the Exposure of Several Species of Fish to Sudden Changes in the Hydrogen Ion Concentration of the Water and to an Atmosphere of Pure Oxygen,
W77-07725 5C

BIOCHEMICAL OXYGEN DEMAND
Relationship Between BOD5 and Fats, Oils and Grease,
W77-07925 5G

Use of State Estimation Techniques in Water Resource System Modeling, by Dennis P. Lettenmaier and Stephen J. Burges,
W77-08035 5B

BIOCHEMISTRY
Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

BIOCONTROL
Making Aquatic Weeds Useful: Some Perspectives for Developing Countries.
W77-07964 4A

BIODEGRADATION
Mutagenic Potential of Petroleum Byproducts in Chesapeake Bay Waters,
W77-07606 5B

Utilization of Mixed Hydrocarbon Substrate by Petroleum-Degrading Microorganisms,
W77-07749 5C

Degradation of Sodium Dodecylsulfate by Bacteria in Waste Waters, (In Russian),
W77-07801 5B

Bacterial Decomposition of Different Polysaccharides in a Eutrophic Lake,
W77-07991 5C

Electron Transport Analysis as an Indicator of Biological Oxidation in Freshwater Sediments,
W77-07992 5C

Studies on the Role of Detritus in Fresh Water Lakes,
W77-08001 5C

BIODEGRADTION
Degradation of Petroleum by an Alga, Prototheca Zopfii,
W77-07737 5C

BIOGENIC MEROMIXIS
Physical, Chemical, and Biological Factors in the Initiation and Destruction of Biogenic Meromixis in a Soft-Water Lake,
W77-07963 5C

BIOGEOCHEMICAL ENVIRONMENT
Mercury in the Biogeochemical Environment,
W77-07823 5B

BIOINDICATORS
Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

Easier Identification with MPN Procedure,
W77-07928 5A

Electron Transport Analysis as an Indicator of Biological Oxidation in Freshwater Sediments,
W77-07992 5C

BIOLOGICAL COMMUNITIES
Inventory of Benthic Organisms and Plankton at Mokapu, Oahu,
W77-07798 2L

Aquatic Insect Diversity and Biomass in a Stream Marginally Polluted by Acid Strip Mine Drainage,
W77-07846 5C

Biological Long-Term Investigations of Swedish Lakes,
W77-07998 5C

BIOLOGICAL FILTERS
Trials on the Operation of Biological Filters,
W77-07954 5D

BIOLOGICAL OXYGEN DEMAND
Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

BIOLOGICAL TREATMENT
Biological Phosphate Elimination of Preliminarily Cleaned Communal Waste Water by Use of Iron Bacteria (Biologische Entphosphatung vorgereinigten kommunalen Abwassers unter Mitwirkung von Eisenbakterian),
W77-07856 5D

Composting--An Approach to Using Sewage Waste,
W77-07876 5E

Biochemical and Physical-Chemical Treatment of Weak Municipal Waste Water,
W77-07916 5D

The Effect of Time Delay and Growth Rate Inhibition in the Bacterial Treatment of Waste Water,
W77-07924 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. I. Initial Observations,
W77-07942 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

Trials on the Operation of Biological Filters,
W77-07954 5D

BIOMASS
The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

Aquatic Insect Diversity and Biomass in a Stream Marginally Polluted by Acid Strip Mine Drainage,
W77-07846 5C

Hydrophyte Biomass and Community Structure in a Small Oligotrophic New Hampshire Lake,
W77-07969 5C

Nutrient Limitation in a Small Oligotrophic Lake in New Hampshire,
W77-07974 5C

Microbial ATP Studies,
W77-07978 5C

BIOTIC ENVIRONMENT
The Problem of the Behavior of Chemical Pollutants in the Environment, (In Russian),
W77-08028 5B

BIOTIC PHOSPHORUS EXCRETION
Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

BLACK SEA
The Problem of the Sanitary Protection of the Waters of Ports and Coastal Zones of the Black Sea Basin, (In Russian),
W77-08014 5G

BLACK WALNUT SHELLS
Method of Filtering Oil from Liquids,
W77-08011 5G

BLOOD LEAD CONCENTRATION
Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

BONNEVILLE DAM
Dissolved Gas Data Report, 1975-1976,
W77-07718 5A

BOTTOM SEDIMENTS
The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

Electron Transport Analysis as an Indicator of Biological Oxidation in Freshwater Sediments,
W77-07992 5C

Studies on the Role of Detritus in Fresh Water Lakes,
W77-08001 5C

BRAZIL
Stabilization Lagoons Including Experience in Brazil,
W77-07940 5D

BREAKWATERS
Floating Breakwater,
W77-08009 8A

BRIDGES
Movement Joint for Concrete Sewer Bridge.
W77-07885 8F

BRITISH CATCHMENTS
The Generation of Synthetic Monthly Runoff Records for Ungauged British Catchments,
W77-07661 2A

BROOK TROUT
Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

Egg Hatchability and Tolerance of Brook Trout (Salvelinus fontinalis) Fry at Low pH,
W77-07844 5C

BUBBLE FORMATION
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

BUBBLER DE-AERATION SYSTEMS
An Analysis of the Feasibility of Using Air Agitation to Reduce Gas Saturations in Sea Water at Pilgrim Nuclear Power Station,
W77-07720 5G

BUBBLES
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

BULRUSHES
Planktonic Primary and Bacterial Productivity in Shallow Waters Within a Large Phragmites Community (Neusiedlersee, Austria),
W77-07977 5C

BUOYS
Petroleum Oil Detection Buoy System,
W77-07750 5A

BYPRODUCTS
Disposal of Feedlot Wastes Using a Two-Stage Process with Net Energy Production,
W77-07816 5D

CADMIUM
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium.
W77-07830 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, To Cadmium. I. Introduction and Experimental Design,
W77-07831 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

Physiological Response of the Cunner, Tautogolabrus Adspersus, to Cadmium. VI. Histopathology,
W77-07836 5C

Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

Ultrastructural Study of Lesions in Gills of a Marine Shrimp Exposed to Cadmium,
W77-07845 5C

CADMIUM CHLORIDE
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

Physiological Response of the Cunner, Tautogolabrus Adspersus, to Cadmium. VI. Histopathology,
W77-07836 5C

Ultrastructural Study of Lesions in Gills of a Marine Shrimp Exposed to Cadmium,
W77-07845 5C

CADMIUM CLEARANCE
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

CALIBRATIONS
Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

CALIFORNIA
Flood Plain Information: Northwest Stream Group, Stockton, California,
W77-07642 4A

Oxygen Uptake of Sediments in Castle Lake, California,
W77-07976 5C

Urban Land Use: Remote Sensing of Groundbasin Permeability,
W77-08065 7B

Microwave Remote Sensing of Soil Moisture,
W77-08066 7B

Remote Sensing Applications in Water Resources Management by the California Department of Water Resources,
W77-08078 7B

Remote Sensing Inputs to Water Demand Modeling,
W77-08080 7B

CAMBRIDGE GULF-ORD RIVER (WA)
Mangrove Ecology and Deltaic-Estuarine Geomorphology: Cambridge Gulf-Ord River, Western Australia,
W77-07738 2L

CANADA
Oil Spill at Deception Bay, Hudson Strait,
W77-07731 5G

A Valley Crossing in Pleistocene Deposits,
W77-07778 8E

Nitrates in Some Soil-Water Systems in Quebec, (In French),
W77-07858 5B

Composting--An Approach to Using Sewage Waste,
W77-07876 5E

Phytoplankton Production in Lake Memphremagog, Quebec (Canada)--Vermont (U.S.A.),
W77-07962 5C

Phosphorus Regeneration by Natural Populations of Limnetic Zooplankton,
W77-07972 5C

The Application of ERTS-1 Digital Data to Water Transport Phenomena in the Point Pelee-Rondeau Area,
W77-07981 2J

Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

Sedimentation: Measurements in Experimental Enclosures,
W77-07990 5C

The Influence of Temperature and Bacterial Numbers on the Heterotrophic Uptake of C14 Glucose in West Blue Lake, Manitoba,
W77-07995 5C

Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

CAPITAL COSTS

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

CARBOHYDRATES

Bacterial Populations and End Products During Anaerobic SLudge Fermentation of Glucose,
W77-07944 5D

Bacterial Decomposition of Different Polysaccharides in a Eutrophic Lake,
W77-07991 5C

CARBON

Less-Costly Activated Carbon for Sewage Treatment.
W77-07934 5D

Whole-Lake Eutrophication Experiments with Phosphorus, Nitrogen and Carbon.
W77-07965 5C

The Influence of Temperature and Bacterial Numbers on the Heterotrophic Uptake of C14 Glucose in West Blue Lake, Manitoba,
W77-07995 5C

Extracellular Release in Planktonic Bacteria,
W77-07996 5C

Studies on the Role of Detritus in Fresh Water Lakes,
W77-08001 5C

CARBON-14

14C Evidence for the Origin of Arid Region Groundwater, Northeastern Province, Kenya,
W77-07611 7B

CARBON BUDGET

A Carbon Budget for Lake Ontario,
W77-07967 5C

CARBON CYCLE

A Carbon Budget for Lake Ontario,
W77-07967 5C

CARBON DIOXIDE

Metamorphic Reactions in Flysch Rocks,
W77-07609 2K

Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

Summary of Gas Supersaturation Research at Western Fish Toxicology Station (EPA), Corvallis, Oregon, 1972-1974.
W77-07729 5C

Method of Filtering Liquids Containing Dissolved Carbon Dioxide,
W77-08013 5D

CARBON RADIOISOTOPES

14C Evidence for the Origin of Arid Region Groundwater, Northeastern Province, Kenya,
W77-07611 7B

CARBONACEOUS OXYGEN DEMAND

A Study on the Strength of Sewage,
W77-07853 5B

CARIBBEAN

Water Resources and Water-Supply Development in Trinidad and Tobago,
W77-07785 6D

CASCADE MOUNTAINS (WASH)

Present and Past Glaciation Threshold in the Cascade Range, Washington, U.S.A.: Topographic and Climatic Controls, and Paleoclimatic Implications,
W77-08056 2C

CASTLE LAKE (CALIF)

Oxygen Uptake of Sediments in Castle Lake, California,
W77-07976 5C

CATALYSTS

Enzyme Kinetics--A Review with Emphasis on Inhibition of Enzymes,
W77-07732 5B

CATFISH

Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

CATIONIC POLYMERS

Composition and Method for Flocculating Suspended Solids,
W77-08031 5D

CEMENT GROUTING

Cementing Oil and Gas Wells, Including Casing Handling Procedures: Part 1,
W77-07697 8F

Slurry and Pumping Guidelines Smooth Casing-Cementing Jobs,
W77-07699 8F

CHANNEL IMPROVEMENT

Flood Plain Information; San Antonio River, Bexar County, Texas.
W77-07635 4A

Channelization: Environmental, Geomorphic, and Engineering Aspects,
W77-07809 8B

CHANNEL MORPHOLOGY

Aspects of Bankfull Geometry in a Distributary System of Eastern Australia,
W77-07782 2E

Channelization: Environmental, Geomorphic, and Engineering Aspects,
W77-07809 8B

CHANNEL RESTORATION

Channelization: Environmental, Geomorphic, and Engineering Aspects,
W77-07809 8B

CHANNELIZATION

Channelization: Environmental, Geomorphic, and Engineering Aspects,
W77-07809 8B

CHEMICAL ANALYSIS

Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

CHEMICAL REACTIONS

Metamorphic Reactions in Flysch Rocks,
W77-07609 2K

CHEMICAL STRATIFICATION

Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

CHEMICAL TREATMENT

Phosphorus is Removed at Low Cost,
W77-07915 5D

Biochemical and Physical-Chemical Treatment of Weak Municipal Waste Water,
W77-07916 5D

Controlling Sludge Bulking.
W77-07921 5D

Physico-Chemical Treatment of Sewage and the Coleshill Project,
W77-07922 5D

CHEMICAL WASTES

Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

The Problem of the Behavior of Chemical Pollutants in the Environment, (In Russian),
W77-08028 5B

Hygienic Criteria of the Complex Action of Chemical Environmental Pollutants, (In Russian),
W77-08029 5G

CHERRY CREEK (CO)

Flood Plain Information, Cherry Creek-Cherry Creek Lake Through Franktown, Colorado.
W77-07639 4A

CHESAPEAKE BAY

Mutagenic Potential of Petroleum Byproducts in Chesapeake Bay Waters,
W77-07606 5B

Effect of South Louisiana Crude Oil and No. 2 Fuel Oil on Growth of Heterotrophic Microorganisms, Including Proteolytic, Lipolytic, Chitinolytic and Celluloytic Bacteria,
W77-07736 5C

CHESAPEAKE BAY

Utilization of Mixed Hydrocarbon Substrate by Petroleum-Degrading Microorganisms,
W77-07749 5C

Citizen Attitudes Toward Management of the Chesapeake Bay,
W77-07796 6B

CHICKASHA (OKLA)
Remote Sensing Techniques for Prediction of Watershed Runoff,
W77-08075 7B

CHIEF JOSEPH DAM
Dissolved Gas Supersaturation, Grand Coulee Dam Project, 1973,
W77-07722 5B

CHINOOK SALMON
Effects of Gas Supersaturated Columbia River Water on the Survival of Juvenile Chinook and Coho Salmon,
W77-07708 5C

Summary of Gas Supersaturation Research at Western Fish Toxicology Station (EPA), Corvallis, Oregon, 1972-1974.
W77-07729 5C

CHLORAMINE
Effects of Chlorine and Chloramine on Uptake of Inorganic Nitrogen by Phytoplankton,
W77-07843 5C

CHLORINATED HYDROCARBON PESTICIDES
Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

Extraction and Separation of Polychlorinated Biphenyls from Pesticide Monitoring Samples,
W77-07826 5A

Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

CHLORINATED ORGANIC COMPOUNDS
Process for Eliminating Reactive Chlorinated Organic Compounds from Aqueous Solutions,
W77-08021 5D

CHLORINATION
Kinetics of Breakpoint Chlorination and Disinfection,
W77-08095 5D

CHLORINE
Effect of Major Ion Variations in the Marine Environment on the Specific Gravity--Conductivity--Chlorinity--Salinity Relationship,
W77-07802 2K

Effects of Chlorine and Chloramine on Uptake of Inorganic Nitrogen by Phytoplankton,
W77-07843 5C

CHLOROPHOS
Experimental Study of the Action of Pesticides on the Microflora of Bodies of Water, (In Russian),
W77-07982 5B

CHLOROPHYL
The Availability of Chlorophyllide in Hydrophytes and Algas of Lake Trasimeno and the Variability of Pigment Content in Spirogyra, (In Italian),
W77-08044 5C

CHLOROPHYLLIDE
The Availability of Chlorophyllide in Hydrophytes and Algas of Lake Trasimeno and the Variability of Pigment Content in Spirogyra, (In Italian),
W77-08044 5C

CHOPTANK RIVER (MD)
Utilization of LANDSAT Data for Water Quality Surveys in the Choptank River,
W77-08072 5A

CHROMATOGRAPHY
Determination of Morestan in Water, Soil, and Cucumbers by Thin-Layer Chromatography, (In Russian),
W77-07688 5A

CITIES
Survey Predicts 33 Percent Municipal Compliance with 1977 Deadline,
W77-07877 5G

CITIZEN PARTICIPATION
Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

CITROBACTER-FREUNDII
Degradation of Sodium Dodecylsulfate by Bacteria in Waste Waters, (In Russian),
W77-07801 5B

CITY PLANNING
Municipal Information Systems: Evaluation of Policy Related Research. Volume 2. Computer Utilization in Local Government,
W77-07631 6B

CLASSIFICATION
Hydrologic Land Use Classification of the Patuxent River Watershed Using Remotely Sensed Data,
W77-08073 7B

CLAYS
Effects of Polyelectrolytes and Clay Colloids on Carbon Adsorption,
W77-07926 5D

CLINOPTILOLITE REGENERATION
Biological Regeneration of Ammonium-Saturated Clinoptilolite. I. Initial Observations,
W77-07942 5D

CLORINITY
Effect of Major Ion Variations in the Marine Environment on the Specific Gravity--Conductivity--Chlorinity--Salinity Relationship,
W77-07802 2K

COAL
Less-Costly Activated Carbon for Sewage Treatment.
W77-07934 5D

COAL MINE WASTES
Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

COAL MINES
Limnologic-Geologic Excursion in the Territory of the Lower Erft River, (In German),
W77-07799 5B

COASTAL ENVIRONMENTS
Flooding Frequence of Hypersaline Coastal Environments Determined by Orbital Imagery: Geologic Implications,
W77-07751 2L

COASTAL TRAPPED WAVES
Observational and Numerical Evidence for Wind-Forced Coastal Trapped Long Waves,
W77-07771 2L

COASTAL ZONE MANAGEMENT
Waste Management for the Coastal Zone: Concepts for the Assessment of Ocean Outfalls,
W77-07747 5E

COASTS
Sediment Measurement in Estuarine and Coastal Areas,
W77-07748 2L

Flooding Frequence of Hypersaline Coastal Environments Determined by Orbital Imagery: Geologic Implications,
W77-07751 2L

Observational and Numerical Evidence for Wind-Forced Coastal Trapped Long Waves,
W77-07771 2L

The Lateral Movement of the Coastal Water and Its Relation to Vertical Diffusion,
W77-08058 2L

COD
Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

CODASYL APPROACH
Extensions and Corrections for the CODASYL Approach to Data Base Management,
W77-07811 6A

COHO SALMON
Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

Protective Effect of Chloride on Nitrite Toxicity to Coho Salmon (Oncorhynchus Kisutch),
W77-07840 5C

COLOR REMOVAL
Review of Colour Removal Technology in the Pulp and Paper Industry,
W77-07734 5D

COLORADO
Flood Plain Information, Cherry Creek-Cherry Creek Lake Through Franktown, Colorado.
W77-07639 4A

Studies of the Benthic Environment of Twin Lakes.
W77-07806 5C

Statistical Forecasting of Snow Avalanches, San Juan Mountains, Southern Colorado, U.S.A.,
W77-08055 2C

COLORADO RIVER (TEX)
Flood Hazard Studies in Central Texas Using Orbital and Suborbital Remote Sensing Imagery,
W77-08069 7B

COLUMBIA RIVER
Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

Effects of Gas Supersaturated Columbia River Water on the Survival of Juvenile Chinook and Coho Salmon,
W77-07708 5C

Dissolved Gas Data Report, 1975-1976,
W77-07718 5A

Dissolved Gas Supersaturation, Grand Coulee Dam Project, 1973,
W77-07722 5B

Mobile Fish Cage and Depth Distribution Studies, Columbia and Snake Rivers,
W77-07723 5C

COLUMBIA RIVER BASIN
Dissolved Gas Data Report, 1975-1976,
W77-07718 5A

COLUMBIA-SNAKE CONFLUENCE
Mobile Fish Cage and Depth Distribution Studies, Columbia and Snake Rivers,
W77-07723 5C

COMBINED SEWERS
Improvement and Expansion of the Drainage System of Hamburg,
W77-07890 5D

COMMERCIAL FISH
Preliminary Studies of Menhaden and Their Mass Mortalities in Long Island and New Jersey Waters,
W77-07724 5C

COMMUNITY DEVELOPMENT
Joint Municipal Corporation Waste Water Treatment,
W77-07920 5D

COMPOSITE RO MEMBRANES
Preparation of Composite Reverse Osmosis Membranes by Plasma Polymerization,
W77-07792 3A

COMPOSTING
Composting--An Approach to Using Sewage Waste,
W77-07876 5E

COMPREHENSIVE PLANNING
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

COMPUTER MODELS
Penn State Urban Runoff Model--User's Manual,
W77-07797 4D

Mathematical Programming within the Context of a Generalized Data Base Management System,
W77-07850 6A

Optimization of Water Use for Irrigation,
W77-07851 3F

An Integrated Model-Approach to the Effect of Water Management on Crop Yield,
W77-08038 3F

COMPUTER PROGRAMS
Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

CONCRETE
Movement Joint for Concrete Sewer Bridge.
W77-07885 8F

Prefabricated Panels for Sub-Surface Sewage Effluent and Waste Water Disposal,
W77-08091 5E

CONCRETE CONSTRUCTION
Telescoping Form System Speeds Sewer Concreting.
W77-07879 8F

CONCRETE-POLYMER MATERIALS
Concrete-Polymer Materials--Final Report (USBR-BNL-AEC-OSW Cooperative Program),
W77-07803 8F

CONCRETE TECHNOLOGY
Concrete-Polymer Materials--Final Report (USBR-BNL-AEC-OSW Cooperative Program),
W77-07803 8F

Telescoping Form System Speeds Sewer Concreting.
W77-07879 8F

CONCRETES
Concrete-Polymer Materials--Final Report (USBR-BNL-AEC-OSW Cooperative Program),
W77-07803 8F

CONDENSERS
The Use of Sewage Effluent as Power Station Cooling Water,
W77-07949 5G

CONDUCTIVITY
Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

Comparisons of Two Models for Predicting the Relative Hydraulic Conductivity of Salt-Affected Swelling Soils,
W77-07777 2G

Effect of Major Ion Variations in the Marine Environment on the Specific Gravity--Conductivity--Chlorinity--Salinity Relationship,
W77-07802 2K

CONDUCTIVITY-SALINITY CALIBRATIONS
Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

CONFERENCES
Implementation of Non-Structural Alternatives in Flood Damage Abatement,
W77-07795 6F

Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D,
W77-08062 7B

CONIFEROUS FORESTS
Effect of Air Pollution on Pinus Strobus L. and Genetic Resistance - A Literature Review,
W77-07829 5C

CONIFERS
Effect of Air Pollution on Pinus Strobus L. and Genetic Resistance - A Literature Review,
W77-07829 5C

CONJUNCTIVE USE
Hierarchical Modeling for the Planning and Management of a Total Regional Water Resource System: Joint Consideration of the Supply and Quality of Ground and Surface Water Resources,
W77-07793 4B

CONNECTICUT
Floodflow Formulas for Urbanized and Nonurbanized Areas of Connecticut,
W77-07612 4C

CONNECTICUT RIVER
An Analysis of Alternative Flood Management Plans in Upstream Watersheds. Connecticut River Basin Supplemental Flood Management Study, Phase 2,
W77-07632 6F

CONNECTICUT RIVER BASIN
An Analysis of Alternative Flood Management Plans in Upstream Watersheds. Connecticut River Basin Supplemental Flood Management Study, Phase 2,
W77-07632 6F

CONSTRAINTS
Objective Function and Constraints in Water Resources Systems,
W77-08046 6A

CONSTRUCTION
The Conception, Design, and Construction of Metropolitan Toronto Mid-Toronto Sewer,
W77-07888 8B

CONSTRUCTION JOINTS
Movement Joint for Concrete Sewer Bridge.
W77-07885 8F

CONSTRUCTION MATERIALS
Plastic Sewer Pipe Materials.
W77-07931 8G

CONTINENTAL SHELF
An Analytical Sea Current Model for Coastal Regions with Application to the New York Bight,
W77-07744 2L

CONTINUUM MODELS
Mechanical and Hydraulic Properties of Rocks Related to Induced Seismicity,
W77-07779 8E

CONVECTION
An Experimental and Theoretical Study of the Turbulent and Laminar Convection Generated Under a Horizontal Ice Sheet Floating on Warm Salty Water,
W77-07773 2C

COOLING
Research Foundation Utilizes Ground Water Heat Pumps,
W77-07693 8C

Ground Water Energy and the Ground Water Heat Pump,
W77-07694 8C

COOLING WATER
The Use of Sewage Effluent as Power Station Cooling Water,
W77-07949 5G

Optimal Engineering Design Under Uncertainty by Geometric Programming,
W77-08040 8C

COORDINATION
Appraisal of Areawide Waste Water Planning,
W77-07874 5G

COPPER
Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

COPPER HYDROXY ION
Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

CORAL
Inventory of Benthic Organisms and Plankton at Mokapu, Oahu,
W77-07798 2L

CORRELATION ANALYSIS
New Forms of Correlation Relationships Between Positive Quantities Applied in Hydrology,
W77-07659 2A

CORROSION
Method of Separation of Fission and Corrosion Products and of Corresponding Isotopes from Liquid Waste,
W77-08020 5D

COST
Drainage--Who Pays, Responsibilities After the 1973 Water Act,
W77-07932 5G

COST ALLOCATION
The Development of Costs Recovery Scheme: Suggested Approaches for Municipal or Regional Waste Water Treatment Plants,
W77-08085 6C

COST ANALYSIS
Estimating Costs of Waste Water Sludge Disposal,
W77-07861 5E

COST-BENEFIT ANALYSIS
Modeling Multiple-Use in Natural Areas: Part II - The Santee Swamp Study,
W77-08050 6A

COST MINIMIZATION
Simplified Optimization of Activated Sludge Process,
W77-08036 5D

Optimal Engineering Design Under Uncertainty by Geometric Programming,
W77-08040 8C

Adjustment Costs and Optimal Waste Treatment,
W77-08045 5G

COST REPAYMENT
The Development of Costs Recovery Scheme: Suggested Approaches for Municipal or Regional Waste Water Treatment Plants,
W77-08085 6C

COSTS
Estimating Costs of Waste Water Sludge Disposal,
W77-07861 5E

Save Sludge Handling Costs by Level Control,
W77-07868 5D

Cost of High Quality Waste Water Treatment for Reuse,
W77-07930 5D

Best Practicable Waste Treatment Screening Model,
W77-08037 5D

CRACKS
Penetration Depth of Closely Spaced Water-Free Crevasses,
W77-08052 2C

CREVASSES
Penetration Depth of Closely Spaced Water-Free Crevasses,
W77-08052 2C

CROP PRODUCTION
An Integrated Model-Approach to the Effect of Water Management on Crop Yield,
W77-08038 3F

CROSS-SECTIONS
Aspects of Bankfull Geometry in a Distributary System of Eastern Australia,
W77-07782 2E

CRUDE OIL
Effect of South Louisiana Crude Oil and No. 2 Fuel Oil on Growth of Heterotrophic Microorganisms, Including Proteolytic, Lipolytic, Chitinolytic and Celluloytic Bacteria,
W77-07736 5C

CRUSTACEANS
Comparative Study of Cladocera from the 1st Meter of Sea Water, Collected in a Polluted Zone and in Another Relatively Clean Zone, (In French),
W77-07730 5C

CRYOGENICS
What's Up with Oxygen,
W77-07919 5D

CUCUMBERS
Determination of Morestan in Water, Soil, and Cucumbers by Thin-Layer Chromatography, (In Russian),
W77-07688 5A

CUNNERS
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium.
W77-07830 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, To Cadmium. I. Introduction and Experimental Design,
W77-07831 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

Physiological Response of the Cunner, Tautogolabrus Adspersus, to Cadmium. VI. Histopathology,
W77-07836 5C

CUPRIC ION
Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

CURRENTS (WATER)
Characteristics of the Areas in Which Fast Current Oil Control is Needed,
W77-07741 5G

Tidal and Current Prediction for the Amazon's North Channel Using a Hydrodynamical-Numerical Model,
W77-07743 2L

An Analytical Sea Current Model for Coastal Regions with Application to the New York Bight,
W77-07744 2L

The Application of ERTS-1 Digital Data to Water Transport Phenomena in the Point Pelee-Rondeau Area,
W77-07981 2J

CURVES
Stochastic Analysis of Short-Time Rainfalls,
W77-07671 2B

CYCLING NUTRIENTS
Cycling of Dissolved Organic Phosphorus Compounds in Natural Waters,
W77-07608 5C

Whole-Lake Eutrophication Experiments with Phosphorus, Nitrogen and Carbon.
W77-07965 5C

Diel Phosphate Flux in Lake Washington, U.S.A.,
W77-07968 5C

Phosphorus Regeneration by Natural Populations of Limnetic Zooplankton,
W77-07972 5C

Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

Phosphorus Release from a Highly Eutrophic Lake Sediment,
W77-07999 5C

CYCLOHEXANE
Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

CYTOLOGICAL STUDIES
Enzyme Kinetics--A Review with Emphasis on Inhibition of Enzymes,
W77-07732 5B

DAILY RAINFALL
Simulation of Daily Rainfall Series Using Markov Chain Models,
W77-07660 2A

DAM
Dissolved Gas Data Report, 1975-1976,
W77-07718 5A

DAM FOUNDATIONS
A Valley Crossing in Pleistocene Deposits,
W77-07778 8E

DAM SITES
Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

DAM TENDER REPORTS
Operating Policy Adaptations for a Reservoir Systems, (Phase I),
W77-07603 4A

Operating Policy Simulation or a Reservoir Systems, (Phase II),
W77-07604 4A

DAMAGES
The Valuation of Aesthetic Preferences,
W77-08041 6G

DAMS
Emptiness of a Finite Dam--Time Dependent Theory,
W77-07683 8B

Dissolved Gas Supersaturation, Grand Coulee Dam Project, 1973,
W77-07722 5B

DAPHNIA
Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

DAPHNIA MAGNA
Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

DATA COLLECTION PLATFORMS
The Use of LANDSAT DCS and Imagery in Reservoir Management and Operation,
W77-08076 7B

DATA COLLECTION SYSTEMS
The Use of LANDSAT DCS and Imagery in Reservoir Management and Operation,
W77-08076 7B

DATA COLLECTIONS
Remote Sensing Applications in Water Resources Management by the California Department of Water Resources,
W77-08078 7B

DATA MANAGEMENT
Information Transferral within a Distributed Data Base Via a Generalized Mapping Language,
W77-07813 6A

DATA MANAGEMENT SYSTEMS
A Decision Support System for Area-Wide Quality Planning,
W77-07810 6A

Extensions and Corrections for the CODASYL Approach to Data Base Management,
W77-07811 6A

Implementation of a Decision Support for Regional Water Quality Planning,
W77-07812 6A

Aiding Decision Makers with a Generalized Data Base Management System: An Application to Inventory Management,
W77-07814 6A

Observations on a Generalized Intelligent Query Processor for Decision Support,
W77-07849 6A

Mathematical Programming within the Context of a Generalized Data Base Management System,
W77-07850 6A

DATA PROCESSING
Municipal Information Systems: Evaluation of Policy Related Research. Volume 2. Computer Utilization in Local Government,
W77-07631 6B

Objective Analysis of Snow Cover Fields,
W77-07678 2C

Observations on a Generalized Intelligent Query Processor for Decision Support,
W77-07849 6A

Evaluation of Thermal X/5-Detector Skylab S-192 Data for Estimating Evapotranspiration and Thermal Properties of Soils for Irrigation Management,
W77-08079 7B

DATA STORAGE AND RETRIEVAL
A Decision Support System for Area-Wide Quality Planning,
W77-07810 6A

Observations on a Generalized Intelligent Query Processor for Decision Support,
W77-07849 6A

Mathematical Programming within the Context of a Generalized Data Base Management System,
W77-07850 6A

DATING
14C Evidence for the Origin of Arid Region Groundwater, Northeastern Province, Kenya,
W77-07611 7B

DDT
Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

DECEPTION BAY
Oil Spill at Deception Bay, Hudson Strait,
W77-07731 5G

DECISION MAKERS
Aiding Decision Makers with a Generalized Data Base Management System: An Application to Inventory Management,
W77-07814 6A

DECISION-MAKING
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

A Decision Support System for Area-Wide Quality Planning,
W77-07810 6A

Extensions and Corrections for the CODASYL Approach to Data Base Management,
W77-07811 6A

Implementation of a Decision Support for Regional Water Quality Planning,
W77-07812 6A

Observations on a Generalized Intelligent Query Processor for Decision Support,
W77-07849 6A

A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

Objective Function and Constraints in Water Resources Systems,
W77-08046 6A

DECOMPRESSION
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

DEEPWATER PORTS
Preliminary Projections of Oil Spill Movement for Three Potential Deepwater Port Sites in the Gulf of Mexico,
W77-07753 5B

DEFORMITIES
Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

DEGRADATION (DECOMPOSITION)
Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

Studies on the Role of Detritus in Fresh Water Lakes,
W77-08001 5C

DEICERS
The Effect of Highway Deicing Salt on Chloride Budgets at Lake George, NY,
W77-08000 5B

DELTAS
Mangrove Ecology and Deltaic-Estuarine Geomorphology: Cambridge Gulf-Ord River, Western Australia,
W77-07738 2L

DEMETON
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

DEMONSTRATION WATERSHEDS
The Representation of a Short Period of Experimental Catchment Data by a Linear Stochastic Difference Equation,
W77-07646 2

DENITRIFICATION
Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W77-08099 5D

DEPOSITION (SEDIMENTS)
Sedimentation in Lower Green Bay, Wisconsin,
W77-07980 2J

DEPTH DISTRIBUTION
Mobile Fish Cage and Depth Distribution Studies, Columbia and Snake Rivers,
W77-07723 5C

DEPTHS
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

DEPURATION (OYSTERS)
Reduction in Sewage Contamination in Sydney Rock Oysters,
W77-07946 5G

DESALINATION
Waste Water Reclamation at St. Croix, U.S. Virgin Islands,
W77-08086 4B

DESALINATION PROCESSES
Preparation of Composite Reverse Osmosis Membranes by Plasma Polymerization,
W77-07792 3A

DESIGN
Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

Optimal Engineering Design Under Uncertainty by Geometric Programming,
W77-08040 8C

DESIGN CRITERIA
The Conception, Design, and Construction of Metropolitan Toronto Mid-Toronto Sewer,
W77-07888 8B

Stabilization Lagoons Including Experience in Brazil,
W77-07940 5D

DETRITUS
Studies on the Role of Detritus in Fresh Water Lakes,
W77-08001 5C

DETRIVORES
Population Ecology and Production of Benthic Detritivores,
W77-07979 5C

DEWATERING
Sludge Dewatering by Belt Filter.
W77-07905 5D

Multi-Stage Filter Press.
W77-07914 5D

Continuous Thickening of Biological Sludges, and the Influence of Stability,
W77-07923 5D

DIATOMS
On the Relation of the Diatiom FLora and Water Quality in the Uji River Kyoto, (In Japanese),
W77-08089 5

DIAZINON
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

DIEL MIGRATION
Diel Phosphate Flux in Lake Washington, U.S.A.,
W77-07968 5C

DIFFERENTIAL THERMAL ANALYSIS
Low Frequency Turbulence and Vertical Temperature Microstructure in Lake Tahoe, California-Nevada,
W77-07984 2H

DIFFUSION
The Generation of Salinity Finestructure by Vertical Diffusion,
W77-07775 2L

Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

DIKEROGAMMARUS
Effect of Salinity on the Fresh-Water Shrimp Dikerogammarus Haemobaphes (Eichwald) from the Mouth of the Dnepr,
W77-07848 5C

DILUTION FACTOR (SEDIMENTS)
Evaluation of Sediment Yields Due to Urban Development,
W77-07705 4D

DIMENSIONS
Some Arithmetical Relations of a Matrix for a Calculus of Reservoirs, (Quelques Relations Arithmetiques de Matrice dans le Calcul des Reservoirs),
W77-07682 4A

DIMETHOATE
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

DIMETHYLHYDRAZINE
Effects of Pollutants on Eggs, Embryos and Larvae of Amphibian Species,
W77-07820 5C

DINITROTOLUENE
Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

DINOFLAGELLATES
Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

DIOXATHION
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

DISCHARGE (WATER)
Spatial and Time Analysis and Estimation of River Flow,
W77-07654 2E

DISCRETE MODELS
Mechanical and Hydraulic Properties of Rocks Related to Induced Seismicity,
W77-07779 8E

DISINFECTION
Kinetics of Breakpoint Chlorination and Disinfection,
W77-08095 5D

DISPERSION
Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

DISSOLVED GAS
Dissolved Gas Supersaturation in the Salmon River, 1972-74,
W77-07719 5A

DISSOLVED GAS MONITORING
Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

DISSOLVED GASES
Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

DISSOLVED OXYGEN
Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

DISTRIBUTED DATA BASE
Information Transferral within a Distributed Data Base Via a Generalized Mapping Language,
W77-07813 6A

DISTRIBUTION
Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

DISTRIBUTION PATTERNS
Tar Ball Distribution in the Western North Atlantic,
W77-07757 5B

DISULFATION
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

DNEPR RIVER (USSR)
Effect of Salinity on the Fresh-Water Shrimp Dikerogammarus Haemobaphes (Eichwald) from the Mouth of the Dnepr,
W77-07848 5C

DOMESTIC WASTES
Macerator-Sterilizer Sewage Treatment System,
W77-07895 5D

Stabilization Lagoons Including Experience in Brazil,
W77-07940 5D

DOWNWELLING CURRENTS
Physical, Chemical, and Biological Factors in the Initiation and Destruction of Biogenic Meromixis in a Soft-Water Lake,
W77-07963 5C

DRAINAGE
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

Go Ahead for Drainage and Outfall,
W77-07889 5E

Drainage--Who Pays, Responsibilities After the 1973 Water Act,
W77-07932 5G

An Integrated Model-Approach to the Effect of Water Management on Crop Yield,
W77-08038 3F

DRAINAGE SYSTEMS
Improvement and Expansion of the Drainage System of Hamburg,
W77-07890 5D

Treating Urban Drainage as a Utility,
W77-07947 5G

DRILLING
E.L.C. Water Development Project, Betul (M.P.) India: Fifth Annual Report, 1975-1976,
W77-07696 8B

DRILLING FLUIDS
Slurry and Pumping Guidelines Smooth Casing-Cementing Jobs,
W77-07699 8F

DYNAMIC PROGRAMMING
Simplified Optimization of Activated Sludge Process,
W77-08036 5D

Best Practicable Waste Treatment Screening Model,
W77-08037 5D

DYSTROPHY
The Influence of Mineral Fertilization on Phytoplankton Production in Lakes of Various Trophic Types,
W77-07988 5C

E. COLI
Concentration of Bacteria in Water Using the Ultrafiltration Method, (In French),
W77-07860 5D

Experimental Study of the Action of Pesticides on the Microflora of Bodies of Water, (In Russian),
W77-07982 5B

Changes in the Properties of E. Coli Under the Influence of Water Environments,
W77-07997 5A

EASTERN WHITE PINE
Effect of Air Pollution on Pinus Strobus L. and Genetic Resistance - A Literature Review,
W77-07829 5C

ECOLOGY
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

Mangrove Ecology and Deltaic-Estuarine Geomorphology: Cambridge Gulf-Ord River, Western Australia,
W77-07738 2L

Environmental Assessment: The Ecological Dimension,
W77-08034 6G

ECONOMIC ANALYSIS
Simplified Optimization of Activated Sludge Process,
W77-08036 5D

ECONOMIC EFFICIENCY
Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

Simplified Optimization of Activated Sludge Process,
W77-08036 5D

Optimal Engineering Design Under Uncertainty by Geometric Programming,
W77-08040 8C

Adjustment Costs and Optimal Waste Treatment,
W77-08045 5G

ECONOMIC FEASIBILITY
Tolls: Efficiency and Equity Issues for Inland Waterways,
W77-08039 6C

ECONOMICS
Objective Function and Constraints in Water Resources Systems,
W77-08046 6A

EFFICIENCIES
Tolls: Efficiency and Equity Issues for Inland Waterways,
W77-08039 6C

ELECTRIC POWER COSTS
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

ELECTRIC POWER DEMAND
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

ELECTRIC POWER PRODUCTION
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

ELECTRIC WIRING
Pumping Systems: Part II,
W77-07704 8C

ELECTRICAL CONDUCTANCE
Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

ELECTRICAL RESISTANCE
Electrical Resistivity Measurements on the Ross Ice Shelf,
W77-08051 2C

ELECTRICAL RESISTIVITY
Determination of Salt-Water Interface by Electric Resistivity Depth Soundings,
W77-07783 2F

ELECTRODES
Sewage Treatment Apparatus,
W77-07896 5D

ELECTROLYSIS
Sewage Treatment Apparatus,
W77-07896 5D

ELECTRON TRANSFER
Electron Transport Analysis as an Indicator of Biological Oxidation in Freshwater Sediments,
W77-07992 5C

EMPHYSEMA
Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

EMPIRICAL HYDROGRAPHS
Multidimensional Statistic Modelling of Hydrological Processes on the Basis of Structural Analysis of the Empirical Hydrographs of Runoff,
W77-07662 2A

EMULSIFIERS
Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

ENCROACHMENT
Saltwater-Freshwater Interfaces in the '2,000-' and '2,800-Foot' Sands in the Capital Area Ground Water Conservation District,
W77-07703 4B

ENERGY
Energy Development and Its Effect on Ground Water,
W77-07691 5B

NWWA Ground Water Heat Pump Research Imperatives,
W77-07692 8C

Research Foundation Utilizes Ground Water Heat Pumps,
W77-07693 8C

Ground Water Energy and the Ground Water Heat Pump,
W77-07694 8C

ENERGY BUDGET
The Contribution of Autochthonous and Allochthonous Matter to the Trophy of a River in the Barbel Region,
W77-07986 5C

ENERGY CONVERSION
Apparatus for Power Generation in Deep Seawater,
W77-08023 8C

Mechanism for Tapping the Surf Energy,
W77-08026 8C

ENERGY LOSS
Aspects of Bankfull Geometry in a Distributary System of Eastern Australia,
W77-07782 2E

ENERGY TRANSFER
Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

Method and Apparatus for Obtaining Electrical Power from Sea Water,
W77-08032 8C

Energy Exchange at a Glacier Surface: An Alternative to Aerodynamic Methods of Measurement,
W77-08053 2C

ENGINEERING STRUCTURES
A Valley Crossing in Pleistocene Deposits,
W77-07778 8E

Floating Breakwater,
W77-08009 8A

Tidewater Power System,
W77-08022 8C

Apparatus for Power Generation in Deep Seawater,
W77-08023 8C

Mechanism for Tapping the Surf Energy,
W77-08026 8C

ENTEROCOCCI
Experimental Study of the Action of Pesticides on the Microflora of Bodies of Water, (In Russian),
W77-07982 5B

ENTEROVIRUSES
Examination of Sewage Sludge for Enteroviruses, Volume 2,
W77-07615 5B

ENVIRONMENT
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

The Problem of the Behavior of Chemical Pollutants in the Environment, (In Russian),
W77-08028 5B

Environmental Assessment: The Ecological Dimension,
W77-08034 6G

ENVIRONMENTAL CONTROL
Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

Environmental Policy Choice Under Uncertainty,
W77-08004 6G

The Current State of Environmental Policy,
W77-08005 6G

A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

Adjustment Costs and Optimal Waste Treatment,
W77-08045 5G

ENVIRONMENTAL EFFECTS
Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

Waste Management for the Coastal Zone: Concepts for the Assessment of Ocean Outfalls,
W77-07747 5E

Impacts of Offshore Oil on North East Scotland,
W77-07752 5C

Preliminary Projections of Oil Spill Movement for Three Potential Deepwater Port Sites in the Gulf of Mexico,
W77-07753 5B

Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

Ultrastructural Study of Lesions in Gills of a Marine Shrimp Exposed to Cadmium,
W77-07845 5C

Aquatic Insect Diversity and Biomass in a Stream Marginally Polluted by Acid Strip Mine Drainage,
W77-07846 5C

Changes in the Properties of E. Coli Under the Influence of Water Environments,
W77-07997 5A

Environmental Policy Choice Under Uncertainty,
W77-08004 6G

ENVIRONMENTAL IMPACT
Impacts of Offshore Oil on North East Scotland,
W77-07752 5C

ENVIRONMENTAL PERSISTENCE
Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

ENVIRONMENTAL POLICIES
Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

ENVIRONMENTAL PROTECTION PROGRAMS
A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

ENZYME DETECTION TEST
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

ENZYME KINETICS
Enzyme Kinetics--A Review with Emphasis on Inhibition of Enzymes,
W77-07732 5B

ENZYMES
Enzyme Kinetics--A Review with Emphasis on Inhibition of Enzymes,
W77-07732 5B

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

EPN
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

EQUATION OF TRANSFER
Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

EQUATIONS
The Errors Involved in Inferring Salinity from Sound Velocity,
W77-07774 2L

The Generation of Salinity Finestructure by Vertical Diffusion,
W77-07775 2L

Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

EQUIPMENT
Water Sampling from Unpumped Wells with Static Water Levels Deeper than 10 Metres,
W77-07787 5A

EQUITY
Tolls: Efficiency and Equity Issues for Inland Waterways,
W77-08039 6C

EROSION
Runoff, Erosion, and Nutrient Movement from Interrill Areas,
W77-07766 2J

ERROR ANALYSIS
The Errors Involved in Inferring Salinity from Sound Velocity,
W77-07774 2L

ERTS
Ice Movements in the Beaufort Sea 1973-1975: Determination by ERTS Imagery,
W77-07769 2C

ESTIMATING
Phytoplankton Production in Lake Memphremagog, Quebec (Canada)--Vermont (U.S.A.),
W77-07962 5C

The Valuation of Aesthetic Preferences,
W77-08041 6G

ESTONIAN-SSR (NIGULA SWAMP)
Hydrochemistry of the Nigula Swamp, (In Estonian),
W77-07859 2H

ESTUARIES
Mangrove Ecology and Deltaic-Estuarine Geomorphology: Cambridge Gulf-Ord River, Western Australia,
W77-07738 2L

Tidal and Current Prediction for the Amazon's North Channel Using a Hydrodynamical-Numerical Model,
W77-07743 2L

Sediment Measurement in Estuarine and Coastal Areas,
W77-07748 2L

Development of the Turbidity Maximum in Rappahannock Estuary; Summary,
W77-07789 2L

A Theoretical Framework for the Description of Estuaries,
W77-08057 2L

The Lateral Movement of the Coastal Water and Its Relation to Vertical Diffusion,
W77-08058 2L

ESTUARINE ENIRONMENT
Mangrove Ecology and Deltaic-Estuarine Geomorphology: Cambridge Gulf-Ord River, Western Australia,
W77-07738 2L

ESTUARINE ENVIRONMENT
Effect of Salinity on the Fresh-Water Shrimp Dikerogammarus Haemobaphes (Eichwald) from the Mouth of the Dnepr,
W77-07848 5C

ETHANOL
Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

ETHION
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

EUTERIC BACTERIA
Experimental Study of the Action of Pesticides on the Microflora of Bodies of Water, (In Russian),
W77-07982 5B

EUTROPHICATION
Whole-Lake Eutrophication Experiments with Phosphorus, Nitrogen and Carbon.
W77-07965 5C

Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

The Influence of Mineral Fertilization on Phytoplankton Production in Lakes of Various Trophic Types,
W77-07988 5C

Bacterial Decomposition of Different Polysaccharides in a Eutrophic Lake,
W77-07991 5C

Phosphorus Release from a Highly Eutrophic Lake Sediment,
W77-07999 5C

Chemical Interactions in a Eutrophic Lake,
W77-08002 5C

EVALUATION
Some Problems of Stochastic Storage with Correlated Inflow,
W77-07689 4A

Methodological Problems in Estimating Recreational Demand Functions and Evaluating Recreational Benefits,
W77-08007 6B

Tolls: Efficiency and Equity Issues for Inland Waterways,
W77-08039 6C

The Valuation of Aesthetic Preferences,
W77-08041 6G

Watershed Organizations--Impact on Water Quality Management: An Analysis of Selected Michigan Watershed Councils,
W77-08093 4D

EVAPOTRANSPIRATION
Evaluation of Thermal X/5-Detector Skylab S-192 Data for Estimating Evapotranspiration and Thermal Properties of Soils for Irrigation Management,
W77-08079 7B

EXCESSIVE PRECIPITATION
Characteristics of the Severe Rainstorm,
W77-07784 2B

EXOPTHALMIA
Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

The Gas Bubble Disease of Fish, (Die Gasblasen Krankheit Bei Fischen,
W77-07716 5C

EXUDATION
Extracellular Release in Planktonic Bacteria,
W77-07996 5C

FACTOR ANALYSIS
Aspects of Bankfull Geometry in a Distributary System of Eastern Australia,
W77-07782 2E

FARM WASTES
Disposal of Feedlot Wastes Using a Two-Stage Process with Net Energy Production,
W77-07816 5D

FECAL CONTAMINATION
Risk of Drinking Water Contamination in Rural Tennessee,
W77-07701 5G

FEDERAL WATER POLLUTION CONTROL ACT
1976 Needs Survey Markedly Lower,
W77-07878 5G

FEED LOTS
Disposal of Feedlot Wastes Using a Two-Stage Process with Net Energy Production,
W77-07816 5D

FERMENTATION
Bacterial Populations and End Products During Anaerobic SLudge Fermentation of Glucose,
W77-07944 5D

FERTILIZATION
The Influence of Mineral Fertilization on Phytoplankton Production in Lakes of Various Trophic Types,
W77-07988 5C

FERTILIZER
'Hydig'-One Example of Controlled Sludge Use,
W77-07871 5E

FERTILIZERS
Composting--An Approach to Using Sewage Waste,
W77-07876 5E

Making Aquatic Weeds Useful: Some Perspectives for Developing Countries.
W77-07964 4A

FIBERGLASS REINFORCED PLASTIC
Plastic Sewer Pipe Materials.
W77-07931 8G

FILTERS
Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

Sludge Dewatering by Belt Filter.
W77-07905 5D

Two-Stage Filtration of Secondary Effluent,
W77-07907 5D

Multi-Stage Filter Press.
W77-07914 5D

Trials on the Operation of Biological Filters,
W77-07954 5D

Use of State Estimation Techniques in Water Resource System Modeling, by Dennis P. Lettenmaier and Stephen J. Burges,
W77-08035 5B

Waste Water Treatment by Upflow Sand Filtration,
W77-08087 5D

FILTRATION
Concentration of Bacteria in Water Using the Ultrafiltration Method, (In French),
W77-07860 5D

Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

Waste Water Renovation by Sewage Ultrafiltration,
W77-07941 5D

Trials on the Operation of Biological Filters,
W77-07954 5D

Method of Filtering Liquids Containing Dissolved Carbon Dioxide,
W77-08013 5D

Mechanisms and Kinetic Parameters in Granular Media Filtration,
W77-08097 5D

FINANCING
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

Financing: There Must be a Better Way,
W77-07873 5G

FINITE DAMS
Emptiness of a Finite Dam--Time Dependent Theory,
W77-07683 8B

FISH CAGES
Mobile Fish Cage and Depth Distribution Studies, Columbia and Snake Rivers,
W77-07723 5C

FISH DIETS
Feeding of Forage Fish in Turbid Kansas Reservoirs,
W77-07817 2H

FISH DISEASE
Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

Some Experiments on the Gas-Disease in Freshwater Fishes, (In Japanese),
W77-07714 5C

FISH DISEASE

Water Quality Requirements of Fishes and Effects of Toxic Substances,
W77-07715 5C

Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

Notes on the Exposure of Several Species of Fish to Sudden Changes in the Hydrogen Ion Concentration of the Water and to an Atmosphere of Pure Oxygen,
W77-07725 5C

FISH DISEASES

Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

The Gas Bubble Disease of Fish, (Die Gasblasen Krankheit Bei Fischen,
W77-07716 5C

Dissolved Gas Supersaturation, Grand Coulee Dam Project, 1973,
W77-07722 5B

Preliminary Studies of Menhaden and Their Mass Mortalities in Long Island and New Jersey Waters,
W77-07724 5C

Gas Disease in Fishes - A Review,
W77-07727 5C

Summary of Gas Supersaturation Research at Western Fish Toxicology Station (EPA), Corvallis, Oregon, 1972-1974.
W77-07729 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

Physiological Response of the Cunner, Tautogolabrus Adspersus, to Cadmium. VI. Histopathology,
W77-07836 5C

FISH EGGS

Egg Hatchability and Tolerance of Brook Trout (Salvelinus fontinalis) Fry at Low pH,
W77-07844 5C

FISH FOOD ORGANISMS

Effect of Salinity on the Fresh-Water Shrimp Dikerogammarus Haemobaphes (Eichwald) from the Mouth of the Dnepr,
W77-07848 5C

FISH HATCHERIES

Trout and Salmon Culture (Hatchery Methods) Hatchery Water Supply,
W77-07726 5G

FISH HATCHERY

Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

FISH MIGRATION

Mobile Fish Cage and Depth Distribution Studies, Columbia and Snake Rivers,
W77-07723 5C

FISH MIGRATIONS

Passing Fish Through Hydraulic Turbines,
W77-07713 8I

FISH PASSAGE

Passing Fish Through Hydraulic Turbines,
W77-07713 8I

FISH PHYSIOLOGY

Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

Water Quality Requirements of Fishes and Effects of Toxic Substances,
W77-07715 5C

The Gas Bubble Disease of Fish, (Die Gasblasen Krankheit Bei Fischen,
W77-07716 5C

Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

Gas Disease in Fishes - A Review,
W77-07727 5C

Summary of Gas Supersaturation Research at Western Fish Toxicology Station (EPA), Corvallis, Oregon, 1972-1974.
W77-07729 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

Egg Hatchability and Tolerance of Brook Trout (Salvelinus fontinalis) Fry at Low pH,
W77-07844 5C

FISSION PRODUCTS

Method of Separation of Fission and Corrosion Products and of Corresponding Isotopes from Liquid Waste,
W77-08020 5D

FJORDS

The Lateral Movement of the Coastal Water and Its Relation to Vertical Diffusion,
W77-08058 2L

FLOATING ICE

An Experimental and Theoretical Study of the Turbulent and Laminar Convection Generated Under a Horizontal Ice Sheet Floating on Warm Salty Water,
W77-07773 2C

FLOCCULATION

Poly Aluminum Chloride in Sludge Treatment,
W77-07912 5D

Composition and Method for Flocculating Suspended Solids,
W77-08031 5D

FLOOD CONTROL

Floodflow Formulas for Urbanized and Nonurbanized Areas of Connecticut,
W77-07612 4C

Flood Plain Information, South Anna River, Hanover County, Va.
W77-07637 4A

Flood Plain Information, North Anna River, Hanover County, Va.
W77-07638 4A

Flood Plain Information, Cherry Creek-Cherry Creek Lake Through Franktown, Colorado.
W77-07639 4A

Determination of the Degree of Protection Offered by Flood Control Systems on the Basis of Distribution Functions,
W77-07673 8B

FLOOD DAMAGE

Implementation of Non-Structural Alternatives in Flood Damage Abatement,
W77-07795 6F

FLOOD DATA

Flood Plain Information: Thompsons Creek and Tributaries, Bryan, Texas,
W77-07634 4A

Flood Plain Information, South Anna River, Hanover County, Va.
W77-07637 4A

Flood Plain Information, North Anna River, Hanover County, Va.
W77-07638 4A

Flood Plain Information, Cherry Creek-Cherry Creek Lake Through Franktown, Colorado.
W77-07639 4A

Flood Plain Information: Northwest Stream Group, Stockton, California,
W77-07642 4A

FLOOD FLOW

Flood Plain Information: Thompsons Creek and Tributaries, Bryan, Texas,
W77-07634 4A

Flood Plain Information; San Antonio River Bexar County, Texas.
W77-07635 4A

FLOOD FORECASTING
Floodflow Formulas for Urbanized and Nonurbanized Areas of Connecticut,
W77-07612 4C

Flood Plain Information: Thompsons Creek and Tributaries, Bryan, Texas,
W77-07634 4A

Flood Plain Information: Wichita River and Tributaries, Wichita Falls, Texas,
W77-07643 4A

FLOOD FREQUENCY
Investigations on the Structure of Frequency Distributions of Floods,
W77-07649 2E

Bayesian Estimation of Frequency of Hydrological Events,
W77-07650 2E

FLOOD INSURANCE
Implementation of Non-Structural Alternatives in Flood Damage Abatement,
W77-07795 6F

FLOOD PLAIN MANAGEMENT
An Analysis of Alternative Flood Management Plans in Upstream Watersheds. Connecticut River Basin Supplemental Flood Management Study, Phase 2,
W77-07632 6F

FLOOD PLAIN ZONING
Flood Plain Information; San Antonio River, Bexar County, Texas.
W77-07635 4A

Flood Plain Information, Cherry Creek-Cherry Creek Lake Through Franktown, Colorado.
W77-07639 4A

Flood Plain Information: Ipswich River, North Reading and Wilmington, Massachusetts,
W77-07644 4A

FLOOD PLAINS
An Analysis of Alternative Flood Management Plans in Upstream Watersheds. Connecticut River Basin Supplemental Flood Management Study, Phase 2,
W77-07632 6F

Flood Plain Information: Thompsons Creek and Tributaries, Bryan, Texas,
W77-07634 4A

Flood Plain Information; San Antonio River, Bexar County, Texas.
W77-07635 4A

Special Flood Hazard Report: Jersey Creek, Kansas City, Kansas.
W77-07636 4A

Flood Plain Information: Allegheny River, Venango County, Pennsylvania,
W77-07641 4A

Flood Plain Information: Wichita River and Tributaries, Wichita Falls, Texas,
W77-07643 4A

Flood Plain Information: Merrimack and Souhegan Rivers, Litchfield and Merrimack, New Hampshire.
W77-07645 4A

FLOOD PROFILES
Flood Plain Information: Thompsons Creek and Tributaries, Bryan, Texas,
W77-07634 4A

Flood Plain Information; San Antonio River, Bexar County, Texas.
W77-07635 4A

Flood Plain Information, Cherry Creek-Cherry Creek Lake Through Franktown, Colorado.
W77-07639 4A

Flood Plain Information: Allegheny River, Warren County, Pennsylvania,
W77-07640 4A

Flood Plain Information: Wichita River and Tributaries, Wichita Falls, Texas,
W77-07643 4A

Flood Plain Information: Ipswich River, North Reading and Wilmington, Massachusetts,
W77-07644 4A

FLOOD PROTECTION
An Analysis of Alternative Flood Management Plans in Upstream Watersheds. Connecticut River Basin Supplemental Flood Management Study, Phase 2,
W77-07632 6F

Flood Plain Information: Merrimack and Souhegan Rivers, Litchfield and Merrimack, New Hampshire.
W77-07645 4A

Determination of the Degree of Protection Offered by Flood Control Systems on the Basis of Distribution Functions,
W77-07673 8B

FLOOD STAGES
Flood Plain Information: Allegheny River, Warren County, Pennsylvania,
W77-07640 4A

FLOOD WAVES
Statistical Analysis Applied to the Study of the Components of a Flood Wave,
W77-07674 2E

FLOODS
Special Flood Hazard Report: Jersey Creek, Kansas City, Kansas.
W77-07636 4A

Flood Plain Information, South Anna River, Hanover County, Va.
W77-07637 4A

Flood Plain Information, North Anna River, Hanover County, Va.
W77-07638 4A

Flood Plain Information, Cherry Creek-Cherry Creek Lake Through Franktown, Colorado.
W77-07639 4A

Flood Plain Information: Allegheny River, Warren County, Pennsylvania,
W77-07640 4A

Flood Plain Information: Allegheny River, Venango County, Pennsylvania,
W77-07641 4A

Flood Plain Information: Northwest Stream Group, Stockton, California,
W77-07642 4A

Flood Plain Information: Wichita River and Tributaries, Wichita Falls, Texas,
W77-07643 4A

Flood Plain Information: Ipswich River, North Reading and Wilmington, Massachusetts,
W77-07644 4A

Flood Plain Information: Merrimack and Souhegan Rivers, Litchfield and Merrimack, New Hampshire.
W77-07645 4A

Investigations on the Structure of Frequency Distributions of Floods,
W77-07649 2E

Flood Hazard Studies in Central Texas Using Orbital and Suborbital Remote Sensing Imagery,
W77-08069 7B

FLOTATION
Flotation Treatment of Waste Water and Sewage-Using Gas Contg. Oxygen in Deep Pit to Float the Particles,
W77-07894 5D

FLOW
Stochastic Analysis of Velocity Fluctuations in a Natural Stream Channel,
W77-07648 2E

In Hydrology h is a Household Word,
W77-07667 2A

Increasing Sewer Capacity by Polymer Dosing,
W77-07883 8G

Fluid Flow Regulator,
W77-08018 3F

FLOW CONTROL
Flow Controller Device,
W77-08017 3F

Fluid Flow Regulator,
W77-08018 3F

FLOW DURATION
Flood Plain Information; San Antonio River, Bexar County, Texas.
W77-07635 4A

FLOW MEASUREMENT
How to Determine Waste Water Flow,
W77-07881 5F

FLOW-THROUGH BIOASSAY
Protective Effect of Chloride on Nitrite Toxicity to Coho Salmon (Oncorhynchus Kisutch),
W77-07840 5C

FLUCTUATIONS
Stochastic Analysis of Velocity Fluctuations in a Natural Stream Channel,
W77-07648 2E

Spectral Analysis of the Structure of Hydrological Series,
W77-07653 2E

Finding Regularities in Long-Term Streamflow Fluctuations by Analysis of Hydrological Ensembles,
W77-07676 2E

The Scaling of Velocity Fluctuations in the Surface Mixed Layer,
W77-07768 2L

FLUORESCENCE SPECTROSCOPY
Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

FLUORINE
A Rapid Volumetric Method of Determining Fluorine in Water, (In Russian),
W77-07950 5A

FLUVIAL PROCESSES
Channelization: Environmental, Geomorphic, and Engineering Aspects,
W77-07809 8B

FLY ASH
Utilization of Fly Ash in Polishing Oxidation Pond Effluents,
W77-07815 5D

FLYSCH ROCKS
Metamorphic Reactions in Flysch Rocks,
W77-07609 2K

FOAMING
Israel's Use of Nonionic Surfactants,
W77-07929 5B

FOOD CHAINS
Feeding of Forage Fish in Turbid Kansas Reservoirs,
W77-07817 2H

FOOD PROCESSING
High Gradient Magnetic Separation of Food Processing Wastewater,
W77-07852 5D

FOOD PROCESSING INDUSTRY
Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

High Gradient Magnetic Separation of Food Processing Wastewater,
W77-07852 5D

FORECASTING
Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

Oregon's Long-Range Requirements for Water. Forest Products Projections and Recreation Projections, Appendices IV and V,
W77-07625 6D

Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

Stochastic Difference Equation Modelling of Hydrological Processes,
W77-07663 2E

A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

Statistical Forecasting of Snow Avalanches, San Juan Mountains, Southern Colorado, U.S.A.,
W77-08055 2C

FOREST SOILS
Hydrologic Differences Between Selected Forested and Agricultural Soils in Hawaii,
W77-07765 2G

FORMWORK (CONSTRUCTION)
Telescoping Form System Speeds Sewer Concreting.
W77-07879 8F

FOUR-ELECTRODE CELLS
Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

FOX RIVER (WIS)
Sedimentation in Lower Green Bay, Wisconsin,
W77-07980 2J

FRANCE
Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

FRANCIS TURBINES
Passing Fish Through Hydraulic Turbines,
W77-07713 8I

FREEZING
Heat and Salt Transfer Associated with Formation of Sea-Ice,
W77-07786 2C

FRESHWATER FISH
The Gas Bubble Disease of Fish, (Die Gasblasen Krankheit Bei Fischen,
W77-07716 5C

FRESHWATER FISHES
Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

FRITTED GLASS BEAD MATERIAL
Fritted Glass Bead Materials as Tensiometers and Tension Plates,
W77-07760 2G

FROGS
Effects of Pollutants on Eggs, Embryos and Larvae of Amphibian Species,
W77-07820 5C

FUNGI
Utilization of Mixed Hydrocarbon Substrate by Petroleum-Degrading Microorganisms,
W77-07749 5C

GAGING STATIONS
The Generation of Synthetic Monthly Runoff Records for Ungauged British Catchments,
W77-07661 2A

GAS BUBBLE DISEASE
Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

Effects of Gas Supersaturated Columbia River Water on the Survival of Juvenile Chinook and Coho Salmon,
W77-07708 5C

Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

Some Experiments on the Gas-Disease in Freshwater Fishes, (In Japanese),
W77-07714 5C

Water Quality Requirements of Fishes and Effects of Toxic Substances,
W77-07715 5C

The Gas Bubble Disease of Fish, (Die Gasblasen Krankheit Bei Fischen,
W77-07716 5C

An Analysis of the Feasibility of Using Air Agitation to Reduce Gas Saturations in Sea Water at Pilgrim Nuclear Power Station,
W77-07720 5G

Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

Dissolved Gas Supersaturation, Grand Coulee Dam Project, 1973,
W77-07722 5B

Summary of Gas Supersaturation Research at Western Fish Toxicology Station (EPA), Corvallis, Oregon, 1972-1974.
W77-07729 5C

GAS BUBBLE DISEASES
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

GAS BUBBLES
Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

GAS EMBOLI
The Gas Bubble Disease of Fish, (Die Gasblasen Krankheit Bei Fischen,
W77-07716 5C

Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

Preliminary Studies of Menhaden and Their Mass Mortalities in Long Island and New Jersey Waters,
W77-07724 5C

GAS SECRETION
Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

GASEOUS EXOPTHALMIA
Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

GASES
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

Dissolved Gas Supersaturation in the Salmon River, 1972-74,
W77-07719 5A

Gas Disease in Fishes - A Review,
W77-07727 5C

Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

Gas Detectors Determine Health Hazards in Sewage Treatment.
W77-07880 5A

Waste-Water Process,
W77-08100 5D

GENERALIZED MAPPING LANGUAGE
Information Transferral within a Distributed Data Base Via a Generalized Mapping Language,
W77-07813 6A

GENERALIZED PLANNING SYSTEM
A Decision Support System for Area-Wide Quality Planning,
W77-07810 6A

Extensions and Corrections for the CODASYL Approach to Data Base Management,
W77-07811 6A

Aiding Decision Makers with a Generalized Data Base Management System: An Application to Inventory Management,
W77-07814 6A

Mathematical Programming within the Context of a Generalized Data Base Management System,
W77-07850 6A

GENERALIZED PLANNING SYSTEMS
Implementation of a Decision Support for Regional Water Quality Planning,
W77-07812 6A

GENETIC RESISTANCE
Effect of Air Pollution on Pinus Strobus L. and Genetic Resistance - A Literature Review,
W77-07829 5C

GEOCHEMISTRY
Metamorphic Reactions in Flysch Rocks,
W77-07609 2K

GEOLOGY
Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

GEOMETRIC PROGRAMMING
Optimal Engineering Design Under Uncertainty by Geometric Programming,
W77-08040 8C

GEOMORPHOLOGY
Mangrove Ecology and Deltaic-Estuarine Geomorphology: Cambridge Gulf-Ord River, Western Australia,
W77-07738 2L

Channelization: Environmental, Geomorphic, and Engineering Aspects,
W77-07809 8B

A Snow-Bank Push Mechanism for the Formation of Some 'Annual' Moraine Ridges,
W77-08054 2C

Flood Hazard Studies in Central Texas Using Orbital and Suborbital Remote Sensing Imagery,
W77-08069 7B

GEOPHYSICAL METHODS
Determination of Salt-Water Interface by Electric Resistivity Depth Soundings,
W77-07783 2F

GEORGIA
Electron Transport Analysis as an Indicator of Biological Oxidation in Freshwater Sediments,
W77-07992 5C

GERMAN DEMOCRATIC REPUBLIC
Investigations on the Structure of Frequency Distributions of Floods,
W77-07649 2E

GILL TISSUE OXYGEN CONSUMPTION
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

GILLS
Ultrastructural Study of Lesions in Gills of a Marine Shrimp Exposed to Cadmium,
W77-07845 5C

GIZZARD SHAD
Feeding of Forage Fish in Turbid Kansas Reservoirs,
W77-07817 2H

GLACIAL DRIFT
A Snow-Bank Push Mechanism for the Formation of Some 'Annual' Moraine Ridges,
W77-08054 2C

GLACIATION
Present and Past Glaciation Threshold in the Cascade Range, Washington, U.S.A.: Topographic and Climatic Controls, and Paleoclimatic Implications,
W77-08056 2C

GLACIERS
Penetration Depth of Closely Spaced Water-Free Crevasses,
W77-08052 2C

Energy Exchange at a Glacier Surface: An Alternative to Aerodynamic Methods of Measurement,
W77-08053 2C

GLACIOLOGY
A Snow-Bank Push Mechanism for the Formation of Some 'Annual' Moraine Ridges,
W77-08054 2C

Present and Past Glaciation Threshold in the Cascade Range, Washington, U.S.A.: Topographic and Climatic Controls, and Paleoclimatic Implications,
W77-08056 2C

GLOSSARIES
Glossary of Water Resource Terms,
W77-07613 10C

GOAL PROGRAMMING
A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

GOLAR GS500 INCINERATOR
Golar Rubbish, Oil Sludge and Sewage Incinerator.
W77-07911 5E

GOLDFISH
Some Experiments on the Gas-Disease in Freshwater Fishes, (In Japanese),
W77-07714 5C

GOOSE LAKE DRAINAGE BASIN (OR)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

GOVERNMENTAL INTERRELATIONS
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

GOVERNOR ALINEMENT TESTING
Electronic Isolation Simulator for Hydraulic Turbine Governor Alinement,
W77-07804 8C

GOVERNORS
Electronic Isolation Simulator for Hydraulic Turbine Governor Alinement,
W77-07804 8C

GRAND COULEE DAM
Dissolved Gas Supersaturation, Grand Coulee Dam Project, 1973,
W77-07722 5B

GRASSLAND
An Integrated Model-Approach to the Effect of Water Management on Crop Yield,
W77-08038 3F

GRAVITY THICKENING
Continuous Thickening of Biological Sludges, and the Influence of Stability,
W77-07923 5D

GREASE
Relationship Between BOD5 and Fats, Oils and Grease,
W77-07925 5G

GREAT LAKES
Frequency Analysis of Water Balance Components in Relation to Climatic Factors,
W77-07668 2A

Evaluation of Potential Use of Vegetation for Erosion Abatement Along the Great Lakes Shoreline,
W77-07788 4D

Analysis of IFYGL Rawinsonde Baseline Measurements,
W77-07790 2B

GREEN LAKE (WYO)
Clastic Sedimentation in a Modern Alpine Lake,
W77-07791 2J

GREEN RIVER BASIN (KY)
Operating Policy Adaptations for a Reservoir Systems, (Phase I),
W77-07603 4A

Operating Policy Simulation or a Reservoir Systems, (Phase II),
W77-07604 4A

GROUNDWATER
14C Evidence for the Origin of Arid Region Groundwater, Northeastern Province, Kenya,
W77-07611 7B

Energy Development and Its Effect on Ground Water,
W77-07691 5B

Research Foundation Utilizes Ground Water Heat Pumps,
W77-07693 8C

Ground Water Energy and the Ground Water Heat Pump,
W77-07694 8C

Law, Rules, and Regulations Pertaining to Groundwater in Nebraska,
W77-07695 4B

GROUNDWATER

Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

Gravity-Measuring Device for Water and Mineral Detection,
W77-08010 7B

Urban Land Use: Remote Sensing of Groundbasin Permeability,
W77-08065 7B

GROUNDWATER AVAILABILITY

Gravity-Measuring Device for Water and Mineral Detection,
W77-08010 7B

GROUNDWATER BARRIERS

Saltwater-Freshwater Interfaces in the '2,000-' and '2,800-Foot' Sands in the Capital Area Ground Water Conservation District,
W77-07703 4B

GROUNDWATER HEAT PUMPS

NWWA Ground Water Heat Pump Research Imperatives,
W77-07692 8C

Ground Water Energy and the Ground Water Heat Pump,
W77-07694 8C

GROUNDWATER RECHARGE

NWWA Ground Water Heat Pump Research Imperatives,
W77-07692 8C

Waste Water Reclamation in St. Croix,
W77-07875 5D

Waste Water Reclamation at St. Croix, U.S. Virgin Islands,
W77-08086 4B

GROUNDWATER RESOURCES

Waste Water Reclamation in St. Croix,
W77-07875 5D

GROUNDWATERHEAT PUMPS

Research Foundation Utilizes Ground Water Heat Pumps,
W77-07693 8C

GROWTH RATES

The Effect of Time Delay and Growth Rate Inhibition in the Bacterial Treatment of Waste Water,
W77-07924 5D

Optimal Growth Temperatures and Media Parameters of Bacterial Communities from Lakes of Different Trophic States,
W77-07994 5C

GULF OF MEXICO

Effects of Sample Handling on the Composition of Marine Sedimentary Pore Water,
W77-07742 5A

Preliminary Projections of Oil Spill Movement for Three Potential Deepwater Port Sites in the Gulf of Mexico,
W77-07753 5B

GULLY EROSION

Gully Wall Stability in Loess-Derived Alluvium,
W77-07764 4D

GULLY WALL STABILITY

Gully Wall Stability in Loess-Derived Alluvium,
W77-07764 4D

GUTHION

The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

HALL LAKE (WASH)

Physical, Chemical, and Biological Factors in the Initiation and Destruction of Biogenic Meromixis in a Soft-Water Lake,
W77-07963 5C

HAMBURG (WEST GERMANY)

Improvement and Expansion of the Drainage System of Hamburg,
W77-07890 5D

HARBORS

The Problem of the Sanitary Protection of the Waters of Ports and Coastal Zones of the Black Sea Basin, (In Russian),
W77-08014 5G

HARFORD COUNTY (MARYLAND)

Analyzing Nitrates in Well Water,
W77-07690 5A

HARVESTING

Making Aquatic Weeds Useful: Some Perspectives for Developing Countries.
W77-07964 4A

HATCHERY WATER SUPPLIES

Trout and Salmon Culture (Hatchery Methods) Hatchery Water Supply,
W77-07726 5G

HAWAII

Hydrologic Differences Between Selected Forested and Agricultural Soils in Hawaii,
W77-07765 2G

Inventory of Benthic Organisms and Plankton at Mokapu, Oahu,
W77-07798 2L

HAZARDOUS CHEMICALS

Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

HAZARDOUS SUBSTANCES

Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

HAZARDS

Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

Gas Detectors Determine Health Hazards in Sewage Treatment.
W77-07880 5A

HEAT TRANSFER

Heat and Salt Transfer Associated with Formation of Sea-Ice,
W77-07786 2C

HEATING

Ground Water Energy and the Ground Water Heat Pump,
W77-07694 8C

HEAVY METAL

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

HEAVY METALS

Mercury in Water, a Bibliography, Volume 3,
W77-07605 5A

Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges, Volume 4, (Analytical Methods for Sewage Sludge Analysis),
W77-07614 5A

Physiological Response of the Cunner, Tautogolabrus adspersus, To Cadmium. I. Introduction and Experimental Design,
W77-07831 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

Physiological Response of the Cunner, Tautogolabrus Adspersus, to Cadmium. VI Histopathology,
W77-07836 5C

Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

Organic Matter and Heavy Metal Uptake,
W77-07870 5

HELL'S CANYON DAM

Snake River, 1973 Dissolved Gas Studies.
W77-07710 5

HEMOPOIETIC TISSUE

Physiological Response of the Cunner, Tautogolabrus Adspersus, to Cadmium. V Histopathology,
W77-07836 5

HERBICIDES

Residues of Emulsified Xylene in Aquat Weed Control and Their Impact on Rainbo Trout, Salmo gairdneri,
W77-07805 5

HERRING

Die Kunstliche Aufzucht Von Clupea Harengu L., (The Artificial Propagation of Clupe Harengus L.),
W77-07711 5

HETEROTROPHIC MICROORGANISMS

Heterotrophic Nitrification in Soils and Aquat Environments, (In Russian),
W77-07754 5

HETEROTROPHIC PRODUCTION

Planktonic Microbial Heterotrophy: Its Si nificance to Community Biomass Production,
W77-07993 5

HETEROTROPHIC UPTAKE
The Influence of Temperature and Bacterial Numbers on the Heterotrophic Uptake of C14 Glucose in West Blue Lake, Manitoba,
W77-07995 5C

HIERARCHICAL MODELS
Hierarchical Modeling for the Planning and Management of a Total Regional Water Resource System: Joint Consideration of the Supply and Quality of Ground and Surface Water Resources,
W77-07793 4B

HIGH GRADIENT MAGNETIC SEPARATION
High Gradient Magnetic Separation of Food Processing Wastewater,
W77-07852 5D

HIGH PLAINS (TX)
The Application of Remote Sensing Technology to the Inventory of Playa Lakes in the High Plains of Texas,
W77-08077 7B

HIGHWAY EFFECTS
The Effect of Highway Deicing Salt on Chloride Budgets at Lake George, NY,
W77-08000 5B

HIGHWAYS
The Effect of Highway Deicing Salt on Chloride Budgets at Lake George, NY,
W77-08000 5B

HISTOPATHOLOGY
Physiological Response of the Cunner, Tautogolabrus Adspersus, to Cadmium. VI. Histopathology,
W77-07836 5C

HISTORIC FLOODS
Flood Plain Information, South Anna River, Hanover County, Va.
W77-07637 4A

Flood Plain Information, North Anna River, Hanover County, Va.
W77-07638 4A

Flood Plain Information: Allegheny River, Warren County, Pennsylvania,
W77-07640 4A

HISTORY
1776-1976: Notes on Water Quality Planning,
W77-07938 5G

HOSPITALS
R and D Project Provides Phys/Chem Data, Foxborough (Mass) State Hospital Plant Can Produce 'Superior Effluent Quality',
W77-07937 5D

HUNGARY
Stochastic Analysis of Short-Time Rainfalls,
W77-07671 2B

HURST'S LAW
A Simple Stochastic Modelling of Hurst's Law,
W77-07666 2E

HYDRAULIC CONDUCTIVITY
Comparisons of Two Models for Predicting the Relative Hydraulic Conductivity of Salt-Affected Swelling Soils,
W77-07777 2G

HYDRAULIC PROPERTIES
Mechanical and Hydraulic Properties of Rocks Related to Induced Seismicity,
W77-07779 8E

HYDRAULIC TURBINES
Passing Fish Through Hydraulic Turbines,
W77-07713 8I

HYDRAULICS
A Simple Stochastic Modelling of Hurst's Law,
W77-07666 2E

HYDRAZINE
Effects of Pollutants on Eggs, Embryos and Larvae of Amphibian Species,
W77-07820 5C

HYDROELECTRIC PLANTS
Passing Fish Through Hydraulic Turbines,
W77-07713 8I

HYDROELECTRIC POWER
Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

HYDROGEN ION CONCENTRATION
Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

Notes on the Exposure of Several Species of Fish to Sudden Changes in the Hydrogen Ion Concentration of the Water and to an Atmosphere of Pure Oxygen,
W77-07725 5C

Enzyme Kinetics--A Review with Emphasis on Inhibition of Enzymes,
W77-07732 5B

Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

Egg Hatchability and Tolerance of Brook Trout (Salvelinus fontinalis) Fry at Low pH,
W77-07844 5C

HYDROGEN SULFIDE
Gas Detectors Determine Health Hazards in Sewage Treatment.
W77-07880 5A

Coal Distn. Waste Liquor Purificn. to Remove Phenols, Ammonia- and Hydrogen Sulphide by 2-Stage Solvent Extn. and Distn.,
W77-07892 5D

HYDROGEOLOGY
14C Evidence for the Origin of Arid Region Groundwater, Northeastern Province, Kenya,
W77-07611 7B

Limnologic-Geologic Excursion in the Territory of the Lower Erft River, (In German),
W77-07799 5B

The Use of Skylab and LANDSAT in a Geohydrological Study of the Paleozoic Section, West-Central Bighorn Mountains, Wyoming,
W77-08063 7B

Hydrogeological Investigations in the Pampa of Argentina,
W77-08064 7B

HYDROGRAPHS
Structural Relation Between Parametric and Stochastic Hydrology Models,
W77-07664 2A

HYDROGRAPHY
Remote Sensing of Mississippi River Characteristics,
W77-08070 7B

HYDROLOGIC ASPECTS
Bayesian Estimation of Frequency of Hydrological Events,
W77-07650 2E

Hydrologic Land Use Classification of the Patuxent River Watershed Using Remotely Sensed Data,
W77-08073 7B

Land Use Classification for Hydrologic Models using Interactive Machine Classification of Landsat Data,
W77-08074 7B

Operational Water Management Applications of Snowcovered Area Observations,
W77-08084 7B

HYDROLOGIC BUDGET
Remote Sensing Inputs to Water Demand Modeling,
W77-08080 7B

HYDROLOGIC DATA
Study of the Rio Grande, Bolivia Highlights Some Basic Questions About Simulation,
W77-07945 2A

HYDROLOGIC OPTICS
Hydrologic Optics. Volume I. Introduction,
W77-07956 1A

Hydrologic Optics, Volume II. Foundations,
W77-07957 1A

Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

Hydrologic Optics. Volume IV. Imbeddings,
W77-07959 1A

Hydrologic Optics. Volume V. Properties,
W77-07960 1A

Hydrologic Optics. Volume VI. Surfaces,
W77-07961 1A

HYDROLOGIC PROPERTIES
The Use of Lysimeters in the Hydrological Investigation of the Unsaturated Zone,
W77-07780 2D

Hydrologic Optics, Volume II. Foundations,
W77-07957 1A

Hydrologic Optics. Volume VI. Surfaces,
W77-07961 1A

HYDROLOGIC SYSTEMS
New Forms of Correlation Relationships Between Positive Quantities Applied in Hydrology,
W77-07659 2A

Stochastic Difference Equation Modelling of Hydrological Processes,
W77-07663 2E

Application of Stochastic Hydrological Models in the Design of Lake Level Control,
W77-07681 4A

HYDROLOGY
Significance Tests of Periodicity in Hydrological Time Series,
W77-07665 2A

Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

HYDROPHYTES
Hydrophyte Biomass and Community Structure in a Small Oligotrophic New Hampshire Lake,
W77-07969 5C

The Availability of Chlorophyllide in Hydrophytes and Algas of Lake Trasimeno and the Variability of Pigment Content in Spirogyra, (In Italian),
W77-08044 5C

HYDROPSYCHE
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

HYDROSTATIC PRESSURE
Effects of Gas Supersaturated Columbia River Water on the Survival of Juvenile Chinook and Coho Salmon,
W77-07708 5C

Notes on the Exposure of Several Species of Fish to Sudden Changes in the Hydrogen Ion Concentration of the Water and to an Atmosphere of Pure Oxygen,
W77-07725 5C

HYSTERESIS
Vertical Mixing Mechanisms and Their Effects on Primary Production of Phytoplankton,
W77-07733 5C

ICE
Oil Spill at Deception Bay, Hudson Strait,
W77-07731 5G

An Experimental and Theoretical Study of the Turbulent and Laminar Convection Generated Under a Horizontal Ice Sheet Floating on Warm Salty Water,
W77-07773 2C

Electrical Resistivity Measurements on the Ross Ice Shelf,
W77-08051 2C

Penetration Depth of Closely Spaced Water-Free Crevasses,
W77-08052 2C

ICE SHELVES
Electrical Resistivity Measurements on the Ross Ice Shelf,
W77-08051 2C

IDAHO
Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

Dissolved Gas Supersaturation in the Salmon River, 1972-74,
W77-07719 5A

ILLINOIS
Eliminating Iron-Bearing Water from Well No. 7,
W77-07702 5G

Relationship Between BOD5 and Fats, Oils and Grease,
W77-07925 5G

IMBEDDINGS
Hydrologic Optics. Volume IV. Imbeddings,
W77-07959 1A

IMIDAN
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

IMMUE SYSTEM
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

IMPOUNDMENTS
Simulation of Impoundment Terrace Hydraulics,
W77-07767 8B

INCINERATION
Disposal of Feedlot Wastes Using a Two-Stage Process with Net Energy Production,
W77-07816 5D

Golar Rubbish, Oil Sludge and Sewage Incinerator.
W77-07911 5E

Incineration Method and System,
W77-08098 5E

INDEXING
A Technique to Index Soil Pores and Aggregates Larger than 20 Micrometers,
W77-08059 2G

INDIANA
Stochastic Difference Equation Modelling of Hydrological Processes,
W77-07663 2E

Soil Formation on Loess in Southwestern Indiana: I. Loess Stratigraphy and Soil Morphology,
W77-07762 2G

Soil Formation on Loess in Southwestern Indiana: II. Distribution of Clay and Free Oxides and Fragipan Formation,
W77-07763 2G

INDICATORS
Biological Long-Term Investigations of Swedish Lakes,
W77-07998 5C

INDUSTRIAL PRODUCTION
Oregon's Long-Range Requirements for Water. Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6D

INDUSTRIAL WASTES
Oregon's Long-Range Requirements for Water. Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6D

The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

Industry Monitors County Storm Sewer Water,
W77-07933 5D

Process for Eliminating Reactive Chlorinated Organic Compounds from Aqueous Solutions,
W77-08021 5D

INDUSTRIAL WATER
Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

Oregon's Long-Range Requirements for Water. Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6D

INDUSTRIAL WATER (USE)
Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

INFILTRATION
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

A Statistical Filtration Model for the Inseepage of Melt Water into Frozen Ground,
W77-07672 2G

INFILTRATION RATES
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

INFORMATION EXCHANGE
Information Transferral within a Distributed Data Base Via a Generalized Mapping Language,
W77-07813 6A

INFORMATION RETRIEVAL
Municipal Information Systems: Evaluation of Policy Related Research. Volume 2. Computer Utilization in Local Government,
W77-07631 6B

INFORMATION TRANSFERRAL
Information Transferral within a Distributed Data Base Via a Generalized Mapping Language,
W77-07813 6A

INHIBITION
Enzyme Kinetics--A Review with Emphasis on Inhibition of Enzymes,
W77-07732 5B

The Effect of Time Delay and Growth Rate Inhibition in the Bacterial Treatment of Waste Water,
W77-07924 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

INHIBITION RATES
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

INKS LAKE STATE PARK (TX)
State Park Gets Good Treatment, Effluents Will Be Used for Irrigation to Reduce Extensive Requirements,
W77-07936 5D

INLAND WATERWAYS
Tolls: Efficiency and Equity Issues for Inland Waterways,
W77-08039 6C

INSECTICIDES
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

Extraction and Separation of Polychlorinated Biphenyls from Pesticide Monitoring Samples,
W77-07826 5A

INSTITUTIONAL CONSTRAINTS
Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

INSTITUTIONS
Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

INSTRUMENTATION
Fritted Glass Bead Materials as Tensiometers and Tension Plates,
W77-07760 2G

The Errors Involved in Inferring Salinity from Sound Velocity,
W77-07774 2L

The Use of Lysimeters in the Hydrological Investigation of the Unsaturated Zone,
W77-07780 2D

Analysis of IFYGL Rawinsonde Baseline Measurements,
W77-07790 2B

Waste Water Plants Use Less Instrumentation than Related Industries,
W77-07872 5D

Automatic Analysis Contributes to Waste Water Treatment Efficiency,
W77-07909 5A

Low Frequency Turbulence and Vertical Temperature Microstructure in Lake Tahoe, California-Nevada,
W77-07984 2H

INTER-BASIN TRANSFERS
Oregon's Long-Range Requirements for Water. Protection of Areas of Origin, Appendix VII,
W77-07627 6D

INTERCEPTOR SEWERS
The Conception, Design, and Construction of Metropolitan Toronto Mid-Toronto Sewer,
W77-07888 8B

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES
Analysis of IFYGL Rawinsonde Baseline Measurements,
W77-07790 2B

INTERSTITIAL WATER
Effects of Sample Handling on the Composition of Marine Sedimentary Pore Water,
W77-07742 5A

INVARIANT IMBEDDING
Hydrologic Optics. Volume IV. Imbeddings,
W77-07959 1A

INVERTEBRATES
The Invertebrate Fauna of the Broel and Its Tributary Brooks, (In German),
W77-07746 5C

The Invertebrates on Submerged Macrophytes in Three Masurian Lakes,
W77-07987 5C

ION EXCHANGE
Biological Regeneration of Ammonium-Saturated Clinoptilolite. I. Initial Observations,
W77-07942 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

IONS
Effect of Major Ion Variations in the Marine Environment on the Specific Gravity--Conductivity--Chlorinity--Salinity Relationship,
W77-07802 2K

IPSWICH RIVER (MA)
Flood Plain Information: Ipswich River, North Reading and Wilmington, Massachusetts,
W77-07644 4A

IRON
Eliminating Iron-Bearing Water from Well No. 7,
W77-07702 5G

Limnologic-Geologic Excursion in the Territory of the Lower Erft River, (In German),
W77-07799 5B

IRON-BEARING WATER
Eliminating Iron-Bearing Water from Well No. 7,
W77-07702 5G

IRRADIANCE FIELDS
Hydrologic Optics. Volume V. Properties,
W77-07960 1A

IRRADIATION
Hydrologic Optics. Volume V. Properties,
W77-07960 1A

IRRIGATION
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

Model of Salt Flow in Soil with a Source-Sink Term,
W77-07761 2G

A Second Look at Water Reuse,
W77-07908 5D

Flow Controller Device,
W77-08017 3F

Fluid Flow Regulator,
W77-08018 3F

Irrigation System,
W77-08019 3F

Sprinkler Adapted for Attachment to the Ground,
W77-08025 3F

IRRIGATION CANALS
Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

IRRIGATION CONSTRUCTION
Manuel Technique Du Village, (Village Technology Handbook), (Vols. 1 and 2).
W77-07628 3F

IRRIGATION DESIGN
Manuel Technique Du Village, (Village Technology Handbook), (Vols. 1 and 2).
W77-07628 3F

IRRIGATION EFFICIENCY
Flow Controller Device,
W77-08017 3F

Irrigation System,
W77-08019 3F

Sprinkler Adapted for Attachment to the Ground,
W77-08025 3F

IRRIGATION PRACTICES
Flow Controller Device,
W77-08017 3F

Sprinkler Adapted for Attachment to the Ground,
W77-08025 3F

IRRIGATION SYSTEM
Irrigation System,
W77-08019 3F

IRRIGATION SYSTEMS
Manuel Technique Du Village, (Village Technology Handbook), (Vols. 1 and 2).
W77-07628 3F

Fluid Flow Regulator,
W77-08018 3F

IRRIGATION WATER
Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

Optimization of Water Use for Irrigation,
W77-07851 3F

IRTYSH RIVER (KAZAKH-SSR)
Experience of the Pavlodar Oblast Public Health Service in Sanitary Protection of the Irtysh River, (In Russian),
W77-07686 5G

ISOLATION SIMULATOR
Electronic Isolation Simulator for Hydraulic Turbine Governor Alinement,
W77-07804 8C

ISONVCHIA
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

ISRAEL
Determination of Salt-Water Interface by Electric Resistivity Depth Soundings,
W77-07783 2F

Direct and Indirect Waste Water Reuse for Municipal Purposes,
W77-07866 5D

Israel's Use of Nonionic Surfactants,
W77-07929 5B

JAPAN
Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

Some Experiments on the Gas-Disease in Freshwater Fishes, (In Japanese),
W77-07714 5C

Characteristics of the Severe Rainstorm,
W77-07784 2B

JAPAN (KYOTO)
On the Relation of the Diatiom FLora and Water Quality in the Uji River Kyoto, (In Japanese),
W77-08089 5

JERSEY CREEK (KS)
Special Flood Hazard Report: Jersey Creek, Kansas City, Kansas.
W77-07636 4A

JOINT TREATMENT
Joint Municipal Corporation Waste Water Treatment,
W77-07920 5D

JUVENILE FISH
Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

KALMAN FILTERS
Use of State Estimation Techniques in Water Resource System Modeling, by Dennis P. Lettenmaier and Stephen J. Burges,
W77-08035 5B

KANSAS
Special Flood Hazard Report: Jersey Creek, Kansas City, Kansas.
W77-07636 4A

Feeding of Forage Fish in Turbid Kansas Reservoirs,
W77-07817 2H

Microwave Remote Sensing of Soil Moisture,
W77-08066 7B

KANSAS CITY (KS)
Special Flood Hazard Report: Jersey Creek, Kansas City, Kansas.
W77-07636 4A

KAPLAN TURBINES
Passing Fish Through Hydraulic Turbines,
W77-07713 8I

KENYA
14C Evidence for the Origin of Arid Region Groundwater, Northeastern Province, Kenya,
W77-07611 7B

KERN COUNTY (CALIF)
Remote Sensing Inputs to Water Demand Modeling,
W77-08080 7B

KINETICS
Process Stability of Activity Sludge Processes,
W77-07857 5D

Kinetics of Breakpoint Chlorination and Disinfection,
W77-08095 5D

Mechanisms and Kinetic Parameters in Granular Media Filtration,
W77-08097 5D

KLAMATH DRAINAGE BASIN (OR)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

LABORATORY EQUIPMENT
Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

LABORATORY TESTS
Some Experiments on the Gas-Disease in Freshwater Fishes, (In Japanese),
W77-07714 5C

Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

LAKE BALATON
Application of Stochastic Hydrological Models in the Design of Lake Level Control,
W77-07681 4A

LAKE BASINS
Phytoplankton Production in Lake Memphremagog, Quebec (Canada)--Vermont (U.S.A.),
W77-07962 5C

LAKE ERIE
The Application of ERTS-1 Digital Data to Water Transport Phenomena in the Point Pelee-Rondeau Area,
W77-07981 2J

LAKE ESROM (DENMARK)
Population Ecology and Production of Benthic Detritivores,
W77-07979 5C

Stability in Structure and Function of the Mud-Water Interface,
W77-07985 5C

LAKE GEORGE (NY)
The Effect of Highway Deicing Salt on Chloride Budgets at Lake George, NY,
W77-08000 5B

LAKE HART (ONTARIO)
Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

LAKE JACKSON (GEO)
Electron Transport Analysis as an Indicator of Biological Oxidation in Freshwater Sediments,
W77-07992 5C

LAKE KINNEREST (ISRAEL)
Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

LAKE LEVELS
Application of Stochastic Hydrological Models in the Design of Lake Level Control,
W77-07681 4A

LAKE MEMPHREMAGOG (QUEBEC-VE)
Phytoplankton Production in Lake Memphremagog, Quebec (Canada)--Vermont (U.S.A.),
W77-07962 5C

LAKE MICHIGAN
Sedimentation in Lower Green Bay, Wisconsin,
W77-07980 2J

LAKE MORPHOMETRY
Physical, Chemical, and Biological Factors in the Initiation and Destruction of Biogenic Meromixis in a Soft-Water Lake,
W77-07963 5C

LAKE ONTARIO
Observational and Numerical Evidence for Wind-Forced Coastal Trapped Long Waves,
W77-07771 2L

A Carbon Budget for Lake Ontario,
W77-07967 5C

Phosphorus Regeneration by Natural Populations of Limnetic Zooplankton,
W77-07972 5C

Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

LAKE REDSTONE (WI)
Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

LAKE REHABILITATION
Phosphorus Release from a Highly Eutrophic Lake Sediment,
W77-07999 5C

LAKE RESTORATION
Chemical Interactions in a Eutrophic Lake,
W77-08002 5C

LAKE ROOSEVELT
Dissolved Gas Supersaturation, Grand Coulee Dam Project, 1973,
W77-07722 5B

LAKE SEDIMENTS
Clastic Sedimentation in a Modern Alpine Lake,
W77-07791 2J

Oxygen Uptake of Sediments in Castle Lake, California,
W77-07976 5C

Phosphorus Release from a Highly Eutrophic Lake Sediment,
W77-07999 5C

LAKE SODRA BERGUNDASJON (SWEDEN)
Phosphorus Release from a Highly Eutrophic Lake Sediment,
W77-07999 5C

LAKE SUPERIOR
Temperature Regime in Lake Superior at Silver Bay, Minnesota,
W77-07970 1A

LAKE TAHOE (CALIF-NEV)
Low Frequency Turbulence and Vertical Temperature Microstructure in Lake Tahoe, California-Nevada,
W77-07984 2H

LAKE WASHINGTON (WASH)
Diel Phosphate Flux in Lake Washington, U.S.A.,
W77-07968 5C

LAKES
Application of Stochastic Hydrological Models in the Design of Lake Level Control,
W77-07681 4A

Model of a Lake Reservoir,
W77-07687 4A

Clastic Sedimentation in a Modern Alpine Lake,
W77-07791 2J

Lakes Will Take the Pollution Load Off Old Father Tame,
W77-07913 5G

Whole-Lake Eutrophication Experiments with Phosphorus, Nitrogen and Carbon.
W77-07965 5C

The Influence of Mineral Fertilization on Phytoplankton Production in Lakes of Various Trophic Types,
W77-07988 5C

Optimal Growth Temperatures and Media Parameters of Bacterial Communities from Lakes of Different Trophic States,
W77-07994 5C

The Application of Remote Sensing Technology to the Inventory of Playa Lakes in the High Plains of Texas,
W77-08077 7B

LAKES OF THE MENOMINEES (WI)
Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

LAND CLASSIFICATION
Hydrologic Land Use Classification of the Patuxent River Watershed Using Remotely Sensed Data,
W77-08073 7B

LAND DISPOSAL
Workshop Proceedings -- Research Needs Related to Recycling Urban Wastewater on Land,
W77-07607 5D

LAND FORMING
The Application of ERTS-1 Digital Data to Water Transport Phenomena in the Point Pelee-Rondeau Area,
W77-07981 2J

LAND MANAGEMENT
Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

Implementation of Non-Structural Alternatives in Flood Damage Abatement,
W77-07795 6F

Local Control of Land Use: Profile of a Problem,
W77-08003 6F

LAND RESOURCES
An Analysis of Alternative Flood Management Plans in Upstream Watersheds. Connecticut River Basin Supplemental Flood Management Study, Phase 2,
W77-07632 6F

LAND USE
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

Hydrologic Differences Between Selected Forested and Agricultural Soils in Hawaii,
W77-07765 2G

Implementation of Non-Structural Alternatives in Flood Damage Abatement,
W77-07795 6F

Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

Local Control of Land Use: Profile of a Problem,
W77-08003 6F

Best Practicable Waste Treatment Screening Model,
W77-08037 5D

Hydrologic Land Use Classification of the Patuxent River Watershed Using Remotely Sensed Data,
W77-08073 7B

Land Use Classification for Hydrologic Models using Interactive Machine Classification of Landsat Data,
W77-08074 7B

LAND USE CONTROLS
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

LAND USE DECISION-MAKING SYSTEM (LUDMS)
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

LANDSAT
Utilization of LANDSAT Data for Water Quality Surveys in the Choptank River,
W77-08072 5A

LATRINE CONSTRUCTION
Manuel Technique Du Village, (Village Technology Handbook), (Vols. 1 and 2).
W77-07628 3F

LEAD
Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

LEGAL ASPECTS
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

Oregon's Long-Range Requirements for Water. Protection of Areas of Origin, Appendix VII,
W77-07627 6D

LEGISLATION
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

Financing: There Must be a Better Way,
W77-07873 5G

Appraisal of Areawide Waste Water Planning,
W77-07874 5G

LEOPARD FROG
Effects of Pollutants on Eggs, Embryos and Larvae of Amphibian Species,
W77-07820 5C

LETHAL LIMIT
Experimental Data for the Hygienic Standardization of Diphenylamine and Diphenyldiethylurea in Water Bodies, (In Russian),
W77-07700 5G

LEVEES
Determination of the Degree of Protection Offered by Flood Control Systems on the Basis of Distribution Functions,
W77-07673 8B

LIFE CYCLES
Population Ecology and Production of Benthic Detritivores,
W77-07979 5C

LIGHT
Hydrologic Optics, Volume II. Foundations,
W77-07957 1A

Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

Hydrologic Optics. Volume IV. Imbeddings,
W77-07959 1A

Hydrologic Optics. Volume V. Properties,
W77-07960 1A

LIGHT FIELDS
Hydrologic Optics. Volume V. Properties,
W77-07960 1A

LIGHT INTENSITY
Feeding of Forage Fish in Turbid Kansas Reservoirs,
W77-07817 2H

Hydrologic Optics. Volume I. Introduction,
W77-07956 1A

LIGNITE
Less-Costly Activated Carbon for Sewage Treatment.
W77-07934 5D

LIMITING FACTORS
Nutrient Limitation in a Small Oligotrophic Lake in New Hampshire,
W77-07974 5C

LIMNOLOGY
Studies of the Benthic Environment of Twin Lakes.
W77-07806 5C

LINEAR PROGRAMMING
A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

LIPIDS
Relationship Between BOD5 and Fats, Oils and Grease,
W77-07925 5G

LIQUID WASTES
Macerator-Sterilizer Sewage Treatment System,
W77-07895 5D

LITERATURE REVIEW
Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

LITERATURE REVIEWS
Effect of Air Pollution on Pinus Strobus L. and Genetic Resistance - A Literature Review,
W77-07829 5C

LITTORAL
The Invertebrates on Submerged Macrophytes in Three Masurian Lakes,
W77-07987 5C

LOESS
Soil Formation on Loess in Southwestern Indiana: I. Loess Stratigraphy and Soil Morphology,
W77-07762 2G

Soil Formation on Loess in Southwestern Indiana: II. Distribution of Clay and Free Oxides and Fragipan Formation,
W77-07763 2G

LOG PEARSON TYPE III
Floodflow Formulas for Urbanized and Nonurbanized Areas of Connecticut,
W77-07612 4C

LOGGING (RECORDING)
Open-Hole Porosity Logs Can Be Used in Cased Holes,
W77-07698 8G

LONG-TERM STORAGE
Multiple Markov Processes in Hydrology and Their Importance for Stochastic Analysis of Water Accumulation Problems,
W77-07684 4A

LOUISIANA
Saltwater-Freshwater Interfaces in the '2,000-' and '2,800-Foot' Sands in the Capital Area Ground Water Conservation District,
W77-07703 4B

LOWER GREAT MIAMI RIVER VALLEY (OHIO)
Hierarchical Modeling for the Planning and Management of a Total Regional Water Resource System: Joint Consideration of the Supply and Quality of Ground and Surface Water Resources,
W77-07793 4B

LOWER GREEN BAY (LAKE MICHIGAN)
Sedimentation in Lower Green Bay, Wisconsin,
W77-07980 2J

LYSIMETERS
The Use of Lysimeters in the Hydrological Investigation of the Unsaturated Zone,
W77-07780 2D

MACROPHYTES
The Invertebrates on Submerged Macrophytes in Three Masurian Lakes,
W77-07987 5C

MADHYA PRADESH (INDIA)
E.L.C. Water Development Project, Betul (M.P.) India: Fifth Annual Report, 1975-1976,
W77-07696 8B

MAINTENANCE
Some Reflections of a Sewage Works Manager,
W77-07952 5D

MALATHION
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

MALHEUR LAKE DRAINAGE BASIN (OR)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

MANGROVE SWAMPS
Mangrove Ecology and Deltaic-Estuarine Geomorphology: Cambridge Gulf-Ord River, Western Australia,
W77-07738 2L

MANURE DISPOSAL
Disposal of Feedlot Wastes Using a Two-Stage Process with Net Energy Production,
W77-07816 5D

MAPPING
Flood Hazard Studies in Central Texas Using Orbital and Suborbital Remote Sensing Imagery,
W77-08069 7B

Snow Survey from Space, with Emphasis on the Results of the Analysis of Skylab EREP S192 Multispectral Scanner Data,
W77-08082 7B

MARINE AQUICULTURE
Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

MARINE ENVIRONMENT
A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

MARINE FISH
Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, To Cadmium. I. Introduction and Experimental Design,
W77-07831 5C

MARKOV PROCESSES
Generation of Multivariate Synthetic Flows,
W77-07610 2A

Stochastic Structure of a Process of Average Monthly Flows,
W77-07651 2E

Simulation of Daily Rainfall Series Using Markov Chain Models,
W77-07660 2A

Multiple Markov Processes in Hydrology and Their Importance for Stochastic Analysis of Water Accumulation Problems,
W77-07684 4A

Environmental Policy Choice Under Uncertainty,
W77-08004 6G

MARYLAND
Mutagenic Potential of Petroleum Byproducts in Chesapeake Bay Waters,
W77-07606 5B

Analyzing Nitrates in Well Water,
W77-07690 5A

Utilization of LANDSAT Data for Water Quality Surveys in the Choptank River,
W77-08072 5A

Hydrologic Land Use Classification of the Patuxent River Watershed Using Remotely Sensed Data,
W77-08073 7B

Land Use Classification for Hydrologic Models using Interactive Machine Classification of Landsat Data,
W77-08074 7B

MASSACHUSETTS
Flood Plain Information: Ipswich River, North Reading and Wilmington, Massachusetts,
W77-07644 4A

The ARGO MERCHANT Oil Spill. A Preliminary Scientific Report,
W77-07807 5C

R and D Project Provides Phys/Chem Data, Foxborough (Mass) State Hospital Plant Can Produce 'Superior Effluent Quality',
W77-07937 5D

MATHEMATICAL MODELS
The Representation of a Short Period of Experimental Catchment Data by a Linear Stochastic Difference Equation,
W77-07646 2

Some Applications of Stochastic Flow Generation,
W77-07647 2A

Elements of Runoff Periodicity in Tasks of Modelling,
W77-07655 2E

Cyclical Structure of the Hydrological Series and the Nature of Individual Components,
W77-07656 2E

Stochastic Difference Equation Modelling of Hydrological Processes,
W77-07663 2E

A Simple Stochastic Modelling of Hurst's Law,
W77-07666 2E

A Statistical Filtration Model for the Inseepage of Melt Water into Frozen Ground,
W77-07672 2G

Hierarchical Modeling for the Planning and Management of a Total Regional Water Resource System: Joint Consideration of the Supply and Quality of Ground and Surface Water Resources,
W77-07793 4B

Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

Mathematical Programming within the Context of a Generalized Data Base Management System,
W77-07850 6A

Process Stability of Activity Sludge Processes,
W77-07857 5D

A Note on the Fair Division of Pollution Rights,
W77-08006 6G

Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

Optimal Operation of Water Resources Systems--II,
W77-08048 4A

MATHEMATICAL STUDIES
Spectral Analysis of the Structure of Hydrological Series,
W77-07653 2E

On Deterministic Components in Natural Streamflow,
W77-07658 2E

New Forms of Correlation Relationships Between Positive Quantities Applied in Hydrology,
W77-07659 2A

MAXIMUM PROBABLE FLOOD
Flood Plain Information, South Anna River, Hanover County, Va.
W77-07637 4A

Flood Plain Information, North Anna River, Hanover County, Va.
W77-07638 4A

MAYFLIES
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

MEASUREMENT
Sediment Measurement in Estuarine and Coastal Areas,
W77-07748 2L

The Errors Involved in Inferring Salinity from Sound Velocity,
W77-07774 2L

Analysis of IFYGL Rawinsonde Baseline Measurements,
W77-07790 2B

How to Determine Waste Water Flow,
W77-07881 5F

Automatic Analysis Contributes to Waste Water Treatment Efficiency,
W77-07909 5A

Microbial ATP Studies,
W77-07978 5C

Sedimentation: Measurements in Experimental Enclosures,
W77-07990 5C

Energy Exchange at a Glacier Surface: An Alternative to Aerodynamic Methods of Measurement,
W77-08053 2C

The Measurement of Rainfall at Ground Level,
W77-08061 2B

MECHANICAL PROPERTIES
Mechanical and Hydraulic Properties of Rocks Related to Induced Seismicity,
W77-07779 8E

MELT WATER
A Statistical Filtration Model for the Inseepage of Melt Water into Frozen Ground,
W77-07672 2G

MELTING
An Experimental and Theoretical Study of the Turbulent and Laminar Convection Generated Under a Horizontal Ice Sheet Floating on Warm Salty Water,
W77-07773 2C

MEMBRANE PROCESSES
Preparation of Composite Reverse Osmosis Membranes by Plasma Polymerization,
W77-07792 3A

MEMBRANES
Preparation of Composite Reverse Osmosis Membranes by Plasma Polymerization,
W77-07792 3A

Waste Water Renovation by Sewage Ultrafiltration,
W77-07941 5D

MENHADEN
Preliminary Studies of Menhaden and Their Mass Mortalities in Long Island and New Jersey Waters,
W77-07724 5C

MERCURY
Mercury in Water, a Bibliography, Volume 3,
W77-07605 5A

Mercury in the Biogeochemical Environment,
W77-07823 5B

Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

Reductions in Biomass and Diversity Resulting from Exposure to Mercury in Artificial Streams,
W77-07838 5C

MEROMIXIS
Physical, Chemical, and Biological Factors in the Initiation and Destruction of Biogenic Meromixis in a Soft-Water Lake,
W77-07963 5C

MERRIMACK RIVER (NH)
Flood Plain Information: Merrimack and Souhegan Rivers, Litchfield and Merrimack, New Hampshire.
W77-07645 4A

MESOTROPHY
On the Relation of the Diatiom FLora and Water Quality in the Uji River Kyoto, (In Japanese),
W77-08089 5

META-SYSTOX
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

METABOLISM
Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

METAL-COMPLEXING PROTEINS
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

METALS
Experimental Study of Acute Toxicity of Salts of Cobalt, Antimony, Strontium and Silver Crustaceans and Their Larvae and in Some Teleosts, (In French),
W77-07728 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium.
W77-07830 5C

Reductions in Biomass and Diversity Resulting from Exposure to Mercury in Artificial Streams,
W77-07838 5C

Ultrastructural Study of Lesions in Gills of a Marine Shrimp Exposed to Cadmium,
W77-07845 5C

Effects of Trace Elements on Nitrogen Mineralization in Soils,
W77-07864 5B

METAMORPHIC ROCKS
Metamorphic Reactions in Flysch Rocks,
W77-07609 2K

METHEMOGLOBIN
Protective Effect of Chloride on Nitrite Toxicity to Coho Salmon (Oncorhynchus Kisutch),
W77-07840 5C

METHODOLOGY
An Analysis of the Feasibility of Using Air Agitation to Reduce Gas Saturations in Sea Water at Pilgrim Nuclear Power Station,
W77-07720 5G

Summary of Gas Supersaturation Research at Western Fish Toxicology Station (EPA), Corvallis, Oregon, 1972-1974.
W77-07729 5C

Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

Methodological Problems in Estimating Recreational Demand Functions and Evaluating Recreational Benefits,
W77-08007 6B

METHOXYCHLOR
Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

METHYL PARATHION
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

METHYLHYDRAZINE
Effects of Pollutants on Eggs, Embryos and Larvae of Amphibian Species,
W77-07820 5C

METHYLMERCURY
Mercury in Water, a Bibliography, Volume 3,
W77-07605 5A

MEVINPHOS
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

MEXICO
Flooding Frequence of Hypersaline Coastal Environments Determined by Orbital Imagery: Geologic Implications,
W77-07751 2L

MICROORGANISMS
Effect of South Louisiana Crude Oil and No. 2 Fuel Oil on Growth of Heterotrophic Microorganisms, Including Proteolytic, Lipolytic, Chitinolytic and Celluloytic Bacteria,
W77-07736 5C

Utilization of Mixed Hydrocarbon Substrate by Petroleum-Degrading Microorganisms,
W77-07749 5C

Planktonic Microbial Heterotrophy: Its Significance to Community Biomass Production,
W77-07993 5C

MID-COAST DRAINAGE BASIN (OR)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

MILL RIVER (MA)
An Analysis of Alternative Flood Management Plans in Upstream Watersheds. Connecticut River Basin Supplemental Flood Management Study, Phase 2,
W77-07632 6F

MINDEL LAKE (GERMANY)
Bacterial Decomposition of Different Polysaccharides in a Eutrophic Lake,
W77-07991 5C

MINE WASTES
Limnologic-Geologic Excursion in the Territory of the Lower Erft River, (In German),
W77-07799 5B

Rum Jungle Environmental Studies, Summary Report,
W77-07822 5B

MINERAL INDUSTRY
Rum Jungle Environmental Studies, Summary Report,
W77-07822 5B

MINERALOGY
Effects of Trace Elements on Nitrogen Mineralization in Soils,
W77-07864 5B

MINNESOTA
Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

Temperature Regime in Lake Superior at Silver Bay, Minnesota,
W77-07970 1A

MIREX
Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

MIRROR LAKE (NH)
Hydrophyte Biomass and Community Structure in a Small Oligotrophic New Hampshire Lake,
W77-07969 5C

Nutrient Limitation in a Small Oligotrophic Lake in New Hampshire,
W77-07974 5C

MISSISSIPPI
Influence of Suspended Sediment on the Temperatures of Surface Waters of Reservoirs,
W77-07975 5C

MISSISSIPPI RIVER
Remote Sensing of Mississippi River Characteristics,
W77-08070 7B

MIXING
Application of Thermal Scanning to the Study of Transverse Mixing in Rivers,
W77-08071 5B

MODEL STUDIES
Generation of Multivariate Synthetic Flows,
W77-07610 2A

Problems Encountered in Synthetic River Flow Generation Procedures,
W77-07657 2A

Multidimensional Statistic Modelling of Hydrological Processes on the Basis of Structural Analysis of the Empirical Hydrographs of Runoff,
W77-07662 2A

Structural Relation Between Parametric and Stochastic Hydrology Models,
W77-07664 2A

Significance Tests of Periodicity in Hydrological Time Series,
W77-07665 2A

A Simple Stochastic Modelling of Hurst's Law,
W77-07666 2E

In Hydrology h is a Household Word,
W77-07667 2A

Mathematical Models Resulting from Statistical Analysis of the Mean Monthly Flow,
W77-07669 2E

Flood Frequency Studies of Rivers in the Federal Republic of Germany,
W77-07670 2E

Stochastic Analysis of Short-Time Rainfalls,
W77-07671 2B

A Statistical Filtration Model for the Inseepage of Melt Water into Frozen Ground,
W77-07672 2G

Determination of the Degree of Protection Offered by Flood Control Systems on the Basis of Distribution Functions,
W77-07673 8B

Statistical Analysis Applied to the Study of the Components of a Flood Wave,
W77-07674 2E

A Multivariate Mathematical Model of Monthly River Flow,
W77-07675 2E

Finding Regularities in Long-Term Streamflow Fluctuations by Analysis of Hydrological Ensembles,
W77-07676 2E

Optimal Spatial Interpolation and Its Errors in the Case of Various Distances Between Observation Points or Watershed Centres,
W77-07677 4D

Use of Cross-Correlation Techniques for Determining the Relationship Between Groundwater Levels and Sources in the Nile Delta Area,
W77-07679 2F

Time and Frequency-Domain Identification of a Casual Bivariate Stochastic Process,
W77-07680 2E

Model of Salt Flow in Soil with a Source-Sink Term,
W77-07761 2G

Simulation of Impoundment Terrace Hydraulics,
W77-07767 8B

Comparisons of Two Models for Predicting the Relative Hydraulic Conductivity of Salt-Affected Swelling Soils,
W77-07777 2G

Mechanical and Hydraulic Properties of Rocks Related to Induced Seismicity,
W77-07779 8E

Heat and Salt Transfer Associated with Formation of Sea-Ice,
W77-07786 2C

Hierarchical Modeling for the Planning and Management of a Total Regional Water Resource System: Joint Consideration of the Supply and Quality of Ground and Surface Water Resources,
W77-07793 4B

Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

Study of the Rio Grande, Bolivia Highlights Some Basic Questions About Simulation,
W77-07945 2A

Process Technological Background Regarding New Protective Regulations for Water Bodies-Results of Experiments on Nitrification and Phosphorus Elimination in Zurich and Bern. II. Process Technological Background of Nitrification in Activated Sludge Plants (Verfahrenstechnische Unterlagen im Hinblick auf die neuen Gewaesserschutz-Anforderungen-Ergebnisse der Versuche ueber die Nitrifikation und Phosphorelimination in Zuerich und Bern. II. Verfahrenstechnische Grundlagen der Nitrifikation in Belebtschlammanlagen),
W77-07953 5D

Three Case Studies on the Application of the Storm Water Management Model,
W77-07955 5B

Use of State Estimation Techniques in Water Resource System Modeling, by Dennis P. Lettenmaier and Stephen J. Burges,
W77-08035 5B

Penetration Depth of Closely Spaced Water-Free Crevasses,
W77-08052 2C

Energy Exchange at a Glacier Surface: An Alternative to Aerodynamic Methods of Measurement,
W77-08053 2C

A Theoretical Framework for the Description of Estuaries,
W77-08057 2L

Application of Thermal Scanning to the Study of Transverse Mixing in Rivers,
W77-08071 5B

Remote Sensing Inputs to Water Demand Modeling,
W77-08080 7B

MOISTURE TENSION
Fritted Glass Bead Materials as Tensiometers and Tension Plates,
W77-07760 2G

MONITORING
Examination of Sewage Sludge for Enteroviruses, Volume 2,
W77-07615 5B

Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

Dissolved Gas Supersaturation in the Salmon River, 1972-74,
W77-07719 5A

Monitoring Dissolved Hydrocarbons as a Function of the Tidal Cycle (New York Harbor),
W77-07740 5B

Flooding Frequence of Hypersaline Coastal Environments Determined by Orbital Imagery: Geologic Implications,
W77-07751 2L

Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

Extraction and Separation of Polychlorinated Biphenyls from Pesticide Monitoring Samples,
W77-07826 5A

Gas Detectors Determine Health Hazards in Sewage Treatment.
W77-07880 5A

How to Determine Waste Water Flow,
W77-07881 5F

Relationship Between BOD5 and Fats, Oils and Grease,
W77-07925 5G

Industry Monitors County Storm Sewer Water,
W77-07933 5D

Some Reflections of a Sewage Works Manager,
W77-07952 5D

Utilization of LANDSAT Data for Water Quality Surveys in the Choptank River,
W77-08072 5A

Factors Affecting Snow Assessment from LANDSAT Data,
W77-08083 7B

MONTE CARLO METHOD
Model of a Lake Reservoir,
W77-07687 4A

MONTHLY
The Generation of Synthetic Monthly Runoff Records for Ungauged British Catchments,
W77-07661 2A

A Multivariate Mathematical Model of Monthly River Flow,
W77-07675 2E

MORESTAN
Determination of Morestan in Water, Soil, and Cucumbers by Thin-Layer Chromatography, (In Russian),
W77-07688 5A

MORTALITIES
Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

The Gas Bubble Disease of Fish, (Die Gasblasen Krankheit Bei Fischen,
W77-07716 5C

Mobile Fish Cage and Depth Distribution Studies, Columbia and Snake Rivers,
W77-07723 5C

MORTALITY
Passing Fish Through Hydraulic Turbines,
W77-07713 8I

Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

Preliminary Studies of Menhaden and Their Mass Mortalities in Long Island and New Jersey Waters,
W77-07724 5C

MOVEMENT
Ice Movements in the Beaufort Sea 1973-1975: Determination by ERTS Imagery,
W77-07769 2C

MUD-WATER INTERFACES
Stability in Structure and Function of the Mud-Water Interface,
W77-07985 5C

MULLETS
Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

MULTI-STAGE FILTER PRESS
Multi-Stage Filter Press.
W77-07914 5D

MULTIPLE-USE
Modeling Multiple-Use in Natural Areas: Part II - The Santee Swamp Study,
W77-08050 6A

MUNICIPAL INFORMATION SYSTEMS
Municipal Information Systems: Evaluation of Policy Related Research. Volume 2. Computer Utilization in Local Government,
W77-07631 6B

MUNICIPAL WASTES
Workshop Proceedings -- Research Needs Related to Recycling Urban Wastewater on Land,
W77-07607 5D

MUNICIPAL WASTEWATER
Workshop Proceedings -- Research Needs Related to Recycling Urban Wastewater on Land,
W77-07607 5D

MUNICIPAL WATER
Direct and Indirect Waste Water Reuse for Municipal Purposes,
W77-07866 5D

MUNITIONS
Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

MURMAN COAST (USSR)
Influence of Mussel Metabolites on the Dynamics of Nutrients in the Coastal Waters of the Eastern Murman Coast, (In Russian),
W77-08043 5C

NALED
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

NATO
Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

NATURAL STREAMS
On Deterministic Components in Natural Streamflow,
W77-07658 2E

NEBRASKA
Law, Rules, and Regulations Pertaining to Groundwater in Nebraska,
W77-07695 4B

NEBRASKA SAFE DRINKING WATER ACT
Law, Rules, and Regulations Pertaining to Groundwater in Nebraska,
W77-07695 4B

NETHERLANDS
An Integrated Model-Approach to the Effect of Water Management on Crop Yield,
W77-08038 3F

NETWORK DESIGN
Optimal Spatial Interpolation and Its Errors in the Case of Various Distances Between Observation Points or Watershed Centres,
W77-07677 4D

NEUSIEDLERSEE (AUSTRIA)
Planktonic Primary and Bacterial Productivity in Shallow Waters Within a Large Phragmites Community (Neusiedlersee, Austria),
W77-07977 5C

NEVADA
Areal Extent of Snow Estimation in the Northern Sierra Nevada Mountains Using LANDSAT-1 Imagery,
W77-08081 7B

Snow Survey from Space, with Emphasis on the Results of the Analysis of Skylab EREP S192 Multispectral Scanner Data,
W77-08082 7B

NEW ENGLAND
The Use of LANDSAT DCS and Imagery in Reservoir Management and Operation,
W77-08076 7B

NEW HAMPSHIRE
Flood Plain Information: Merrimack and Souhegan Rivers, Litchfield and Merrimack, New Hampshire.
W77-07645 4A

Hydrophyte Biomass and Community Structure in a Small Oligotrophic New Hampshire Lake,
W77-07969 5C

Nutrient Limitation in a Small Oligotrophic Lake in New Hampshire,
W77-07974 5C

NEW YORK
Monitoring Dissolved Hydrocarbons as a Function of the Tidal Cycle (New York Harbor),
W77-07740 5B

The Effect of Highway Deicing Salt on Chloride Budgets at Lake George, NY,
W77-08000 5B

Studies on the Role of Detritus in Fresh Water Lakes,
W77-08001 5C

Chemical Interactions in a Eutrophic Lake,
W77-08002 5C

NEW YORK BIGHT
Preliminary Studies of Menhaden and Their Mass Mortalities in Long Island and New Jersey Waters,
W77-07724 5C

An Analytical Sea Current Model for Coastal Regions with Application to the New York Bight,
W77-07744 2L

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium.
W77-07830 5C

NEW YORK HARBOR
Preliminary Studies of Menhaden and Their Mass Mortalities in Long Island and New Jersey Waters,
W77-07724 5C

Monitoring Dissolved Hydrocarbons as a Function of the Tidal Cycle (New York Harbor),
W77-07740 5B

NEW ZEALAND
The Measurement of Rainfall at Ground Level,
W77-08061 2B

NILE RIVER (EGYPT)
Use of Cross-Correlation Techniques for Determining the Relationship Between Groundwater Levels and Sources in the Nile Delta Area,
W77-07679 2F

NITRATES
Analyzing Nitrates in Well Water,
W77-07690 5A

Effects of Chlorine and Chloramine on Uptake of Inorganic Nitrogen by Phytoplankton,
W77-07843 5C

Nitrates in Some Soil-Water Systems in Quebec, (In French),
W77-07858 5B

The Determination of Nitrates in Water, (In Russian),
W77-07966 5A

NITRIFICATION
Heterotrophic Nitrification in Soils and Aquatic Environments, (In Russian),
W77-07754 5C

Factors Affecting Nitrification,
W77-07854 5D

Nitrification in Soil Treated with Domestic and Industrial Sewage Sluge,
W77-07862 5E

Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

Process Technological Background Regarding New Protective Regulations for Water Bodies-Results of Experiments on Nitrification and Phosphorus Elimination in Zurich and Bern. II. Process Technological Background of Nitrification in Activated Sludge Plants (Verfahrenstechnische Unterlagen im Hinblick auf die neuen Gewaesserschutz-Anforderungen-Ergebnisse der Versuche ueber die Nitrifikation und Phosphorelimination in Zuerich und Bern. II. Verfahrenstechnische Grundlagen der Nitrifikation in Belebtschlammanlagen),
W77-07953 5D

NITRIFYING BACTERIA
Biological Regeneration of Ammonium-Saturated Clinoptilolite. I. Initial Observations,
W77-07942 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

NITROGEN
Effects of Gas Supersaturated Columbia River Water on the Survival of Juvenile Chinook and Coho Salmon,
W77-07708 5C

Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

Some Experiments on the Gas-Disease in Freshwater Fishes, (In Japanese),
W77-07714 5C

Water Quality Requirements of Fishes and Effects of Toxic Substances,
W77-07715 5C

Dissolved Gas Data Report, 1975-1976,
W77-07718 5A

Dissolved Gas Supersaturation in the Salmon River, 1972-74,
W77-07719 5A

Dissolved Gas Supersaturation, Grand Coulee Dam Project, 1973,
W77-07722 5B

Mobile Fish Cage and Depth Distribution Studies, Columbia and Snake Rivers,
W77-07723 5C

Trout and Salmon Culture (Hatchery Methods) Hatchery Water Supply,
W77-07726 5G

Effects of Trace Elements on Nitrogen Mineralization in Soils,
W77-07864 5B

Whole-Lake Eutrophication Experiments with Phosphorus, Nitrogen and Carbon.
W77-07965 5C

Influence of Mussel Metabolites on the Dynamics of Nutrients in the Coastal Waters of the Eastern Murman Coast, (In Russian),
W77-08043 5C

Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W77-08099 5D

NITROGEN COMPOUNDS
Heterotrophic Nitrification in Soils and Aquatic Environments, (In Russian),
W77-07754 5C

Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

NITROGEN FIXATION
Effects of Chlorine and Chloramine on Uptake of Inorganic Nitrogen by Phytoplankton,
W77-07843 5C

NITROGEN PARTIAL PRESSURES
Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

NITROGEN SATURATION VALUES
An Analysis of the Feasibility of Using Air Agitation to Reduce Gas Saturations in Sea Water at Pilgrim Nuclear Power Station,
W77-07720 5G

NITROGEN SUPERSATURATION
Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

NITROGENOUS OXYGEN DEMAND
A Study on the Strength of Sewage,
W77-07853 5B

NON-STRUCTURAL ALTERNATIVES
An Analysis of Alternative Flood Management Plans in Upstream Watersheds. Connecticut River Basin Supplemental Flood Management Study, Phase 2,
W77-07632 6F

Implementation of Non-Structural Alternatives in Flood Damage Abatement,
W77-07795 6F

NONIONIC POLYMERS
Composition and Method for Flocculating Suspended Solids,
W77-08031 5D

NONIONIC SURFACTANTS
Israel's Use of Nonionic Surfactants,
W77-07929 5B

NONPOINT POLLUTION
Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

NORTH ANNA RIVER (VA)
Flood Plain Information, North Anna River, Hanover County, Va.
W77-07638 4A

NORTH CAROLINA
Optimization of Water Use for Irrigation,
W77-07851 3F

NORTH COAST DRAINAGE BASIN (OR)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

NORTH DAKOTA
Utilization of Fly Ash in Polishing Oxidation Pond Effluents,
W77-07815 5D

NORTH PACIFIC OCEAN
Results of R/V Yaquina Cruise Yaloc-74, Leg 3: Seabed Disposal Program, North Pacific Study Area MPG-2, 33 degrees 20'N, 151 degrees 00'W, Nov. 30 - Dec. 21, 1974,
W77-07739 5E

NORWAY
The Lateral Movement of the Coastal Water and Its Relation to Vertical Diffusion,
W77-08058 2L

NUCLEAR POWER PLANTS
Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

NUTRIENT REMOVAL
Chemical Interactions in a Eutrophic Lake,
W77-08002 5C

NUTRIENT REQUIREMENTS
Nutrient Limitation in a Small Oligotrophic Lake in New Hampshire,
W77-07974 5C

NUTRIENTS
Runoff, Erosion, and Nutrient Movement from Interrill Areas,
W77-07766 2J

The Effect of Time Delay and Growth Rate Inhibition in the Bacterial Treatment of Waste Water,
W77-07924 5D

Sedimentation: Measurements in Experimental Enclosures,
W77-07990 5C

Influence of Mussel Metabolites on the Dynamics of Nutrients in the Coastal Waters of the Eastern Murman Coast, (In Russian),
W77-08043 5C

OAHU (HAWAII)
Inventory of Benthic Organisms and Plankton at Mokapu, Oahu,
W77-07798 2L

OBJECTIVE FUNCTIONS
Objective Function and Constraints in Water Resources Systems,
W77-08046 6A

OCEAN DISPOSAL
Go Ahead for Drainage and Outfall,
W77-07889 5E

OCEAN OUTFALLS
Waste Management for the Coastal Zone: Concepts for the Assessment of Ocean Outfalls,
W77-07747 5E

OCEANOGRAPHY
An Analytical Sea Current Model for Coastal Regions with Application to the New York Bight,
W77-07744 2L

OCEANS
The Errors Involved in Inferring Salinity from Sound Velocity,
W77-07774 2L

Method and Apparatus for Obtaining Electrical Power from Sea Water,
W77-08032 8C

OHIO
Hierarchical Modeling for the Planning and Management of a Total Regional Water Resource System: Joint Consideration of the Supply and Quality of Ground and Surface Water Resources,
W77-07793 4B

OIL
Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

OIL DETECTION
Petroleum Oil Detection Buoy System,
W77-07750 5A

OIL POLLUTION
Mutagenic Potential of Petroleum Byproducts in Chesapeake Bay Waters,
W77-07606 5B

Effect of South Louisiana Crude Oil and No. 2 Fuel Oil on Growth of Heterotrophic Microorganisms, Including Proteolytic, Lipolytic, Chitinolytic and Celluloytic Bacteria,
W77-07736 5C

Degradation of Petroleum by an Alga, Prototheca Zopfii,
W77-07737 5C

Monitoring Dissolved Hydrocarbons as a Function of the Tidal Cycle (New York Harbor),
W77-07740 5B

Verification by Remote Sensing of an Oil Slick Movement Prediction Model,
W77-07745 5B

Utilization of Mixed Hydrocarbon Substrate by Petroleum-Degrading Microorganisms,
W77-07749 5C

Petroleum Oil Detection Buoy System,
W77-07750 5A

Impacts of Offshore Oil on North East Scotland,
W77-07752 5C

Preliminary Projections of Oil Spill Movement for Three Potential Deepwater Port Sites in the Gulf of Mexico,
W77-07753 5B

A Method for Determining Oil in Water,
W77-07756 5A

Tar Ball Distribution in the Western North Atlantic,
W77-07757 5B

Determination of the Leeway of Oil Slicks,
W77-07800 5B

The ARGO MERCHANT Oil Spill. A Preliminary Scientific Report,
W77-07807 5C

A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

Moving Belt-Type Oil Skimmer with Propulsion Induced Flow, Method and Apparatus,
W77-08012 5G

Oil Separator Device,
W77-08015 5G

Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

OIL SLICKS
A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

OIL SPILLS
Oil Spill at Deception Bay, Hudson Strait,
W77-07731 5G

Characteristics of the Areas in Which Fast Current Oil Control is Needed,
W77-07741 5G

Verification by Remote Sensing of an Oil Slick Movement Prediction Model,
W77-07745 5B

Impacts of Offshore Oil on North East Scotland,
W77-07752 5C

Preliminary Projections of Oil Spill Movement for Three Potential Deepwater Port Sites in the Gulf of Mexico,
W77-07753 5B

Determination of the Leeway of Oil Slicks,
W77-07800 5B

The ARGO MERCHANT Oil Spill. A Preliminary Scientific Report,
W77-07807 5C

A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

OIL WASTES
Mutagenic Potential of Petroleum Byproducts in Chesapeake Bay Waters,
W77-07606 5B

Effect of South Louisiana Crude Oil and No. 2 Fuel Oil on Growth of Heterotrophic Microorganisms, Including Proteolytic, Lipolytic, Chitinolytic and Celluloytic Bacteria,
W77-07736 5C

Degradation of Petroleum by an Alga, Prototheca Zopfii,
W77-07737 5C

A Method for Determining Oil in Water,
W77-07756 5A

Relationship Between BOD5 and Fats, Oils and Grease,
W77-07925 5G

Method of Filtering Oil from Liquids,
W77-08011 5G

OIL WELLS
Slurry and Pumping Guidelines Smooth Casing-Cementing Jobs,
W77-07699 8F

OKLAHOMA
Remote Sensing Techniques for Prediction of Watershed Runoff,
W77-08075 7B

OLIGOTROPHY
Hydrophyte Biomass and Community Structure in a Small Oligotrophic New Hampshire Lake,
W77-07969 5C

Nutrient Limitation in a Small Oligotrophic Lake in New Hampshire,
W77-07974 5C

On the Relation of the Diatiom FLora and Water Quality in the Uji River Kyoto, (In Japanese),
W77-08089 5

ON-SITE DATA COLLECTIONS
Temperature Regime in Lake Superior at Silver Bay, Minnesota,
W77-07970 1A

Remote Sensing of Mississippi River Characteristics,
W77-08070 7B

ON-SITE INVESTIGATIONS
Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

Mobile Fish Cage and Depth Distribution Studies, Columbia and Snake Rivers,
W77-07723 5C

R and D Project Provides Phys/Chem Data, Foxborough (Mass) State Hospital Plant Can Produce 'Superior Effluent Quality',
W77-07937 5D

OPERATING POLICY
Operating Policy Adaptations for a Reservoir Systems, (Phase I),
W77-07603 4A

OPERATING POLICY ALGORITHM
Operating Policy Simulation or a Reservoir Systems, (Phase II),
W77-07604 4A

OPERATION AND MAINTENANCE
Investigation of Dynamic Performance of Waste Water Treatment Plants,
W77-08094 5D

OPERATIONS
Some Reflections of a Sewage Works Manager,
W77-07952 5D

OPTICAL PROPERTIES
Hydrologic Optics. Volume I. Introduction,
W77-07956 1A

Hydrologic Optics, Volume II. Foundations,
W77-07957 1A

Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

Hydrologic Optics. Volume V. Properties,
W77-07960 1A

Hydrologic Optics. Volume VI. Surfaces,
W77-07961 1A

OPTIMIZATION
Optimization of Water Use for Irrigation,
W77-07851 3F

Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

Simplified Optimization of Activated Sludge Process,
W77-08036 5D

Optimal Engineering Design Under Uncertainty by Geometric Programming,
W77-08040 8C

Adjustment Costs and Optimal Waste Treatment,
W77-08045 5G

Optimal Operation of Water Resources Systems--1,
W77-08047 4A

Optimal Operation of Water Resources Systems--II,
W77-08048 4A

Planning of Systems for Regional Development in Water Resources,
W77-08049 6A

OPTIMUM DEVELOPMENT PLANS
Some Arithmetical Relations of a Matrix for a Calculus of Reservoirs, (Quelques Relations Arithmetiques de Matrice dans le Calcul des Reservoirs),
W77-07682 4A

OREGON
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

Oregon's Long-Range Requirements for Water. Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6D

Oregon's Long-Range Requirements for Water. Forest Products Projections and Recreation Projections, Appendices IV and V,
W77-07625 6D

Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

Oregon's Long-Range Requirements for Water. Protection of Areas of Origin, Appendix VII,
W77-07627 6D

Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

Observational and Numerical Evidence for Wind-Forced Coastal Trapped Long Waves,
W77-07771 2L

ORGANIC COMPOUNDS
Experimental Data for the Hygienic Standardization of Diphenylamine and Diphenyldiethylurea in Water Bodies, (In Russian),
W77-07700 5G

Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

Effects of Pollutants on Eggs, Embryos and Larvae of Amphibian Species,
W77-07820 5C

The Influence of Temperature and Bacterial Numbers on the Heterotrophic Uptake of C14 Glucose in West Blue Lake, Manitoba,
W77-07995 5C

Extracellular Release in Planktonic Bacteria,
W77-07996 5C

Process for Eliminating Reactive Chlorinated Organic Compounds from Aqueous Solutions,
W77-08021 5D

ORGANIC MATTER
Factors Affecting Nitrification,
W77-07854 5D

Organic Matter and Heavy Metal Uptake,
W77-07870 5E

The Contribution of Autochthonous and Allochthonous Matter to the Trophy of a River in the Barbel Region,
W77-07986 5C

ORGANIC WASTES
The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

Utilization of Fly Ash in Polishing Oxidation Pond Effluents,
W77-07815 5D

Influence of Mussel Metabolites on the Dynamics of Nutrients in the Coastal Waters of the Eastern Murman Coast, (In Russian),
W77-08043 5C

ORGANOPHOSPHORUS COMPOUNDS
Cycling of Dissolved Organic Phosphorus Compounds in Natural Waters,
W77-07608 5C

ORGANOPHOSPHORUS PESTICIDES
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

OSMOREGULATION
Effect of Salinity on the Fresh-Water Shrimp Dikerogammarus Haemobaphes (Eichwald) from the Mouth of the Dnepr,
W77-07848 5C

OSMOTIC PRESSURE
Effect of Salinity on the Fresh-Water Shrimp Dikerogammarus Haemobaphes (Eichwald) from the Mouth of the Dnepr,
W77-07848 5C

OUTDOOR RECREATION
Oregon's Long-Range Requirements for Water. Forest Products Projections and Recreation Projections, Appendices IV and V,
W77-07625 6D

OUTER CONTINENTAL SHELF
An Analytical Sea Current Model for Coastal Regions with Application to the New York Bight,
W77-07744 2L

OUTFALL SEWERS
Inventory of Benthic Organisms and Plankton at Mokapu, Oahu,
W77-07798 2L

OUTFALLS
Go Ahead for Drainage and Outfall,
W77-07889 5E

A Second Look at Water Reuse,
W77-07908 5D

OVERLAND FLOW
Runoff, Erosion, and Nutrient Movement from Interrill Areas,
W77-07766 2J

Representative and Experimental Basins - Where Next,
W77-07781 2A

OXBOW DAM
Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

OXIDATION
Disposal of Feedlot Wastes Using a Two-Stage Process with Net Energy Production,
W77-07816 5D

Biological Phosphate Elimination of Preliminarily Cleaned Communal Waste Water by Use of Iron Bacteria (Biologische Entphosphatung vorgereinigten kommunalen Abwassers unter Mitwirkung von Eisenbakterian),
W77-07856 5D

Physico-Chemical Treatment of Sewage and the Coleshill Project,
W77-07922 5D

OXIDATION LAGOONS
Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

Stabilization Lagoons Including Experience in Brazil,
W77-07940 5D

OXIDATION LAGOONS EFFLUENTS
Utilization of Fly Ash in Polishing Oxidation Pond Effluents,
W77-07815 5D

OXIDATION-REDUCTION POTENTIAL
Stability in Structure and Function of the Mud-Water Interface,
W77-07985 5C

Electron Transport Analysis as an Indicator of Biological Oxidation in Freshwater Sediments,
W77-07992 5C

OXYGEN
Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

Water Quality Requirements of Fishes and Effects of Toxic Substances,
W77-07715 5C

Dissolved Gas Data Report, 1975-1976,
W77-07718 5A

Dissolved Gas Supersaturation in the Salmon River, 1972-74,
W77-07719 5A

Notes on the Exposure of Several Species of Fish to Sudden Changes in the Hydrogen Ion Concentration of the Water and to an Atmosphere of Pure Oxygen,
W77-07725 5C

Trout and Salmon Culture (Hatchery Methods) Hatchery Water Supply,
W77-07726 5G

Summary of Gas Supersaturation Research at Western Fish Toxicology Station (EPA), Corvallis, Oregon, 1972-1974.
W77-07729 5C

Air V. Oxygen in Dorset,
W77-07910 5D

What's Up with Oxygen,
W77-07919 5D

Oxygen Uptake of Sediments in Castle Lake, California,
W77-07976 5C

OXYGEN CONSUMPTION
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

OXYGEN DEMAND
A Study on the Strength of Sewage,
W77-07853 5B

Oxygen Uptake of Sediments in Castle Lake, California,
W77-07976 5C

OXYGEN METABOLISM
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

OXYGEN-NITROGEN VALUE
Water Quality Requirements of Fishes and Effects of Toxic Substances,
W77-07715 5C

OXYGEN REQUIREMENTS
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

OXYGENATION
Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

Oxygen Addn. Regulation in Water and Sewage Purifcn.--Using Ejectors to Secure Intimate Contact with Activated Sludge,
W77-07893 5D

Air V. Oxygen in Dorset,
W77-07910 5D

OYSTERS
Reduction in Sewage Contamination in Sydney Rock Oysters,
W77-07946 5G

PACIFIC NORTHWEST U.S.
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

PACIFIC OCEAN
Results of R/V Yaquina Cruise Yaloc-74, Leg 3: Seabed Disposal Program, North Pacific Study Area MPG-2, 33 degrees 20'N, 151 degrees 00'W, Nov. 30 - Dec. 21, 1974,
W77-07739 5E

PALEOCLIMATOLOGY
Present and Past Glaciation Threshold in the Cascade Range, Washington, U.S.A.: Topo-

graphic and Climatic Controls, and Paleoclimatic Implications,
W77-08056 2C

PARAMETRIC HYDROLOGY
Structural Relation Between Parametric and Stochastic Hydrology Models,
W77-07664 2A

Significance Tests of Periodicity in Hydrological Time Series,
W77-07665 2A

PARATHION
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

PARKS
State Park Gets Good Treatment, Effluents Will Be Used for Irrigation to Reduce Extensive Requirements,
W77-07936 5D

PARTIAL PRESSURE
Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

PASSUMPSIC RIVER (VT)
An Analysis of Alternative Flood Management Plans in Upstream Watersheds. Connecticut River Basin Supplemental Flood Management Study, Phase 2,
W77-07632 6F

PATENTS
Marine Sanitation Method and Device,
W77-07891 5D

Coal Distn. Waste Liquor Purificn. to Remove Phenols, Ammonia- and Hydrogen Sulphide by 2-Stage Solvent Extn. and Distn.,
W77-07892 5D

Oxygen Addn. Regulation in Water and Sewage Purificn.--Using Ejectors to Secure Intimate Contact with Activated Sludge,
W77-07893 5D

Flotation Treatment of Waste Water and Sewage-Using Gas Contg. Oxygen in Deep Pit to Float the Particles,
W77-07894 5D

Macerator-Sterilizer Sewage Treatment System,
W77-07895 5D

Sewage Treatment Apparatus,
W77-07896 5D

Control of Aerobic Biological Growth in Activated Carbon Waste Treatment,
W77-07897 5D

Floating Breakwater,
W77-08009 8A

Gravity-Measuring Device for Water and Mineral Detection,
W77-08010 7B

Method of Filtering Oil from Liquids,
W77-08011 5G

Moving Belt-Type Oil Skimmer with Propulsion Induced Flow, Method and Apparatus,
W77-08012 5G

Method of Filtering Liquids Containing Dissolved Carbon Dioxide,
W77-08013 5D

Oil Separator Device,
W77-08015 5G

Flow Controller Device,
W77-08017 3F

Fluid Flow Regulator,
W77-08018 3F

Irrigation System,
W77-08019 3F

Method of Separation of Fission and Corrosion Products and of Corresponding Isotopes from Liquid Waste,
W77-08020 5D

Process for Eliminating Reactive Chlorinated Organic Compounds from Aqueous Solutions,
W77-08021 5D

Tidewater Power System,
W77-08022 8C

Apparatus for Power Generation in Deep Seawater,
W77-08023 8C

Liquid Sampler,
W77-08024 7B

Sprinkler Adapted for Attachment to the Ground,
W77-08025 3F

Mechanism for Tapping the Surf Energy,
W77-08026 8C

Composition and Method of Inhibiting Growth of Slime in Water,
W77-08027 5G

Sewage Sludge Treatment System,
W77-08030 5D

Composition and Method for Flocculating Suspended Solids,
W77-08031 5D

Method and Apparatus for Obtaining Electrical Power from Sea Water,
W77-08032 8C

Skimmer Apparatus for Sewage Settling Tanks and the Like,
W77-08088 5G

Method for Improving the Quality of Contaminated Waste Water,
W77-08090 5D

Prefabricated Panels for Sub-Surface Sewage Effluent and Waste Water Disposal,
W77-08091 5E

Water Waste Treatment,
W77-08092 5D

Incineration Method and System,
W77-08098 5E

Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W77-08099 5D

Waste-Water Process,
W77-08100 5D

PATH OF POLLUTANTS
Preliminary Projections of Oil Spill Movement for Three Potential Deepwater Port Sites in the Gulf of Mexico,
W77-07753 5B

Tar Ball Distribution in the Western North Atlantic,
W77-07757 5B

Determination of the Leeway of Oil Slicks,
W77-07800 5B

A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

Rum Jungle Environmental Studies, Summary Report,
W77-07822 5B

Mercury in the Biogeochemical Environment,
W77-07823 5B

Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

Physiological Response of the Cunner, Tautogolabrus Adspersus, to Cadmium. VI. Histopathology,
W77-07836 5C

Ultrastructural Study of Lesions in Gills of a Marine Shrimp Exposed to Cadmium,
W77-07845 5C

Nitrates in Some Soil-Water Systems in Quebec, (In French),
W77-07858 5B

Migration of 90Sr with Runoff Waters from Soils, (In Russian),
W77-07971 5B

The Problem of the Behavior of Chemical Pollutants in the Environment, (In Russian),
W77-08028 5B

PATHOGENIC BACTERIA
Examination of Sewage Sludge for Enteroviruses, Volume 2,
W77-07615 5B

PATHOLOGICAL PROCESS
Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

PATHOLOGY
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

PATUXENT RIVER
Hydrologic Land Use Classification of the Patuxent River Watershed Using Remotely Sensed Data,
W77-08073 7B

PEAK DISCHARGE
Flood Plain Information: Thompsons Creek and Tributaries, Bryan, Texas,
W77-07634 4A

Flood Plain Information; San Antonio River, Bexar County, Texas.
W77-07635 4A

Flood Plain Information: Allegheny River, Warren County, Pennsylvania,
W77-07640 4A

Flood Plain Information: Allegheny River, Venango County, Pennsylvania,
W77-07641 4A

Flood Plain Information: Wichita River and Tributaries, Wichita Falls, Texas,
W77-07643 4A

Flood Plain Information: Merrimack and Souhegan Rivers, Litchfield and Merrimack, New Hampshire.
W77-07645 4A

PEAK FLOWS
Flood Plain Information: Northwest Stream Group, Stockton, California,
W77-07642 4A

PEAT
Hydrochemistry of the Nigula Swamp, (In Estonian),
W77-07859 2H

PENN STATE URBAN RUNOFF MODEL
Penn State Urban Runoff Model--User's Manual,
W77-07797 4D

PENNSYLVANIA
Flood Plain Information: Allegheny River, Warren County, Pennsylvania,
W77-07640 4A

Flood Plain Information: Allegheny River, Venango County, Pennsylvania,
W77-07641 4A

PERCENT INSECTICIDE RECOVERY
Extraction and Separation of Polychlorinated Biphenyls from Pesticide Monitoring Samples,
W77-07826 5A

PERCENT SATURATION
Dissolved Gas Data Report, 1975-1976,
W77-07718 5A

PERFORMANCE
Investigation of Dynamic Performance of Waste Water Treatment Plants,
W77-08094 5D

Analysis of Activated Sludge Process Performance,
W77-08096 5D

PERIDINIUM CINCTUM
Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

PERIPHYTON
Reductions in Biomass and Diversity Resulting from Exposure to Mercury in Artificial Streams,
W77-07838 5C

PERMAFROST
Oil Spill at Deception Bay, Hudson Strait,
W77-07731 5G

PERMITS
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

PESTICIDE RESIDUES
Determination of Morestan in Water, Soil, and Cucumbers by Thin-Layer Chromatography, (In Russian),
W77-07688 5A

Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

PESTICIDES
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

Extraction and Separation of Polychlorinated Biphenyls from Pesticide Monitoring Samples,
W77-07826 5A

Experimental Study of the Action of Pesticides on the Microflora of Bodies of Water, (In Russian),
W77-07982 5B

PETAWAWA RIVER (CANADA)
Mathematical Models Resulting from Statistical Analysis of the Mean Monthly Flow,
W77-07669 2E

PHENOLS
Coal Distn. Waste Liquor Purificn. to Remove Phenols, Ammonia- and Hydrogen Sulphide by 2-Stage Solvent Extn. and Distn.,
W77-07892 5D

PHOSPHATE FLUX
Diel Phosphate Flux in Lake Washington, U.S.A.,
W77-07968 5C

PHOSPHATES
Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

Biological Phosphate Elimination of Preliminarily Cleaned Communal Waste Water by Use of Iron Bacteria (Biologische Entphosphatung vorgereinigten kommunalen Abwassers unter Mitwirkung von Eisenbakterian),
W77-07856 5D

Diel Phosphate Flux in Lake Washington, U.S.A.,
W77-07968 5C

Influence of Mussel Metabolites on the Dynamics of Nutrients in the Coastal Waters of the Eastern Murman Coast, (In Russian),
W77-08043 5C

PHOSPHORUS
Phosphorus is Removed at Low Cost,
W77-07915 5D

Whole-Lake Eutrophication Experiments with Phosphorus, Nitrogen and Carbon.
W77-07965 5C

Phosphorus Regeneration by Natural Populations of Limnetic Zooplankton,
W77-07972 5C

Nutrient Limitation in a Small Oligotrophic Lake in New Hampshire,
W77-07974 5C

Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

Phosphorus Release from a Highly Eutrophic Lake Sediment,
W77-07999 5C

Influence of Mussel Metabolites on the Dynamics of Nutrients in the Coastal Waters of the Eastern Murman Coast, (In Russian),
W77-08043 5C

PHOSPHORUS COMPOUNDS
Cycling of Dissolved Organic Phosphorus Compounds in Natural Waters,
W77-07608 5C

The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

PHOSPHORUS CYCLE
Cycling of Dissolved Organic Phosphorus Compounds in Natural Waters,
W77-07608 5C

PHOSPHORUS EXCRETION
Phosphorus Regeneration by Natural Populations of Limnetic Zooplankton,
W77-07972 5C

PHOSPHOTHIOATE PESTICIDES
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

PHOTOSYNTHESIS
Vertical Mixing Mechanisms and Their Effects on Primary Production of Phytoplankton,
W77-07733 5C

PHYSICAL-CHEMICAL TREATMENT
Biochemical and Physical-Chemical Treatment of Weak Municipal Waste Water,
W77-07916 5D

PHYSICAL PROPERTIES
Hydrologic Optics. Volume I. Introduction,
W77-07956 1A

Hydrologic Optics, Volume II. Foundations,
W77-07957 1A

Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

Hydrologic Optics. Volume IV. Imbeddings,
W77-07959 1A

Hydrologic Optics. Volume V. Properties,
W77-07960 1A

PHYSIOLOGICAL ECOLOGY
The Gas Bubble Disease of Fish, (Die Gasblasen Krankheit Bei Fischen,
W77-07716 5C

Changes in the Properties of E. Coli Under the Influence of Water Environments,
W77-07997 5A

PHYSIOLOGY
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium.
W77-07830 5C

PHYTASE
Cycling of Dissolved Organic Phosphorus Compounds in Natural Waters,
W77-07608 5C

PHYTOPLANKTON
The Gas Bubble Disease of Fish, (Die Gasblasen Krankheit Bei Fischen,
W77-07716 5C

Vertical Mixing Mechanisms and Their Effects on Primary Production of Phytoplankton,
W77-07733 5C

Biological Assessment of the Water Quality of the Small Rivers Sora and Byurya (Yenisei Basin), (In Russian),
W77-07755 5C

Effects of Chlorine and Chloramine on Uptake of Inorganic Nitrogen by Phytoplankton,
W77-07843 5C

Phytoplankton Production in Lake Memphremagog, Quebec (Canada)--Vermont (U.S.A.),
W77-07962 5C

Planktonic Primary and Bacterial Productivity in Shallow Waters Within a Large Phragmites Community (Neusiedlersee, Austria),
W77-07977 5C

The Contribution of Autochthonous and Allochthonous Matter to the Trophy of a River in the Barbel Region,
W77-07986 5C

The Influence of Mineral Fertilization on Phytoplankton Production in Lakes of Various Trophic Types,
W77-07988 5C

PHYTOTOXIC GASES
Effect of Air Pollution on Pinus Strobus L. and Genetic Resistance - A Literature Review,
W77-07829 5C

PHYTOTOXICITY
Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

Effect of Air Pollution on Pinus Strobus L. and Genetic Resistance - A Literature Review,
W77-07829 5C

PIGMENTS
The Availability of Chlorophyllide in Hydrophytes and Algas of Lake Trasimeno and the Variability of Pigment Content in Spirogyra, (In Italian),
W77-08044 5C

PILICA RIVER (POLAND)
The Contribution of Autochthonous and Allochthonous Matter to the Trophy of a River in the Barbel Region,
W77-07986 5C

PILOT PLANTS
Waste Water Renovation by Sewage Ultrafiltration,
W77-07941 5D

PINE TREES
Effect of Air Pollution on Pinus Strobus L. and Genetic Resistance - A Literature Review,
W77-07829 5C

PINK SHRIMP
Ultrastructural Study of Lesions in Gills of a Marine Shrimp Exposed to Cadmium,
W77-07845 5C

PIPE FLOW
How to Determine Waste Water Flow,
W77-07881 5F

PIPES
Study of In-Service Bituminized Fiber Sewer Pipe,
W77-07884 8G

Pipes for Sewerage and Surface Water.
W77-07887 8G

PIPING
Structural Polymer, ADIPRENE Replaces Iron Pipe Fittings on New Lightweight Aeration Assembly.
W77-07935 8G

PITLESS ADAPTERS
Pumping Systems: Part II,
W77-07704 8C

PLANNING
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

Penn State Urban Runoff Model--User's Manual,
W77-07797 4D

A Decision Support System for Area-Wide Quality Planning,
W77-07810 6A

Extensions and Corrections for the CODASYL Approach to Data Base Management,
W77-07811 6A

Implementation of a Decision Support for Regional Water Quality Planning,
W77-07812 6A

Community Water Supply and Excreta Disposal in the Developing Countries,
W77-07865 5G

Appraisal of Areawide Waste Water Planning,
W77-07874 5G

Bristol Regional Sewage Treatment Works--Past, Present and Future,
W77-07901 5D

1776-1976: Notes on Water Quality Planning,
W77-07938 5G

Environmental Policy Choice Under Uncertainty,
W77-08004 6G

Planning of Systems for Regional Development in Water Resources,
W77-08049 6A

Modeling Multiple-Use in Natural Areas: Part II - The Santee Swamp Study,
W77-08050 6A

PLANT MORPHOLOGY
Changes in the Properties of E. Coli Under the Influence of Water Environments,
W77-07997 5A

PLANT PHYSIOLOGY
Changes in the Properties of E. Coli Under the Influence of Water Environments,
W77-07997 5A

PLASMA POLYMERIZATION
Preparation of Composite Reverse Osmosis Membranes by Plasma Polymerization,
W77-07792 3A

PLASTIC PIPES
Plastic Sewer Pipe Materials.
W77-07931 8G

PLASTICS
Structural Polymer, ADIPRENE Replaces Iron Pipe Fittings on New Lightweight Aeration Assembly.
W77-07935 8G

PLAYAS
The Application of Remote Sensing Technology to the Inventory of Playa Lakes in the High Plains of Texas,
W77-08077 7B

POLAND
Stochastic Structure of a Process of Average Monthly Flows,
W77-07651 2E

POLAND (MASURIAN LAKES)
The Invertebrates on Submerged Macrophytes in Three Masurian Lakes,
W77-07987 5C

POLICY PLANNING
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

POLITICAL CONSTRAINTS
The Current State of Environmental Policy,
W77-08005 6G

POLLUTANT IDENTIFICATION
Mercury in Water, a Bibliography, Volume 3,
W77-07605 5A

Interlaboratory Quality Control Studies Nos. 12 and 13, Aluminum, Cadmium, Chromium, Cobalt, Copper, Lead, Iron, Manganese, Nickel and Zinc,
W77-07616 5A

Determination of Morestan in Water, Soil, and Cucumbers by Thin-Layer Chromatography, (In Russian),
W77-07688 5A

Analyzing Nitrates in Well Water,
W77-07690 5A

Results of R/V Yaquina Cruise Yaloc-74, Leg 3: Seabed Disposal Program, North Pacific

Study Area MPG-2, 33 degrees 20'N, 151 degrees 00'W, Nov. 30 - Dec. 21, 1974,
W77-07739 5E

Effects of Sample Handling on the Composition of Marine Sedimentary Pore Water,
W77-07742 5A

Petroleum Oil Detection Buoy System,
W77-07750 5A

A Method for Determining Oil in Water,
W77-07756 5A

Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

Easier Identification with MPN Procedure,
W77-07928 5A

A Rapid Volumetric Method of Determining Fluorine in Water, (In Russian),
W77-07950 5A

The Determination of Nitrates in Water, (In Russian),
W77-07966 5A

Study of Free Living Amoebae in the Waters of Strabourg: Preliminary Report, (In French),
W77-08016 5A

Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

POLLUTANTS

The Problem of the Behavior of Chemical Pollutants in the Environment, (In Russian),
W77-08028 5B

Hygienic Criteria of the Complex Action of Chemical Environmental Pollutants, (In Russian),
W77-08029 5G

POLLUTION ABATEMENT

Reduction in Sewage Contamination in Sydney Rock Oysters,
W77-07946 5G

Watershed Management and Water Quality,
W77-07951 5G

POLLUTION CONTROL METHODS

Mercury in the Biogeochemical Environment,
W77-07823 5B

POLLUTION DISPERSAL

Mercury in the Biogeochemical Environment,
W77-07823 5B

POLLUTION FIXATION

Mercury in the Biogeochemical Environment,
W77-07823 5B

POLLUTION RIGHTS

A Note on the Fair Division of Pollution Rights,
W77-08006 6G

POLY ALUMINUM CHLORIDE

Poly Aluminum Chloride in Sludge Treatment,
W77-07912 5D

POLYCHLORINATED BIPHENYLS

Extraction and Separation of Polychlorinated Biphenyls from Pesticide Monitoring Samples,
W77-07826 5A

POLYELECTROLYTES

Effects of Polyelectrolytes and Clay Colloids on Carbon Adsorption,
W77-07926 5D

POLYMER-IMPREGNATED CONCRETE

Concrete-Polymer Materials--Final Report (USBR-BNL-AEC-OSW Cooperative Program),
W77-07803 8F

POLYMERS

Concrete-Polymer Materials--Final Report (USBR-BNL-AEC-OSW Cooperative Program),
W77-07803 8F

Increasing Sewer Capacity by Polymer Dosing,
W77-07883 8G

Phosphorus is Removed at Low Cost,
W77-07915 5D

Structural Polymer, ADIPRENE Replaces Iron Pipe Fittings on New Lightweight Aeration Assembly.
W77-07935 8G

Composition and Method for Flocculating Suspended Solids,
W77-08031 5D

POLYSACCHARIDE BIODEGRADATION

Bacterial Decomposition of Different Polysaccharides in a Eutrophic Lake,
W77-07991 5C

POLYSORB PROCESS

Process Could Save Millions of Pounds on Sewage Treatment Plants,
W77-07904 5D

POPULATION

Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

POPULATION PROJECTIONS

Oregon's Long-Range Requirements for Water. Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6D

POPULATIONS

Aquatic Insect Diversity and Biomass in a Stream Marginally Polluted by Acid Strip Mine Drainage,
W77-07846 5C

PORE WATER

Effects of Sample Handling on the Composition of Marine Sedimentary Pore Water,
W77-07742 5A

POROSITY

Open-Hole Porosity Logs Can Be Used in Cased Holes,
W77-07698 8G

POROUS MEDIA

A Statistical Filtration Model for the Inseepage of Melt Water into Frozen Ground,
W77-07672 2G

PORT OF TAGONOURA (JAPAN)

The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

POTABLE WATER

Risk of Drinking Water Contamination in Rural Tennessee,
W77-07701 5G

Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

Direct and Indirect Waste Water Reuse for Municipal Purposes,
W77-07866 5D

Study of Free Living Amoebae in the Waters of Strabourg: Preliminary Report, (In French),
W77-08016 5A

POWER PLANTS

Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

POWERPLANTS

Optimal Engineering Design Under Uncertainty by Geometric Programming,
W77-08040 8C

The Valuation of Aesthetic Preferences,
W77-08041 6G

PRECIPITATION (ATMOSPHERIC)

Frequency Analysis of Water Balance Components in Relation to Climatic Factors,
W77-07668 2A

PREDICTION MODELS

Verification by Remote Sensing of an Oil Slick Movement Prediction Model,
W77-07745 5B

PRIMARY PRODUCTIVITY

Vertical Mixing Mechanisms and Their Effects on Primary Production of Phytoplankton,
W77-07733 5C

Reductions in Biomass and Diversity Resulting from Exposure to Mercury in Artificial Streams,
W77-07838 5C

Effects of Chlorine and Chloramine on Uptake of Inorganic Nitrogen by Phytoplankton,
W77-07843 5C

Phytoplankton Production in Lake Memphremagog, Quebec (Canada)--Vermont (U.S.A.),
W77-07962 5C

Physical, Chemical, and Biological Factors in the Initiation and Destruction of Biogenic Meromixis in a Soft-Water Lake,
W77-07963 5C

Planktonic Primary and Bacterial Productivity in Shallow Waters Within a Large Phragmites Community (Neusiedlersee, Austria),
W77-07977 5C

PRIMAY PRODUCTIVITY

Nutrient Limitation in a Small Oligotrophic Lake in New Hampshire,
W77-07974 5C

PROBABILITY

Some Arithmetical Relations of a Matrix for a Calculus of Reservoirs, (Quelques Relations Arithmetiques de Matrice dans le Calcul des Reservoirs),
W77-07682 4A

Some Problems of Stochastic Storage with Correlated Inflow,
W77-07689 4A

PRODUCTIVITY
Planktonic Primary and Bacterial Productivity in Shallow Waters Within a Large Phragmites Community (Neusiedlersee, Austria),
W77-07977 5C

Population Ecology and Production of Benthic Detritivores,
W77-07979 5C

The Influence of Mineral Fertilization on Phytoplankton Production in Lakes of Various Trophic Types,
W77-07988 5C

Planktonic Microbial Heterotrophy: Its Significance to Community Biomass Production,
W77-07993 5C

The Influence of Temperature and Bacterial Numbers on the Heterotrophic Uptake of C14 Glucose in West Blue Lake, Manitoba,
W77-07995 5C

Extracellular Release in Planktonic Bacteria,
W77-07996 5C

PROGRAMMING LANGUAGES
Mathematical Programming within the Context of a Generalized Data Base Management System,
W77-07850 6A

PROJECTIONS
Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

Oregon's Long-Range Requirements for Water. Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6D

Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

PROJECTS
The Application of Remote Sensing Technology to the Inventory of Playa Lakes in the High Plains of Texas,
W77-08077 7B

PROPANIDE
Experimental Study of the Action of Pesticides on the Microflora of Bodies of Water, (In Russian),
W77-07982 5B

PROTEASE
Cycling of Dissolved Organic Phosphorus Compounds in Natural Waters,
W77-07608 5C

PROTEINS
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

PROTOTHECA ZOPFII
Degradation of Petroleum by an Alga, Prototheca Zopfii,
W77-07737 5C

PUBLIC HEALTH
Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

Improvement and Expansion of the Drainage System of Hamburg,
W77-07890 5D

PULP AND PAPER INDUSTRY
Review of Colour Removal Technology in the Pulp and Paper Industry,
W77-07734 5D

PULP WASTES
Review of Colour Removal Technology in the Pulp and Paper Industry,
W77-07734 5D

The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

PUMPING
E.L.C. Water Development Project, Betul (M.P.) India: Fifth Annual Report, 1975-1976,
W77-07696 8B

PUMPS
NWWA Ground Water Heat Pump Research Imperatives,
W77-07692 8C

Research Foundation Utilizes Ground Water Heat Pumps,
W77-07693 8C

Ground Water Energy and the Ground Water Heat Pump,
W77-07694 8C

E.L.C. Water Development Project, Betul (M.P.) India: Fifth Annual Report, 1975-1976,
W77-07696 8B

Pumping Systems: Part II,
W77-07704 8C

PYRROPHYTA
Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

QUALITY CONTROL
Interlaboratory Quality Control Studies Nos. 12 and 13, Aluminum, Cadmium, Chromium, Cobalt, Copper, Lead, Iron, Manganese, Nickel and Zinc,
W77-07616 5A

QUEBEC
Nitrates in Some Soil-Water Systems in Quebec, (In French),
W77-07858 5B

QUERY PROCESSOR
Observations on a Generalized Intelligent Query Processor for Decision Support,
W77-07849 6A

RADIANCE
Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

Hydrologic Optics. Volume VI. Surfaces,
W77-07961 1A

RADIANT ENERGY
Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

RADIANT FLUX
Hydrologic Optics, Volume II. Foundations,
W77-07957 1A

RADIATION
Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

RADIOACTIVE WASTE DISPOSAL
Results of R/V Yaquina Cruise Yaloc-74, Leg 3: Seabed Disposal Program, North Pacific Study Area MPG-2, 33 degrees 20'N, 151 degrees 00'W, Nov. 30 - Dec. 21, 1974,
W77-07739 5E

Rum Jungle Environmental Studies, Summary Report,
W77-07822 5B

RADIOACTIVE WELL LOGGING
Open-Hole Porosity Logs Can Be Used in Cased Holes,
W77-07698 8G

RADIOMETRY
Hydrologic Optics. Volume I. Introduction,
W77-07956 1A

RADIOSONDES
Analysis of IFYGL Rawinsonde Baseline Measurements,
W77-07790 2B

RADIUM
Rum Jungle Environmental Studies, Summary Report,
W77-07822 5B

RAIN GAGES
The Measurement of Rainfall at Ground Level,
W77-08061 2B

RAINBOW TROUT
Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

RAINFALL
Stochastic Analysis of Short-Time Rainfalls,
W77-07671 2B

Runoff, Erosion, and Nutrient Movement from Interrill Areas,
W77-07766 2J

Characteristics of the Severe Rainstorm,
W77-07784 2B

The Measurement of Rainfall at Ground Level,
W77-08061 2B

RANDOM FLOW
Multiple Markov Processes in Hydrology and Their Importance for Stochastic Analysis of Water Accumulation Problems,
W77-07684 4A

RAPPAHANNOCK ESTUARY (VA)
Development of the Turbidity Maximum in Rappahannock Estuary; Summary,
W77-07789 2L

RAWINSONDE INSTRUMENTATION
Analysis of IFYGL Rawinsonde Baseline Measurements,
W77-07790 2B

RECREATION
Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

The Valuation of Aesthetic Preferences,
W77-08041 6G

RECREATION DEMAND
Oregon's Long-Range Requirements for Water. Forest Products Projections and Recreation Projections, Appendices IV and V,
W77-07625 6D

Methodological Problems in Estimating Recreational Demand Functions and Evaluating Recreational Benefits,
W77-08007 6B

Recreational Use of Small Streams in Wisconsin,
W77-08008 5G

RECREATIONAL FACILITIES
State Park Gets Good Treatment, Effluents Will Be Used for Irrigation to Reduce Extensive Requirements,
W77-07936 5D

RECYCLING
Silk from Sow's Ears.
W77-07867 5D

REFLECTANCE
Hydrologic Optics, Volume II. Foundations,
W77-07957 1A

Influence of Suspended Sediment on the Temperatures of Surface Waters of Reservoirs,
W77-07975 5C

REFRIGERATION CONSTRUCTION
Manuel Technique Du Village, (Village Technology Handbook), (Vols. 1 and 2).
W77-07628 3F

REGIONAL ANALYSIS
Hierarchical Modeling for the Planning and Management of a Total Regional Water Resource System: Joint Consideration of the Supply and Quality of Ground and Surface Water Resources,
W77-07793 4B

Implementation of a Decision Support for Regional Water Quality Planning,
W77-07812 6A

REGIONAL DEVELOPMENT
Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

Planning of Systems for Regional Development in Water Resources,
W77-08049 6A

REGIONAL PLANNING
Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

REGIONAL WATER QUALITY PLANNING
Implementation of a Decision Support for Regional Water Quality Planning,
W77-07812 6A

REGRESSION ANALYSIS
Floodflow Formulas for Urbanized and Nonurbanized Areas of Connecticut,
W77-07612 4C

REGULATION
Law, Rules, and Regulations Pertaining to Groundwater in Nebraska,
W77-07695 4B

The Current State of Environmental Policy,
W77-08005 6G

A Note on the Fair Division of Pollution Rights,
W77-08006 6G

REHABILITATION
Eliminating Iron-Bearing Water from Well No. 7,
W77-07702 5G

RELATIVE RIGHTS
A Note on the Fair Division of Pollution Rights,
W77-08006 6G

REMOTE SENSING
Verification by Remote Sensing of an Oil Slick Movement Prediction Model,
W77-07745 5B

Sediment Measurement in Estuarine and Coastal Areas,
W77-07748 2L

Flooding Frequence of Hypersaline Coastal Environments Determined by Orbital Imagery: Geologic Implications,
W77-07751 2L

Ice Movements in the Beaufort Sea 1973-1975: Determination by ERTS Imagery,
W77-07769 2C

The Application of ERTS-1 Digital Data to Water Transport Phenomena in the Point Pelee-Rondeau Area,
W77-07981 2J

Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D,
W77-08062 7B

The Use of Skylab and LANDSAT in a Geohydrological Study of the Paleozoic Section, West-Central Bighorn Mountains, Wyoming,
W77-08063 7B

Hydrogeological Investigations in the Pampa of Argentina,
W77-08064 7B

Urban Land Use: Remote Sensing of Groundbasin Permeability,
W77-08065 7B

Microwave Remote Sensing of Soil Moisture,
W77-08066 7B

Soil Moisture Detection from Skylab,
W77-08067 7B

The Correlation of Skylab L-Band Brightness Temperatures with Antecedent Precipitation,
W77-08068 7B

Flood Hazard Studies in Central Texas Using Orbital and Suborbital Remote Sensing Imagery,
W77-08069 7B

Remote Sensing of Mississippi River Characteristics,
W77-08070 7B

Application of Thermal Scanning to the Study of Transverse Mixing in Rivers,
W77-08071 5B

Utilization of LANDSAT Data for Water Quality Surveys in the Choptank River,
W77-08072 5A

Hydrologic Land Use Classification of the Patuxent River Watershed Using Remotely Sensed Data,
W77-08073 7B

Land Use Classification for Hydrologic Models using Interactive Machine Classification of Landsat Data,
W77-08074 7B

Remote Sensing Techniques for Prediction of Watershed Runoff,
W77-08075 7B

The Use of LANDSAT DCS and Imagery in Reservoir Management and Operation,
W77-08076 7B

The Application of Remote Sensing Technology to the Inventory of Playa Lakes in the High Plains of Texas,
W77-08077 7B

Remote Sensing Applications in Water Resources Management by the California Department of Water Resources,
W77-08078 7B

Evaluation of Thermal X/5-Detector Skylab S-192 Data for Estimating Evapotranspiration and Thermal Properties of Soils for Irrigation Management,
W77-08079 7B

Remote Sensing Inputs to Water Demand Modeling,
W77-08080 7B

Areal Extent of Snow Estimation in the Northern Sierra Nevada Mountains Using LANDSAT-1 Imagery,
W77-08081 7B

Snow Survey from Space, with Emphasis on the Results of the Analysis of Skylab EREP S192 Multispectral Scanner Data,
W77-08082 7B

Factors Affecting Snow Assessment from LANDSAT Data,
W77-08083 7B

Operational Water Management Applications of Snowcovered Area Observations,
W77-08084 7B

REPRODUCTION
Egg Hatchability and Tolerance of Brook Trout (Salvelinus fontinalis) Fry at Low pH,
W77-07844 5C

RESEARCH AND DEVELOPMENT
R and D Project Provides Phys/Chem Data, Foxborough (Mass) State Hospital Plant Can Produce 'Superior Effluent Quality',
W77-07937 5D

RESEARCH NEEDS
Implementation of Non-Structural Alternatives in Flood Damage Abatement,
W77-07795 6F

RESEARCH PRIORITIES
Implementation of Non-Structural Alternatives in Flood Damage Abatement,
W77-07795 6F

RESERVOIR OPERATION
Operating Policy Adaptations for a Reservoir Systems, (Phase I),
W77-07603 4A

Operating Policy Simulation or a Reservoir Systems, (Phase II),
W77-07604 4A

Model of a Lake Reservoir,
W77-07687 4A

Some Problems of Stochastic Storage with Correlated Inflow,
W77-07689 4A

Optimal Operation of Water Resources Systems--1,
W77-08047 4A

RESERVOIR RELEASES
Operating Policy Adaptations for a Reservoir Systems, (Phase I),
W77-07603 4A

Operating Policy Simulation or a Reservoir Systems, (Phase II),
W77-07604 4A

RESERVOIR STORAGE
Multiple Markov Processes in Hydrology and Their Importance for Stochastic Analysis of Water Accumulation Problems,
W77-07684 4A

Mathematical Models of Runoff for the Computation of Storage Reservoirs,
W77-07685 4A

Some Problems of Stochastic Storage with Correlated Inflow,
W77-07689 4A

RESERVOIRS
Some Arithmetical Relations of a Matrix for a Calculus of Reservoirs, (Quelques Relations Arithmetiques de Matrice dans le Calcul des Reservoirs),
W77-07682 4A

Multiple Markov Processes in Hydrology and Their Importance for Stochastic Analysis of Water Accumulation Problems,
W77-07684 4A

Mathematical Models of Runoff for the Computation of Storage Reservoirs,
W77-07685 4A

Model of a Lake Reservoir,
W77-07687 4A

Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

Feeding of Forage Fish in Turbid Kansas Reservoirs,
W77-07817 2H

A Second Look at Water Reuse,
W77-07908 5D

RESOURCE ALLOCATION
A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

RESOURCES DEVELOPMENT
Impacts of Offshore Oil on North East Scotland,
W77-07752 5C

RESPONSE TIME
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

REVERSE OSMOSIS
Preparation of Composite Reverse Osmosis Membranes by Plasma Polymerization,
W77-07792 3A

Waste Water Renovation by Sewage Ultrafiltration,
W77-07941 5D

REVIEWS
Water Quality Requirements of Fishes and Effects of Toxic Substances,
W77-07715 5C

Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

Gas Disease in Fishes - A Review,
W77-07727 5C

A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

Effect of Air Pollution on Pinus Strobus L. and Genetic Resistance - A Literature Review,
W77-07829 5C

RIO GRANDE RIVER (BOLIVIA)
Study of the Rio Grande, Bolivia Highlights Some Basic Questions About Simulation,
W77-07945 2A

RISKS
Environmental Policy Choice Under Uncertainty,
W77-08004 6G

Optimal Engineering Design Under Uncertainty by Geometric Programming,
W77-08040 8C

RIVER FLOW
Mathematical Models Resulting from Statistical Analysis of the Mean Monthly Flow,
W77-07669 2E

A Multivariate Mathematical Model of Monthly River Flow,
W77-07675 2E

RIVER REGULATION
Mathematical Models of Runoff for the Computation of Storage Reservoirs,
W77-07685 4A

RIVERS
Cyclical Structure of the Hydrological Series and the Nature of Individual Components,
W77-07656 2E

Mathematical Models Resulting from Statistical Analysis of the Mean Monthly Flow,
W77-07669 2E

Statistical Analysis Applied to the Study of the Components of a Flood Wave,
W77-07674 2E

A Multivariate Mathematical Model of Monthly River Flow,
W77-07675 2E

Use of Cross-Correlation Techniques for Determining the Relationship Between Groundwater Levels and Sources in the Nile Delta Area,
W77-07679 2F

Time and Frequency-Domain Identification of a Casual Bivariate Stochastic Process,
W77-07680 2E

Lakes Will Take the Pollution Load Off Old Father Tame,
W77-07913 5G

Application of Thermal Scanning to the Study of Transverse Mixing in Rivers,
W77-08071 5B

Utilization of LANDSAT Data for Water Quality Surveys in the Choptank River,
W77-08072 5A

ROCK PROPERTIES
Mechanical and Hydraulic Properties of Rocks Related to Induced Seismicity,
W77-07779 8E

ROGUE DRAINAGE BASIN (OR)
Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

ROMANIA
Statistical Analysis Applied to the Study of the Components of a Flood Wave,
W77-07674 2E

ROSS ICE SHELF
Electrical Resistivity Measurements on the Ross Ice Shelf,
W77-08051 2C

RUM JUNGLE (AUSTRALIA)
Rum Jungle Environmental Studies, Summary Report,
W77-07822 5B

RUNOFF
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

Methods for the Mathematical Description of the Structure of River Runoff Variations,
W77-07652 2E

Spectral Analysis of the Structure of Hydrological Series,
W77-07653 2E

Elements of Runoff Periodicity in Tasks of Modelling,
W77-07655 2E

Cyclical Structure of the Hydrological Series and the Nature of Individual Components,
W77-07656 2E

The Generation of Synthetic Monthly Runoff Records for Ungauged British Catchments,
W77-07661 2A

Multidimensional Statistic Modelling of Hydrological Processes on the Basis of Structural Analysis of the Empirical Hydrographs of Runoff,
W77-07662 2A

Frequency Analysis of Water Balance Components in Relation to Climatic Factors,
W77-07668 2A

Flood Frequency Studies of Rivers in the Federal Republic of Germany,
W77-07670 2E

Finding Regularities in Long-Term Streamflow Fluctuations by Analysis of Hydrological Ensembles,
W77-07676 2E

Mathematical Models of Runoff for the Computation of Storage Reservoirs,
W77-07685 4A

Runoff, Erosion, and Nutrient Movement from Interrill Areas,
W77-07766 2J

Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

RUNOFF COEFFICIENT
Remote Sensing Techniques for Prediction of Watershed Runoff,
W77-08075 7B

RUNOFF QUALITY
Penn State Urban Runoff Model--User's Manual,
W77-07797 4D

RURAL AREAS
Floodflow Formulas for Urbanized and Nonurbanized Areas of Connecticut,
W77-07612 4C

Risk of Drinking Water Contamination in Rural Tennessee,
W77-07701 5G

Joint Municipal Corporation Waste Water Treatment,
W77-07920 5D

Water and Waste Water Engineering for Low Income Communities in Developing Countries,
W77-07939 5G

SALINE SOILS
Model of Salt Flow in Soil with a Source-Sink Term,
W77-07761 2G

Comparisons of Two Models for Predicting the Relative Hydraulic Conductivity of Salt-Affected Swelling Soils,
W77-07777 2G

SALINE WATER-FRESHWATER INTERFACES
Saltwater-Freshwater Interfaces in the '2,000-' and '2,800-Foot' Sands in the Capital Area Ground Water Conservation District,
W77-07703 4B

Determination of Salt-Water Interface by Electric Resistivity Depth Soundings,
W77-07783 2F

SALINE WATER INTRUSION
Saltwater-Freshwater Interfaces in the '2,000-' and '2,800-Foot' Sands in the Capital Area Ground Water Conservation District,
W77-07703 4B

Determination of Salt-Water Interface by Electric Resistivity Depth Soundings,
W77-07783 2F

SALINITY
The Errors Involved in Inferring Salinity from Sound Velocity,
W77-07774 2L

The Generation of Salinity Finestructure by Vertical Diffusion,
W77-07775 2L

Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

Heat and Salt Transfer Associated with Formation of Sea-Ice,
W77-07786 2C

Effect of Major Ion Variations in the Marine Environment on the Specific Gravity--Conductivity--Chlorinity--Salinity Relationship,
W77-07802 2K

Effect of Salinity on the Fresh-Water Shrimp Dikerogammarus Haemobaphes (Eichwald) from the Mouth of the Dnepr,
W77-07848 5C

SALINITY FINESTRUCTURE
The Generation of Salinity Finestructure by Vertical Diffusion,
W77-07775 2L

SALMON
Trout and Salmon Culture (Hatchery Methods) Hatchery Water Supply,
W77-07726 5G

Summary of Gas Supersaturation Research at Western Fish Toxicology Station (EPA), Corvallis, Oregon, 1972-1974.
W77-07729 5C

Protective Effect of Chloride on Nitrite Toxicity to Coho Salmon (Oncorhynchus Kisutch),
W77-07840 5C

SALMON RIVER
Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

Dissolved Gas Supersaturation in the Salmon River, 1972-74,
W77-07719 5A

SALMONIDS
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

SALT REJECTION
Heat and Salt Transfer Associated with Formation of Sea-Ice,
W77-07786 2C

SALTS
Model of Salt Flow in Soil with a Source-Sink Term,
W77-07761 2G

Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

SAMPLING
Analyzing Nitrates in Well Water,
W77-07690 5A

Water Sampling from Unpumped Wells with Static Water Levels Deeper than 10 Metres,
W77-07787 5A

Liquid Sampler,
W77-08024 7B

SAMPLING PUMPS
Water Sampling from Unpumped Wells with Static Water Levels Deeper than 10 Metres,
W77-07787 5A

SAN ANTONIO RIVER (TX)
Flood Plain Information; San Antonio River, Bexar County, Texas.
W77-07635 4A

SAN FRANCISCO RIVER (NM)
Time and Frequency-Domain Identification of a Casual Bivariate Stochastic Process,
W77-07680 2E

SAN JOAQUIN RIVER (CA)
Flood Plain Information: Northwest Stream Group, Stockton, California,
W77-07642 4A

SAN JUAN MOUNTAINS (COLO)
Statistical Forecasting of Snow Avalanches, San Juan Mountains, Southern Colorado, U.S.A.,
W77-08055 2C

SAND FILTRATION
Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

SANDY CREEK (WV)
Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

SANTEE SWAMP (S. CAROLINA)
Modeling Multiple-Use in Natural Areas: Part II - The Santee Swamp Study,
W77-08050 6A

SARATOGA LAKE (NY)
Chemical Interactions in a Eutrophic Lake,
W77-08002 5C

SARONICOS GULF (GREECE)
Comparative Study of Cladocera from the 1st Meter of Sea Water, Collected in a Polluted Zone and in Another Relatively Clean Zone, (In French),
W77-07730 5C

SASKATCHEWAN
A Valley Crossing in Pleistocene Deposits,
W77-07778 8E

SATELLITES (ARTIFICIAL)
The Application of ERTS-1 Digital Data to Water Transport Phenomena in the Point Pelee-Rondeau Area,
W77-07981 2J

Soil Moisture Detection from Skylab,
W77-08067 7B

The Correlation of Skylab L-Band Brightness Temperatures with Antecedent Precipitation,
W77-08068 7B

SATURATION
Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

Dissolved Gas Supersaturation in the Salmon River, 1972-74,
W77-07719 5A

SCOTLAND
Impacts of Offshore Oil on North East Scotland,
W77-07752 5C

SCREENING MODEL
Best Practicable Waste Treatment Screening Model,
W77-08037 5D

SEA ICE
Ice Movements in the Beaufort Sea 1973-1975: Determination by ERTS Imagery,
W77-07769 2C

Heat and Salt Transfer Associated with Formation of Sea-Ice,
W77-07786 2C

SEA ICE FORMATION
Heat and Salt Transfer Associated with Formation of Sea-Ice,
W77-07786 2C

SEA WATER
Effect of Major Ion Variations in the Marine Environment on the Specific Gravity--Conductivity--Chlorinity--Salinity Relationship,
W77-07802 2K

Method and Apparatus for Obtaining Electrical Power from Sea Water,
W77-08032 8C

SEASONAL
Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

SEASONAL DISCHARGE (WATER)
Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

SEDIMENT DISCHARGE
Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

SEDIMENT RUNOFF
Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

SEDIMENT SOURCES
Clastic Sedimentation in a Modern Alpine Lake,
W77-07791 2J

SEDIMENT TRANSPORT
Sediment Measurement in Estuarine and Coastal Areas,
W77-07748 2L

Sedimentation in Lower Green Bay, Wisconsin,
W77-07980 2J

The Application of ERTS-1 Digital Data to Water Transport Phenomena in the Point Pelee-Rondeau Area,
W77-07981 2J

SEDIMENT-WATER INTERFACES
Oxygen Uptake of Sediments in Castle Lake, California,
W77-07976 5C

Stability in Structure and Function of the Mud-Water Interface,
W77-07985 5C

SEDIMENT YIELDS
Evaluation of Sediment Yields Due to Urban Development,
W77-07705 4D

SEDIMENTATION
Flooding Frequence of Hypersaline Coastal Environments Determined by Orbital Imagery: Geologic Implications,
W77-07751 2L

Clastic Sedimentation in a Modern Alpine Lake,
W77-07791 2J

Controlling Sludge Bulking.
W77-07921 5D

Sedimentation: Measurements in Experimental Enclosures,
W77-07990 5C

Skimmer Apparatus for Sewage Settling Tanks and the Like,
W77-08088 5G

SEDIMENTATION RATES
Studies of the Benthic Environment of Twin Lakes.
W77-07806 5C

Sedimentation in Lower Green Bay, Wisconsin,
W77-07980 2J

SEDIMENTS
Effects of Sample Handling on the Composition of Marine Sedimentary Pore Water,
W77-07742 5A

Sediment Measurement in Estuarine and Coastal Areas,
W77-07748 2L

SEEPAGE
A Statistical Filtration Model for the Inseepage of Melt Water into Frozen Ground,
W77-07672 2G

SELF PURIFICATION
Biological Assessment of the Water Quality of the Small Rivers Sora and Byurya (Yenisei Basin), (In Russian),
W77-07755 5C

SEPARATED SEWERS
Improvement and Expansion of the Drainage System of Hamburg,
W77-07890 5D

SEPARATION TECHNIQUES
High Gradient Magnetic Separation of Food Processing Wastewater,
W77-07852 5D

Coal Distn. Waste Liquor Purificn. to Remove Phenols, Ammonia- and Hydrogen Sulphide by 2-Stage Solvent Extn. and Distn.,
W77-07892 5D

Flotation Treatment of Waste Water and Sewage-Using Gas Contg. Oxygen in Deep Pit to Float the Particles,
W77-07894 5D

Process Could Save Millions of Pounds on Sewage Treatment Plants,
W77-07904 5D

Physico-Chemical Treatment of Sewage and the Coleshill Project,
W77-07922 5D

Method of Filtering Oil from Liquids,
W77-08011 5G

Moving Belt-Type Oil Skimmer with Propulsion Induced Flow, Method and Apparatus,
W77-08012 5G

Oil Separator Device,
W77-08015 5G

Method for Improving the Quality of Contaminated Waste Water,
W77-08090 5D

SESTON
The Contribution of Autochthonous and Allochthonous Matter to the Trophy of a River in the Barbel Region,
W77-07986 5C

SETTLING BASINS
Skimmer Apparatus for Sewage Settling Tanks and the Like,
W77-08088 5G

SEVERE RAINSTORMS
Characteristics of the Severe Rainstorm,
W77-07784 2B

SEWAGE
A Study on the Strength of Sewage,
W77-07853 5B

The Problem of the Sanitary Protection of the Waters of Ports and Coastal Zones of the Black Sea Basin, (In Russian),
W77-08014 5G

SEWAGE DISPOSAL
Nitrification in Soil Treated with Domestic and Industrial Sewage Sluge,
W77-07862 5E

A New Vacuum Sewage System by IFO Wartsila.
W77-07882 5D

Handling Small Amounts of Crude Sewage.
W77-07886 8G

Sewage Sludge Disposal: A Sticky Problem with No Fail-Safe Answer,
W77-07948 5E

SEWAGE EFFLUENTS
Reduction in Sewage Contamination in Sydney Rock Oysters,
W77-07946 5G

The Use of Sewage Effluent as Power Station Cooling Water,
W77-07949 5G

SEWAGE SLUDGE
Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges, Volume 4, (Analytical Methods for Sewage Sludge Analysis),
W77-07614 5A

Examination of Sewage Sludge for Enteroviruses, Volume 2,
W77-07615 5B

Nitrification in Soil Treated with Domestic and Industrial Sewage Sluge,
W77-07862 5E

Application of Sewage Sludge to Cropland.
W77-07869 5E

SEWAGE TREATMENT
Biological Phosphate Elimination of Preliminarily Cleaned Communal Waste Water by Use of Iron Bacteria (Biologische Entphosphatung vorgereinigten kommunalen Abwassers unter Mitwirkung von Eisenbakterian),
W77-07856 5D

'Hydig'-One Example of Controlled Sludge Use,
W77-07871 5E

Handling Small Amounts of Crude Sewage.
W77-07886 8G

Macerator-Sterilizer Sewage Treatment System,
W77-07895 5D

Sewage Treatment Apparatus,
W77-07896 5D

Less-Costly Activated Carbon for Sewage Treatment.
W77-07934 5D

Waste Water Renovation by Sewage Ultrafiltration,
W77-07941 5D

Sewage Sludge Treatment System,
W77-08030 5D

Best Practicable Waste Treatment Screening Model,
W77-08037 5D

Water Waste Treatment,
W77-08092 5D

SEWER CONSTRUCTION
Drainage--Who Pays, Responsibilities After the 1973 Water Act,
W77-07932 5G

SEWERAGE
A New Vacuum Sewage System by IFO Wartsila.
W77-07882 5D

Movement Joint for Concrete Sewer Bridge.
W77-07885 8F

State Park Gets Good Treatment, Effluents Will Be Used for Irrigation to Reduce Extensive Requirements,
W77-07936 5D

SEWERS
Telescoping Form System Speeds Sewer Concreting.
W77-07879 8F

Gas Detectors Determine Health Hazards in Sewage Treatment.
W77-07880 5A

How to Determine Waste Water Flow,
W77-07881 5F

Increasing Sewer Capacity by Polymer Dosing,
W77-07883 8G

Study of In-Service Bituminized Fiber Sewer Pipe,
W77-07884 8G

Handling Small Amounts of Crude Sewage.
W77-07886 8G

The Conception, Design, and Construction of Metropolitan Toronto Mid-Toronto Sewer,
W77-07888 8B

Plastic Sewer Pipe Materials.
W77-07931 8G

Drainage--Who Pays, Responsibilities After the 1973 Water Act,
W77-07932 5G

SHALLOW WATER
Sedimentation in Lower Green Bay, Wisconsin,
W77-07980 2J

SHASTA DAM
Passing Fish Through Hydraulic Turbines,
W77-07713 8I

SHORELINE COVER
Evaluation of Potential Use of Vegetation for Erosion Abatement Along the Great Lakes Shoreline,
W77-07788 4D

SHRIMP
Ultrastructural Study of Lesions in Gills of a Marine Shrimp Exposed to Cadmium,
W77-07845 5C

Effect of Salinity on the Fresh-Water Shrimp Dikerogammarus Haemobaphes (Eichwald) from the Mouth of the Dnepr,
W77-07848 5C

SHRINK-SWELL POTENTIAL
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

SIERRA MOUNTAINS
Snow Survey from Space, with Emphasis on the Results of the Analysis of Skylab EREP S192 Multispectral Scanner Data,
W77-08082 7B

SIERRA MOUNTAINS (NEV)
Areal Extent of Snow Estimation in the Northern Sierra Nevada Mountains Using LANDSAT-1 Imagery,
W77-08081 7B

SILVER BAY (MINN)
Temperature Regime in Lake Superior at Silver Bay, Minnesota,
W77-07970 1A

SIMULATION ANALYSIS
Problems Encountered in Synthetic River Flow Generation Procedures,
W77-07657 2A

Application of Stochastic Hydrological Models in the Design of Lake Level Control,
W77-07681 4A

Model of a Lake Reservoir,
W77-07687 4A

Some Problems of Stochastic Storage with Correlated Inflow,
W77-07689 4A

Representative and Experimental Basins - Where Next,
W77-07781 2A

Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

Study of the Rio Grande, Bolivia Highlights Some Basic Questions About Simulation,
W77-07945 2A

Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

Best Practicable Waste Treatment Screening Model,
W77-08037 5D

An Integrated Model-Approach to the Effect of Water Management on Crop Yield,
W77-08038 3F

Optimal Operation of Water Resources Systems--1,
W77-08047 4A

Planning of Systems for Regional Development in Water Resources,
W77-08049 6A

SKIMMERS
Skimmer Apparatus for Sewage Settling Tanks and the Like,
W77-08088 5G

SKIMMING
Moving Belt-Type Oil Skimmer with Propulsion Induced Flow, Method and Apparatus,
W77-08012 5G

Skimmer Apparatus for Sewage Settling Tanks and the Like,
W77-08088 5G

SLIME
Composition and Method of Inhibiting Growth of Slime in Water,
W77-08027 5G

SLUDGE
Workshop Proceedings -- Research Needs Related to Recycling Urban Wastewater on Land,
W77-07607 5D

SLUDGE DIGESTION
Autothermal Aerobic Digestion,
W77-07898 5D

Survey of Anaerobic Digestion Supernatant Treatment Alternatives,
W77-07903 5D

Bacterial Populations and End Products During Anaerobic SLudge Fermentation of Glucose,
W77-07944 5D

SLUDGE DISPOSAL
Estimating Costs of Waste Water Sludge Disposal,
W77-07861 5E

Nitrification in Soil Treated with Domestic and Industrial Sewage Sluge,
W77-07862 5E

Save Sludge Handling Costs by Level Control,
W77-07868 5D

Application of Sewage Sludge to Cropland.
W77-07869 5E

Organic Matter and Heavy Metal Uptake,
W77-07870 5E

'Hydig'-One Example of Controlled Sludge Use,
W77-07871 5E

Composting--An Approach to Using Sewage Waste,
W77-07876 5E

Sewage Sludge Disposal: A Sticky Problem with No Fail-Safe Answer,
W77-07948 5E

SLUDGE TREATMENT
Silk from Sow's Ears.
W77-07867 5D

Save Sludge Handling Costs by Level Control,
W77-07868 5D

Sludge Dewatering by Belt Filter.
W77-07905 5D

Poly Aluminum Chloride in Sludge Treatment,
W77-07912 5D

Controlling Sludge Bulking.
W77-07921 5D

Continuous Thickening of Biological Sludges, and the Influence of Stability,
W77-07923 5D

Bacterial Populations and End Products During Anaerobic SLudge Fermentation of Glucose,
W77-07944 5D

SLURRIES
Slurry and Pumping Guidelines Smooth Casing-Cementing Jobs,
W77-07699 8F

SNAKE RIVER
Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

Dissolved Gas Data Report, 1975-1976,
W77-07718 5A

Dissolved Gas Supersaturation in the Salmon River, 1972-74,
W77-07719 5A

SNAKE RIVER (OR)
Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

SNOW
Statistical Forecasting of Snow Avalanches, San Juan Mountains, Southern Colorado, U.S.A.,
W77-08055 2C

Factors Affecting Snow Assessment from LANDSAT Data,
W77-08083 7B

Operational Water Management Applications of Snowcovered Area Observations,
W77-08084 7B

SNOW COVER
Objective Analysis of Snow Cover Fields,
W77-07678 2C

Areal Extent of Snow Estimation in the Northern Sierra Nevada Mountains Using LANDSAT-1 Imagery,
W77-08081 7B

SNOW SURVEYS
Areal Extent of Snow Estimation in the Northern Sierra Nevada Mountains Using LANDSAT-1 Imagery,
W77-08081 7B

Snow Survey from Space, with Emphasis on the Results of the Analysis of Skylab EREP S192 Multispectral Scanner Data,
W77-08082 7B

SOCIAL ASPECTS
Risk of Drinking Water Contamination in Rural Tennessee,
W77-07701 5G

SOCKEYE SALMON
Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

SODIUM CHLORIDE
The Effect of Highway Deicing Salt on Chloride Budgets at Lake George, NY,
W77-08000 5B

SODIUM DODECYLSULFATE
Degradation of Sodium Dodecylsulfate by Bacteria in Waste Waters, (In Russian),
W77-07801 5B

SOIL AMENDMENTS
Application of Sewage Sludge to Cropland.
W77-07869 5E

SOIL ANALYSIS
Nitrates in Some Soil-Water Systems in Quebec, (In French),
W77-07858 5B

SOIL DISPOSAL FIELDS
Application of Sewage Sludge to Cropland.
W77-07869 5E

SOIL ELECTRICAL CONDUCTIVITY
Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

SOIL EROSION
Evaluation of Sediment Yields Due to Urban Development,
W77-07705 4D

SOIL FILTERS
Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

Waste Water Treatment by Upflow Sand Filtration,
W77-08087 5D

SOIL FORMATION
Soil Formation on Loess in Southwestern Indiana: I. Loess Stratigraphy and Soil Morphology,
W77-07762 2G

Soil Formation on Loess in Southwestern Indiana: II. Distribution of Clay and Free Oxides and Fragipan Formation,
W77-07763 2G

SOIL MOISTURE
Microwave Remote Sensing of Soil Moisture,
W77-08066 7B

Soil Moisture Detection from Skylab,
W77-08067 7B

The Correlation of Skylab L-Band Brightness Temperatures with Antecedent Precipitation,
W77-08068 7B

SOIL MORPHOLOGY
Gully Wall Stability in Loess-Derived Alluvium,
W77-07764 4D

SOIL PHYSICAL PROPERTIES
Comparisons of Two Models for Predicting the Relative Hydraulic Conductivity of Salt-Affected Swelling Soils,
W77-07777 2G

SOIL PORES
A Technique to Index Soil Pores and Aggregates Larger than 20 Micrometers,
W77-08059 2G

SOIL PROFILES
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

SOIL PROPERTIES
Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

Predictions of the Soil Water Flux Based Upon Field-Measured Soil-Water Properties,
W77-07772 2G

SOIL SALT MOVEMENT
Model of Salt Flow in Soil with a Source-Sink Term,
W77-07761 2G

SOIL STRENGTH
Gully Wall Stability in Loess-Derived Alluvium,
W77-07764 4D

SOIL STRUCTURE
A Technique to Index Soil Pores and Aggregates Larger than 20 Micrometers,
W77-08059 2G

SOIL SURVEY
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

SOIL SURVEYS
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

SOIL TYPES
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Malheur Lake Drainage Basin, Appendix I-12,
W77-07617 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

Effects of Trace Elements on Nitrogen Mineralization in Soils,
W77-07864 5B

SOIL WATER FLUX
Predictions of the Soil Water Flux Based Upon Field-Measured Soil-Water Properties,
W77-07772 2G

SOIL WATER MOVEMENT
Transport of Reactive Solutes Through Multilayered Soils,
W77-07758 2G

Solute Movement in a Field Soil,
W77-07759 2G

Predictions of the Soil Water Flux Based Upon Field-Measured Soil-Water Properties,
W77-07772 2G

SOILS
Heterotrophic Nitrification in Soils and Aquatic Environments, (In Russian),
W77-07754 5C

Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

SOLAR RADIATION
Influence of Suspended Sediment on the Temperatures of Surface Waters of Reservoirs,
W77-07975 5C

SOLID WASTES
Evaluation of Alternate Solids Handling Methods for Advanced Waste Treatment,
W77-07902 5D

SOLIDS CONTACT PROCESSES
Evaluation of Alternate Solids Handling Methods for Advanced Waste Treatment,
W77-07902 5D

SOLUBILITY
Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

Gas Disease in Fishes - A Review,
W77-07727 5C

SOLUBLE ORGANIC PHOSPHORUS
Cycling of Dissolved Organic Phosphorus Compounds in Natural Waters,
W77-07608 5C

SOLUTE TRANSPORT
Transport of Reactive Solutes Through Multilayered Soils,
W77-07758 2G

Solute Movement in a Field Soil,
W77-07759 2G

SOLUTES
Transport of Reactive Solutes Through Multilayered Soils,
W77-07758 2G

Solute Movement in a Field Soil,
W77-07759 2G

SORPTION
Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

SOUHEGAN RIVER (NH)
Flood Plain Information: Merrimack and Souhegan Rivers, Litchfield and Merrimack, New Hampshire.
W77-07645 4A

SOUTH AFRICAN CLAW TOAD
Effects of Pollutants on Eggs, Embryos and Larvae of Amphibian Species,
W77-07820 5C

SOUTH ANNA RIVER (VA)
Flood Plain Information, South Anna River, Hanover County, Va.
W77-07637 4A

SOUTH CAROLINA
Modeling Multiple-Use in Natural Areas: Part II - The Santee Swamp Study,
W77-08050 6A

SOUTH COAST DRAINAGE BASIN (OR)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

SOUTH GEORGIA ISLAND
A Snow-Bank Push Mechanism for the Formation of Some 'Annual' Moraine Ridges,
W77-08054 2C

SPAIN (LAKES)
Optimal Growth Temperatures and Media Parameters of Bacterial Communities from Lakes of Different Trophic States,
W77-07994 5C

SPATIAL DISTRIBUTION
Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

SPECIES DIVERSITY
Aquatic Insect Diversity and Biomass in a Stream Marginally Polluted by Acid Strip Mine Drainage,
W77-07846 5C

SPECIFIC GRAVITY
Effect of Major Ion Variations in the Marine Environment on the Specific Gravity--Conductivity--Chlorinity--Salinity Relationship,
W77-07802 2K

SPILLWAY DEFLECTOR
Dissolved Gas Data Report, 1975-1976,
W77-07718 5A

SPILLWAYS
Dissolved Gas Data Report, 1975-1976,
W77-07718 5A

SPIROGYRA
The Availability of Chlorophyllide in Hydrophytes and Algas of Lake Trasimeno and the Variability of Pigment Content in Spirogyra, (In Italian),
W77-08044 5C

SPRINGS
Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

SPRINKLER IRRIGATION
Sprinkler Adapted for Attachment to the Ground,
W77-08025 3F

ST. CROIX (VIRGIN ISLANDS)
Waste Water Reclamation in St. Croix,
W77-07875 5D

ST. LAWRENCE RIVER
Frequency Analysis of Water Balance Components in Relation to Climatic Factors,
W77-07668 2A

ST. LOUIS RIVER
Frequency Analysis of Water Balance Components in Relation to Climatic Factors,
W77-07668 2A

STABILITY
Process Stability of Activity Sludge Processes,
W77-07857 5D

Stability in Structure and Function of the Mud-Water Interface,
W77-07985 5C

STANDARDS
Adjustment Costs and Optimal Waste Treatment,
W77-08045 5G

STANFORD WATERSHED MODEL
Representative and Experimental Basins - Where Next,
W77-07781 2A

STATE ESTIMATION
Use of State Estimation Techniques in Water Resource System Modeling, by Dennis P. Lettenmaier and Stephen J. Burges,
W77-08035 5B

STATISTICAL ANALYSIS
Multidimensional Statistic Modelling of Hydrological Processes on the Basis of Structural Analysis of the Empirical Hydrographs of Runoff,
W77-07662 2A

STATISTICAL METHODS
Investigations on the Structure of Frequency Distributions of Floods,
W77-07649 2E

Bayesian Estimation of Frequency of Hydrological Events,
W77-07650 2E

Spatial and Time Analysis and Estimation of River Flow,
W77-07654 2E

Elements of Runoff Periodicity in Tasks of Modelling,
W77-07655 2E

New Forms of Correlation Relationships Between Positive Quantities Applied in Hydrology,
W77-07659 2A

Multidimensional Statistic Modelling of Hydrological Processes on the Basis of Structural Analysis of the Empirical Hydrographs of Runoff,
W77-07662 2A

Significance Tests of Periodicity in Hydrological Time Series,
W77-07665 2A

STATISTICAL MODELS
Some Applications of Stochastic Flow Generation,
W77-07647 2A

Stochastic Structure of a Process of Average Monthly Flows,
W77-07651 2E

Methods for the Mathematical Description of the Structure of River Runoff Variations,
W77-07652 2E

STEELHEAD TROUT
Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

Summary of Gas Supersaturation Research at Western Fish Toxicology Station (EPA), Corvallis, Oregon, 1972-1974.
W77-07729 5C

STERILIZATION
Macerator-Sterilizer Sewage Treatment System,
W77-07895 5D

STOCHASTIC PROCESSES
Stochastic Analysis of Velocity Fluctuations in a Natural Stream Channel,
W77-07648 2E

Simulation of Daily Rainfall Series Using Markov Chain Models,
W77-07660 2A

Stochastic Analysis of Short-Time Rainfalls,
W77-07671 2B

Emptiness of a Finite Dam--Time Dependent Theory,
W77-07683 8B

Some Problems of Stochastic Storage with Correlated Inflow,
W77-07689 4A

Optimal Engineering Design Under Uncertainty by Geometric Programming,
W77-08040 8C

STOCKTON (CA)
Flood Plain Information: Northwest Stream Group, Stockton, California,
W77-07642 4A

STONEFLIES
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

STORM DRAINS
Industry Monitors County Storm Sewer Water,
W77-07933 5D

STORM RUNOFF
Penn State Urban Runoff Model--User's Manual,
W77-07797 4D

STORM WATER
Penn State Urban Runoff Model--User's Manual,
W77-07797 4D

STORM WATER MANAGEMENT MODEL
Three Case Studies on the Application of the Storm Water Management Model,
W77-07955 5B

STORMS
Characteristics of the Severe Rainstorm,
W77-07784 2B

STRASBOURG (FRANCE)
Study of Free Living Amoebae in the Waters of Strabourg: Preliminary Report, (In French),
W77-08016 5A

STREAMFLOW
Generation of Multivariate Synthetic Flows,
W77-07610 2A

Some Applications of Stochastic Flow Generation,
W77-07647 2A

Methods for the Mathematical Description of the Structure of River Runoff Variations,
W77-07652 2E

Spectral Analysis of the Structure of Hydrological Series,
W77-07653 2E

Elements of Runoff Periodicity in Tasks of Modelling,
W77-07655 2E

Cyclical Structure of the Hydrological Series and the Nature of Individual Components,
W77-07656 2E

Problems Encountered in Synthetic River Flow Generation Procedures,
W77-07657 2A

On Deterministic Components in Natural Streamflow,
W77-07658 2E

Structural Relation Between Parametric and Stochastic Hydrology Models,
W77-07664 2A

A Simple Stochastic Modelling of Hurst's Law,
W77-07666 2E

Finding Regularities in Long-Term Streamflow Fluctuations by Analysis of Hydrological Ensembles,
W77-07676 2E

Time and Frequency-Domain Identification of a Casual Bivariate Stochastic Process,
W77-07680 2E

STREAMFLOW FORECASTING
The Representation of a Short Period of Experimental Catchment Data by a Linear Stochastic Difference Equation,
W77-07646 2

Spatial and Time Analysis and Estimation of River Flow,
W77-07654 2E

STREAMS
Aspects of Bankfull Geometry in a Distributary System of Eastern Australia,
W77-07782 2E

Recreational Use of Small Streams in Wisconsin,
W77-08008 5G

STRIP MINES
Limnologic-Geologic Excursion in the Territory of the Lower Erft River, (In German),
W77-07799 5B

STRIPED MULLET
Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

STRONTIUM RADIOISOTOPES
Migration of 90Sr with Runoff Waters from Soils, (In Russian),
W77-07971 5B

SUB-LETHAL EFFECTS
Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

SUBCUTANEOUS EMPHYSEMA
Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

SUBMERGED PLANTS
The Invertebrates on Submerged Macrophytes in Three Masurian Lakes,
W77-07987 5C

SUBMERSIBLE PUMPS
Pumping Systems: Part II,
W77-07704 8C

SUBSURFACE FLOW
Solute Movement in a Field Soil,
W77-07759 2G

SUDAN
Comparisons of Two Models for Predicting the Relative Hydraulic Conductivity of Salt-Affected Swelling Soils,
W77-07777 2G

SULFATES
Degradation of Sodium Dodecylsulfate by Bacteria in Waste Waters, (In Russian),
W77-07801 5B

SUMMER LAKE DRAINAGE BASIN (OR)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

SUNFISHES
Notes on the Exposure of Several Species of Fish to Sudden Changes in the Hydrogen Ion Concentration of the Water and to an Atmosphere of Pure Oxygen,
W77-07725 5C

Feeding of Forage Fish in Turbid Kansas Reservoirs,
W77-07817 2H

Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

SUPERSATURATION
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

Effects of Gas Supersaturated Columbia River Water on the Survival of Juvenile Chinook and Coho Salmon,
W77-07708 5C

Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

Some Experiments on the Gas-Disease in Freshwater Fishes, (In Japanese),
W77-07714 5C

Water Quality Requirements of Fishes and Effects of Toxic Substances,
W77-07715 5C

Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

Dissolved Gas Data Report, 1975-1976,
W77-07718 5A

Dissolved Gas Supersaturation in the Salmon River, 1972-74,
W77-07719 5A

An Analysis of the Feasibility of Using Air Agitation to Reduce Gas Saturations in Sea Water at Pilgrim Nuclear Power Station,
W77-07720 5G

Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

Dissolved Gas Supersaturation, Grand Coulee Dam Project, 1973,
W77-07722 5B

Notes on the Exposure of Several Species of Fish to Sudden Changes in the Hydrogen Ion Concentration of the Water and to an Atmosphere of Pure Oxygen,
W77-07725 5C

Gas Disease in Fishes - A Review,
W77-07727 5C

Summary of Gas Supersaturation Research at Western Fish Toxicology Station (EPA), Corvallis, Oregon, 1972-1974.
W77-07729 5C

SURF
Observations of Wave Height and Wave Celerity in the Surf Zone,
W77-07770 2L

Mechanism for Tapping the Surf Energy,
W77-08026 8C

SURF ZONE WAVES
Observations of Wave Height and Wave Celerity in the Surf Zone,
W77-07770 2L

SURFACE-GROUNDWATER RELATIONSHIPS
Hierarchical Modeling for the Planning and Management of a Total Regional Water Resource System: Joint Consideration of the Supply and Quality of Ground and Surface Water Resources,
W77-07793 4B

SURFACE WATERS
The Use of LANDSAT DCS and Imagery in Reservoir Management and Operation,
W77-08076 7B

SURFACES
Hydrologic Optics. Volume VI. Surfaces,
W77-07961 1A

SURFACTANTS
Israel's Use of Nonionic Surfactants,
W77-07929 5B

SURVEYS
Local Control of Land Use: Profile of a Problem,
W77-08003 6F

Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D,
W77-08062 7B

The Use of Skylab and LANDSAT in a Geohydrological Study of the Paleozoic Section, West-Central Bighorn Mountains, Wyoming,
W77-08063 7B

Hydrogeological Investigations in the Pampa of Argentina,
W77-08064 7B

SUSPENDED LOAD
Influence of Suspended Sediment on the Temperatures of Surface Waters of Reservoirs,
W77-07975 5C

SUSPENDED SOLIDS
Development of the Turbidity Maximum in Rappahannock Estuary; Summary,
W77-07789 2L

Two-Stage Filtration of Secondary Effluent,
W77-07907 5D

SWAMPS
Flood Plain Information: Ipswich River, North Reading and Wilmington, Massachusetts,
W77-07644 4A

Hydrochemistry of the Nigula Swamp, (In Estonian),
W77-07859 2H

Modeling Multiple-Use in Natural Areas: Part II - The Santee Swamp Study,
W77-08050 6A

SWEDEN
Biological Long-Term Investigations of Swedish Lakes,
W77-07998 5C

SWELLING SOILS
Comparisons of Two Models for Predicting the Relative Hydraulic Conductivity of Salt-Affected Swelling Soils,
W77-07777 2G

SYNERGISTIC ACTIVITY
Composition and Method of Inhibiting Growth of Slime in Water,
W77-08027 5G

SYNTHETIC HYDROLOGY
Generation of Multivariate Synthetic Flows,
W77-07610 2A

The Representation of a Short Period of Experimental Catchment Data by a Linear Stochastic Difference Equation,
W77-07646 2

Some Applications of Stochastic Flow Generation,
W77-07647 2A

Problems Encountered in Synthetic River Flow Generation Procedures,
W77-07657 2A

The Generation of Synthetic Monthly Runoff Records for Ungauged British Catchments,
W77-07661 2A

In Hydrology h is a Household Word,
W77-07667 2A

SYNTHETIC RUNOFF RECORD
The Generation of Synthetic Monthly Runoff Records for Ungauged British Catchments,
W77-07661 2A

SYSTEMS ANALYSIS
Hierarchical Modeling for the Planning and Management of a Total Regional Water Resource System: Joint Consideration of the Supply and Quality of Ground and Surface Water Resources,
W77-07793 4B

Environmental Assessment: The Ecological Dimension,
W77-08034 6G

TAR BALLS
Tar Ball Distribution in the Western North Atlantic,
W77-07757 5B

TECHNOLOGY
A Technique to Index Soil Pores and Aggregates Larger than 20 Micrometers,
W77-08059 2G

TELEMETRY
Analysis of IFYGL Rawinsonde Baseline Measurements,
W77-07790 2B

The Application of ERTS-1 Digital Data to Water Transport Phenomena in the Point Pelee-Rondeau Area,
W77-07981 2J

TELEOSTS
Experimental Study of Acute Toxicity of Salts of Cobalt, Antimony, Strontium and Silver Crustaceans and Their Larvae and in Some Teleosts, (In French),
W77-07728 5C

TEMPORAL DISTRIBUTION
Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

TENNESSEE
Risk of Drinking Water Contamination in Rural Tennessee,
W77-07701 5G

TENSIOMETERS
Fritted Glass Bead Materials as Tensiometers and Tension Plates,
W77-07760 2G

TEPP
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

TERMINOLOGY
Glossary of Water Resource Terms,
W77-07613 10C

TERRACING
Simulation of Impoundment Terrace Hydraulics,
W77-07767 8B

TERTIARY TREATMENT
Utilization of Fly Ash in Polishing Oxidation Pond Effluents,
W77-07815 5D

Evaluation of Alternate Solids Handling Methods for Advanced Waste Treatment,
W77-07902 5D

Hygenic Assessment of Tertiary Adsorption Treatment of Domestic Sewage and Industrial Effluents (Gigienicheskaya Otsenka Tretichnoyi Adsorbtsionnoyi Ochistki Bytovykh I Promyshlennikh Stochnykh Vod),
W77-07906 5D

AWT Plant Meets Tough Demands,
W77-07918 5D

TESTING PROCEDURES
Electronic Isolation Simulator for Hydraulic Turbine Governor Alinement,
W77-07804 8C

TEXAS
Flood Plain Information: Thompsons Creek and Tributaries, Bryan, Texas,
W77-07634 4A

Flood Plain Information; San Antonio River, Bexar County, Texas.
W77-07635 4A

Flood Plain Information: Wichita River and Tributaries, Wichita Falls, Texas,
W77-07643 4A

State Park Gets Good Treatment, Effluents Will Be Used for Irrigation to Reduce Extensive Requirements,
W77-07936 5D

Flood Hazard Studies in Central Texas Using Orbital and Suborbital Remote Sensing Imagery,
W77-08069 7B

The Application of Remote Sensing Technology to the Inventory of Playa Lakes in the High Plains of Texas,
W77-08077 7B

Evaluation of Thermal X/5-Detector Skylab S-192 Data for Estimating Evapotranspiration and Thermal Properties of Soils for Irrigation Management,
W77-08079 7B

THAILAND
A Multivariate Mathematical Model of Monthly River Flow,
W77-07675 2E

THERMAL POLLUTION
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

THERMAL POWER
Method and Apparatus for Obtaining Electrical Power from Sea Water,
W77-08032 8C

THERMAL SHOCK
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

THERMAL STRATIFICATION
Physical, Chemical, and Biological Factors in the Initiation and Destruction of Biogenic Meromixis in a Soft-Water Lake,
W77-07963 5C

THERMAL STRESS
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

THESAURI
Glossary of Water Resource Terms,
W77-07613 10C

THOMPSONS CREEK (TX)
Flood Plain Information: Thompsons Creek and Tributaries. Bryan, Texas,
W77-07634 4A

TIDAL EFFECTS
Monitoring Dissolved Hydrocarbons as a Function of the Tidal Cycle (New York Harbor),
W77-07740 5B

TIDAL ENERGY
Tidewater Power System,
W77-08022 8C

TIDAL POWERPLANTS
Tidewater Power System,
W77-08022 8C

TIDAL WATERS
Flood Plain Information: Northwest Stream Group, Stockton, California,
W77-07642 4A

TIDES
Tidal and Current Prediction for the Amazon's North Channel Using a Hydrodynamical-Numerical Model,
W77-07743 2L

TISSUE ACCUMULATION
Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

TISSUE CONCENTRATION
Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

TLM (MEDIAN TOLERANCE LEVEL)
Physiological Response of the Cunner, Tautogolabrus adspersus, To Cadmium. I. Introduction and Experimental Design,
W77-07831 5C

TOADS
Effects of Pollutants on Eggs, Embryos and Larvae of Amphibian Species,
W77-07820 5C

TOBAGO
Water Resources and Water-Supply Development in Trinidad and Tobago,
W77-07785 6D

TOLLS
Tolls: Efficiency and Equity Issues for Inland Waterways,
W77-08039 6C

TOXAPHENE
Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

TOXICITY
Experimental Study of Acute Toxicity of Salts of Cobalt, Antimony, Strontium and Silver Crustaceans and Their Larvae and in Some Teleosts, (In French),
W77-07728 5C

Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, To Cadmium. I. Introduction and Experimental Design,
W77-07831 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

Protective Effect of Chloride on Nitrite Toxicity to Coho Salmon (Oncorhynchus Kisutch),
W77-07840 5C

Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

TRACE ELEMENTS
Effects of Trace Elements on Nitrogen Mineralization in Soils,
W77-07864 5B

TRACERS
Phosphorus Regeneration by Natural Populations of Limnetic Zooplankton,
W77-07972 5C

TRANSFER
Mercury in the Biogeochemical Environment,
W77-07823 5B

TRANSMITTANCE
Hydrologic Optics, Volume II. Foundations,
W77-07957 1A

TRANSPORT DEPLETION
Mercury in the Biogeochemical Environment,
W77-07823 5B

TREATMENT FACILITIES
Waste Water Plants Use Less Instrumentation than Related Industries,
W77-07872 5D

Financing: There Must be a Better Way,
W77-07873 5G

Survey Predicts 33 Percent Municipal Compliance with 1977 Deadline,
W77-07877 5G

1976 Needs Survey Markedly Lower,
W77-07878 5G

Bristol Regional Sewage Treatment Works--Past, Present and Future,
W77-07901 5D

Automatic Analysis Contributes to Waste Water Treatment Efficiency,
W77-07909 5A

Air V. Oxygen in Dorset,
W77-07910 5D

In-House Treatment.
W77-07917 5D

AWT Plant Meets Tough Demands,
W77-07918 5D

Cost of High Quality Waste Water Treatment for Reuse,
W77-07930 5D

R and D Project Provides Phys/Chem Data, Foxborough (Mass) State Hospital Plant Can Produce 'Superior Effluent Quality',
W77-07937 5D

Some Reflections of a Sewage Works Manager,
W77-07952 5D

Process Technological Background Regarding New Protective Regulations for Water Bodies-Results of Experiments on Nitrification and Phosphorus Elimination in Zurich and Bern. II. Process Technological Background of Nitrification in Activated Sludge Plants (Verfahrenstechnische Unterlagen im Hinblick auf die neuen Gewaesserschutz-Anforderungen-Ergebnisse der Versuche ueber die Nitrifikation und Phosphorelimination in Zuerich und Bern. II. Verfahrenstechnische Grundlagen der Nitrifikation in Belebtschlammanlagen),
W77-07953 5D

Investigation of Dynamic Performance of Waste Water Treatment Plants,
W77-08094 5D

Analysis of Activated Sludge Process Performance,
W77-08096 5D

TRICHLOROFON
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

TRICKLING FILTERS
Two-Stage Filtration of Secondary Effluent,
W77-07907 5D

TRINIDAD
Water Resources and Water-Supply Development in Trinidad and Tobago,
W77-07785 6D

TRITHION
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

TROPHIC LEVEL
The Contribution of Autochthonous and Allochthonous Matter to the Trophy of a River in the Barbel Region,
W77-07986 5C

The Influence of Mineral Fertilization on Phytoplankton Production in Lakes of Various Trophic Types,
W77-07988 5C

Optimal Growth Temperatures and Media Parameters of Bacterial Communities from Lakes of Different Trophic States,
W77-07994 5C

TROUT
Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

Trout and Salmon Culture (Hatchery Methods) Hatchery Water Supply,
W77-07726 5G

TURBIDITY
Development of the Turbidity Maximum in Rappahannock Estuary; Summary,
W77-07789 2L

Feeding of Forage Fish in Turbid Kansas Reservoirs,
W77-07817 2H

Influence of Suspended Sediment on the Temperatures of Surface Waters of Reservoirs,
W77-07975 5C

TURBIDITY MAXIMUMS
Development of the Turbidity Maximum in Rappahannock Estuary; Summary,
W77-07789 2L

TURBINE OPERATING CONDITIONS
Passing Fish Through Hydraulic Turbines,
W77-07713 8I

TURBINES
Passing Fish Through Hydraulic Turbines,
W77-07713 8I

TWIN LAKES (CO)
Studies of the Benthic Environment of Twin Lakes.
W77-07806 5C

TWO-STAGE FILTER SYSTEMS
Two-Stage Filtration of Secondary Effluent,
W77-07907 5D

TYGART LAKE (WV)
Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

UJI RIVER (JAPAN)
On the Relation of the Diatiom FLora and Water Quality in the Uji River Kyoto, (In Japanese),
W77-08089 5

ULTIMATE DISPOSAL
Golar Rubbish, Oil Sludge and Sewage Incinerator.
W77-07911 5E

ULTRAFILTRATION METHOD
Concentration of Bacteria in Water Using the Ultrafiltration Method, (In French),
W77-07860 5D

ULTRAFILTRATION (SUF)
Waste Water Renovation by Sewage Ultrafiltration,
W77-07941 5D

UMPQUA DRAINAGE BASIN (OR)
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

UNDERGROUND DISPOSAL
Prefabricated Panels for Sub-Surface Sewage Effluent and Waste Water Disposal,
W77-08091 5E

UNDERWATER VISIBILITY
Hydrologic Optics. Volume I. Introduction,
W77-07956 1A

UNITED KINGDOM
Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

The Representation of a Short Period of Experimental Catchment Data by a Linear Stochastic Difference Equation,
W77-07646 2

Some Applications of Stochastic Flow Generation,
W77-07647 2A

Stochastic Analysis of Velocity Fluctuations in a Natural Stream Channel,
W77-07648 2E

Problems Encountered in Synthetic River Flow Generation Procedures,
W77-07657 2A

UNITED NATIONS CONFERENCE ON HUMAN SETTLEMENTS
Community Water Supply and Excreta Disposal in the Developing Countries,
W77-07865 5G

UNITED STATES
Environment and Regional Planning, A Pilot Study of the Committee on the Challenges of Modern Society,
W77-07633 6G

UNIVERSAL SOIL LOSS EQUATION
Evaluation of Sediment Yields Due to Urban Development,
W77-07705 4D

UPPER COLUMBIA RIVER
Dissolved Gas Supersaturation, Grand Coulee Dam Project, 1973,
W77-07722 5B

UPPER LETHAL TEMPERATURES
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

URANIUM RADIOISOTOPES
Rum Jungle Environmental Studies, Summary Report,
W77-07822 5B

URBAN AREAS
Community Water Supply and Excreta Disposal in the Developing Countries,
W77-07865 5G

URBAN DRAINAGE
Penn State Urban Runoff Model--User's Manual,
W77-07797 4D

Treating Urban Drainage as a Utility,
W77-07947 5G

URBAN HYDROLOGY
Floodflow Formulas for Urbanized and Nonurbanized Areas of Connecticut,
W77-07612 4C

URBAN RUNOFF
Evaluation of Sediment Yields Due to Urban Development,
W77-07705 4D

Treating Urban Drainage as a Utility,
W77-07947 5G

URBAN RUNOFF MODEL
Penn State Urban Runoff Model--User's Manual,
W77-07797 4D

URBANIZATION
Floodflow Formulas for Urbanized and Nonurbanized Areas of Connecticut,
W77-07612 4C

Penn State Urban Runoff Model--User's Manual,
W77-07797 4D

UREAS
Experimental Data for the Hygienic Standardization of Diphenylamine and Diphenyldiethylurea in Water Bodies, (In Russian),
W77-07700 5G

USER CHARGES
Tolls: Efficiency and Equity Issues for Inland Waterways,
W77-08039 6C

USSR
Methods for the Mathematical Description of the Structure of River Runoff Variations,
W77-07652 2E

Spectral Analysis of the Structure of Hydrological Series,
W77-07653 2E

Spatial and Time Analysis and Estimation of River Flow,
W77-07654 2E

Elements of Runoff Periodicity in Tasks of Modelling,
W77-07655 2E

Cyclical Structure of the Hydrological Series and the Nature of Individual Components,
W77-07656 2E

On Deterministic Components in Natural Streamflow,
W77-07658 2E

New Forms of Correlation Relationships Between Positive Quantities Applied in Hydrology,
W77-07659 2A

Finding Regularities in Long-Term Streamflow Fluctuations by Analysis of Hydrological Ensembles,
W77-07676 2E

Optimal Spatial Interpolation and Its Errors in the Case of Various Distances Between Observation Points or Watershed Centres,
W77-07677 4D

Objective Analysis of Snow Cover Fields,
W77-07678 2C

UTAH
Snow Survey from Space, with Emphasis on the Results of the Analysis of Skylab EREP S192 Multispectral Scanner Data,
W77-08082 7B

UTILIZATION
Making Aquatic Weeds Useful: Some Perspectives for Developing Countries.
W77-07964 4A

VALLEY CROSSINGS
A Valley Crossing in Pleistocene Deposits,
W77-07778 8E

VALLEYS
A Valley Crossing in Pleistocene Deposits,
W77-07778 8E

VALUATION
The Valuation of Aesthetic Preferences,
W77-08041 6G

VARIABILITY
Predictions of the Soil Water Flux Based Upon Field-Measured Soil-Water Properties,
W77-07772 2G

VEGETATION EFFECTS
Evaluation of Potential Use of Vegetation for Erosion Abatement Along the Great Lakes Shoreline,
W77-07788 4D

Microwave Remote Sensing of Soil Moisture,
W77-08066 7B

VELOCITY
Stochastic Analysis of Velocity Fluctuations in a Natural Stream Channel,
W77-07648 2E

The Scaling of Velocity Fluctuations in the Surface Mixed Layer,
W77-07768 2I

VELOCITY SPECTRA
The Scaling of Velocity Fluctuations in the Surface Mixed Layer,
W77-07768 2I

VERMONT
Phytoplankton Production in Lake Memphremagog, Quebec (Canada)--Vermont (U.S.A.),
W77-07962 5C

VERTICAL TEMPERATURE GRADIENTS
Low Frequency Turbulence and Vertical Temperature Microstructure in Lake Tahoe California-Nevada,
W77-07984 2E

VILLAGE WATER SUPPLY
Manuel Technique Du Village, (Village Technology Handbook), (Vols. 1 and 2).
W77-07628 3

VIRGIN ISLANDS
Waste Water Reclamation in St. Croix,
W77-07875 5I

VIRGINIA
Flood Plain Information, South Anna River Hanover County, Va.
W77-07637 4A

Flood Plain Information, North Anna River Hanover County, Va.
W77-07638 4A

Evaluation of Sediment Yields Due to Urban Development,
W77-07705 4I

Development of the Turbidity Maximum in Rappahannock Estuary; Summary,
W77-07789 2I

VIRUSES
Examination of Sewage Sludge for Enteroviruses, Volume 2,
W77-07615 5I

VOLUMETRIC ANALYSIS
A Rapid Volumetric Method of Determining Fluorine in Water, (In Russian),
W77-07950 5A

WABASH RIVER (ILL)
Stochastic Difference Equation Modelling of Hydrological Processes,
W77-07663 2A

WALES
Drainage--Who Pays, Responsibilities After the 1973 Water Act,
W77-07932 5C

WASATCH MOUNTAINS
Snow Survey from Space, with Emphasis on the Results of the Analysis of Skylab EREP S192 Multispectral Scanner Data,
W77-08082 7B

WASHINGTON
Physical, Chemical, and Biological Factors in the Initiation and Destruction of Biogenic Meromixis in a Soft-Water Lake,
W77-07963 5C

Diel Phosphate Flux in Lake Washington, U.S.A.,
W77-07968 5C

Present and Past Glaciation Threshold in the Cascade Range, Washington, U.S.A.: Topographic and Climatic Controls, and Paleoclimatic Implications,
W77-08056 2C

WASTE ASSIMILATIVE CAPACITY

Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

WASTE DISPOSAL

Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

Waste Management for the Coastal Zone: Concepts for the Assessment of Ocean Outfalls,
W77-07747 5E

Tar Ball Distribution in the Western North Atlantic,
W77-07757 5B

Disposal of Feedlot Wastes Using a Two-Stage Process with Net Energy Production,
W77-07816 5D

Community Water Supply and Excreta Disposal in the Developing Countries,
W77-07865 5G

Silk from Sow's Ears.
W77-07867 5D

Golar Rubbish, Oil Sludge and Sewage Incinerator.
W77-07911 5E

WASTE TREATMENT

Disposal of Feedlot Wastes Using a Two-Stage Process with Net Energy Production,
W77-07816 5D

Incineration Method and System,
W77-08098 5E

WASTE WATER DISPOSAL

Workshop Proceedings -- Research Needs Related to Recycling Urban Wastewater on Land,
W77-07607 5D

WASTE WATER TREATMENT

Workshop Proceedings -- Research Needs Related to Recycling Urban Wastewater on Land,
W77-07607 5D

Review of Colour Removal Technology in the Pulp and Paper Industry,
W77-07734 5D

Utilization of Fly Ash in Polishing Oxidation Pond Effluents,
W77-07815 5D

High Gradient Magnetic Separation of Food Processing Wastewater,
W77-07852 5D

Factors Affecting Nitrification,
W77-07854 5D

Studies on Adsorption with Activated Carbon,
W77-07855 5D

Biological Phosphate Elimination of Preliminarily Cleaned Communal Waste Water by Use of Iron Bacteria (Biologische Entphosphatung vorgereinigten kommunalen Abwassers unter Mitwirkung von Eisenbakterian),
W77-07856 5D

Process Stability of Activity Sludge Processes,
W77-07857 5D

Concentration of Bacteria in Water Using the Ultrafiltration Method, (In French),
W77-07860 5D

Nitrification in Soil Treated with Domestic and Industrial Sewage Sluge,
W77-07862 5E

German Pollution Control,
W77-07863 5G

Direct and Indirect Waste Water Reuse for Municipal Purposes,
W77-07866 5D

Silk from Sow's Ears.
W77-07867 5D

Save Sludge Handling Costs by Level Control,
W77-07868 5D

'Hydig'-One Example of Controlled Sludge Use,
W77-07871 5E

Waste Water Plants Use Less Instrumentation than Related Industries,
W77-07872 5D

Survey Predicts 33 Percent Municipal Compliance with 1977 Deadline,
W77-07877 5G

Marine Sanitation Method and Device,
W77-07891 5D

Coal Distn. Waste Liquor Purificn. to Remove Phenols, Ammonia- and Hydrogen Sulphide by 2-Stage Solvent Extn. and Distn.,
W77-07892 5D

Oxygen Addn. Regulation in Water and Sewage Purificn.--Using Ejectors to Secure Intimate Contact with Activated Sludge,
W77-07893 5D

Flotation Treatment of Waste Water and Sewage-Using Gas Contg. Oxygen in Deep Pit to Float the Particles,
W77-07894 5D

Macerator-Sterilizer Sewage Treatment System,
W77-07895 5D

Sewage Treatment Apparatus,
W77-07896 5D

Control of Aerobic Biological Growth in Activated Carbon Waste Treatment,
W77-07897 5D

Experiences in Evaluating and Specifying Aeration Equipment,
W77-07899 5D

Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

Bristol Regional Sewage Treatment Works--Past, Present and Future,
W77-07901 5D

Evaluation of Alternate Solids Handling Methods for Advanced Waste Treatment,
W77-07902 5D

Survey of Anaerobic Digestion Supernatant Treatment Alternatives,
W77-07903 5D

Process Could Save Millions of Pounds on Sewage Treatment Plants,
W77-07904 5D

Sludge Dewatering by Belt Filter.
W77-07905 5D

Hygenic Assessment of Tertiary Adsorption Treatment of Domestic Sewage and Industrial Effluents (Gigienicheskaya Otsenka Tretichnoyi Adsorbtsionnoyi Ochistki Bytovykh I Promyshlennikh Stochnykh Vod),
W77-07906 5D

Two-Stage Filtration of Secondary Effluent,
W77-07907 5D

A Second Look at Water Reuse,
W77-07908 5D

Automatic Analysis Contributes to Waste Water Treatment Efficiency,
W77-07909 5A

Air V. Oxygen in Dorset,
W77-07910 5D

Poly Aluminum Chloride in Sludge Treatment,
W77-07912 5D

Multi-Stage Filter Press.
W77-07914 5D

Phosphorus is Removed at Low Cost,
W77-07915 5D

Biochemical and Physical-Chemical Treatment of Weak Municipal Waste Water,
W77-07916 5D

In-House Treatment.
W77-07917 5D

AWT Plant Meets Tough Demands,
W77-07918 5D

What's Up with Oxygen,
W77-07919 5D

Joint Municipal Corporation Waste Water Treatment,
W77-07920 5D

Controlling Sludge Bulking.
W77-07921 5D

Physico-Chemical Treatment of Sewage and the Coleshill Project,
W77-07922 5D

Continuous Thickening of Biological Sludges, and the Influence of Stability,
W77-07923 5D

The Effect of Time Delay and Growth Rate Inhibition in the Bacterial Treatment of Waste Water,
W77-07924 5D

Relationship Between BOD5 and Fats, Oils and Grease,
W77-07925 5G

Effects of Polyelectrolytes and Clay Colloids on Carbon Adsorption,
W77-07926 5D

The Activated Sludge Process Without Preliminary Purification. Results of Pilot Experiments in the Purification Plant Karlsruhe (Das Belebungsverfahren ohne Vorreinigung. Ergebnisse der Versuche im halbtechnischen Massstab im Klaerwerk Karlsruhe),
W77-07927 5D

Israel's Use of Nonionic Surfactants,
W77-07929 5B

Cost of High Quality Waste Water Treatment for Reuse,
W77-07930 5D

Industry Monitors County Storm Sewer Water,
W77-07933 5D

Less-Costly Activated Carbon for Sewage Treatment.
W77-07934 5D

State Park Gets Good Treatment, Effluents Will Be Used for Irrigation to Reduce Extensive Requirements,
W77-07936 5D

R and D Project Provides Phys/Chem Data, Foxborough (Mass) State Hospital Plant Can Produce 'Superior Effluent Quality',
W77-07937 5D

Water and Waste Water Engineering for Low Income Communities in Developing Countries,
W77-07939 5G

Stabilization Lagoons Including Experience in Brazil,
W77-07940 5D

Waste Water Renovation by Sewage Ultrafiltration,
W77-07941 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. I. Initial Observations,
W77-07942 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

Bacterial Populations and End Products During Anaerobic SLudge Fermentation of Glucose,
W77-07944 5D

Sewage Sludge Disposal: A Sticky Problem with No Fail-Safe Answer,
W77-07948 5E

Some Reflections of a Sewage Works Manager,
W77-07952 5D

Process Technological Background Regarding New Protective Regulations for Water Bodies-Results of Experiments on Nitrification and Phosphorus Elimination in Zurich and Bern. II. Process Technological Background of Nitrification in Activated Sludge Plants (Verfahrenstechnische Unterlagen im Hinblick auf die neuen Gewaesserschutz-Anforderungen-Ergebnisse der Versuche ueber die Nitrifikation und Phosphorelimination in Zuerich und Bern. II. Verfahrenstechnische Grundlagen der Nitrifikation in Belebtschlammanlagen),
W77-07953 5D

Method of Filtering Oil from Liquids,
W77-08011 5G

Method of Filtering Liquids Containing Dissolved Carbon Dioxide,
W77-08013 5D

Method of Separation of Fission and Corrosion Products and of Corresponding Isotopes from Liquid Waste,
W77-08020 5D

Process for Eliminating Reactive Chlorinated Organic Compounds from Aqueous Solutions,
W77-08021 5D

Sewage Sludge Treatment System,
W77-08030 5D

Composition and Method for Flocculating Suspended Solids,
W77-08031 5D

Simplified Optimization of Activated Sludge Process,
W77-08036 5D

Best Practicable Waste Treatment Screening Model,
W77-08037 5D

Adjustment Costs and Optimal Waste Treatment,
W77-08045 5G

Method for Improving the Quality of Contaminated Waste Water,
W77-08090 5D

Water Waste Treatment,
W77-08092 5D

Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W77-08099 5D

Waste-Water Process,
W77-08100 5D

WASTES
Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

WATER ANALYSIS
Analyzing Nitrates in Well Water,
W77-07690 5A

Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

WATER BALANCE
The Use of Lysimeters in the Hydrological Investigation of the Unsaturated Zone,
W77-07780 2D

WATER CHEMISTRY
Metamorphic Reactions in Flysch Rocks,
W77-07609 2K

Hydrochemistry of the Nigula Swamp, (In Estonian),
W77-07859 2H

WATER CIRCULATION
Physical, Chemical, and Biological Factors in the Initiation and Destruction of Biogenic Meromixis in a Soft-Water Lake,
W77-07963 5C

WATER CONSUMPTION
Oregon's Long-Range Requirements for Water Forest Products Projections and Recreation Projections, Appendices IV and V,
W77-07625 6I

WATER DEMAND
Oregon's Long-Range Requirements for Water Irrigation and Food Products Projections, Appendix II,
W77-07623 6I

Oregon's Long-Range Requirements for Water Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6I

Oregon's Long-Range Requirements for Water Protection of Areas of Origin, Appendix VII,
W77-07627 6I

Water Resources and Water-Supply Development in Trinidad and Tobago,
W77-07785 6I

Optimization of Water Use for Irrigation,
W77-07851 3

WATER DISTRICTS
Joint Municipal Corporation Waste Water Treatment,
W77-07920 5I

WATER LAW
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6

Oregon's Long-Range Requirements for Water Protection of Areas of Origin, Appendix VII,
W77-07627 6I

Law, Rules, and Regulations Pertaining to Groundwater in Nebraska,
W77-07695 4

WATER LEVELS
Use of Cross-Correlation Techniques for Determining the Relationship Between Groundwater Levels and Sources in the Nile Delta Area,
W77-07679 2

Application of Stochastic Hydrological Models in the Design of Lake Level Control,
W77-07681 4A

WATER MANAGEMENT (APPLIED)
Oregon's Long-Range Requirements for Water Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6I

Oregon's Long-Range Requirements for Water Protection of Areas of Origin, Appendix VII,
W77-07627 6I

Treating Urban Drainage as a Utility,
W77-07947 5G

Three Case Studies on the Application of the Storm Water Management Model,
W77-07955 5G

An Integrated Model-Approach to the Effect of Water Management on Crop Yield,
W77-08038 3F

The Use of LANDSAT DCS and Imagery in Reservoir Management and Operation,
W77-08076 7B

Operational Water Management Applications of Snowcovered Area Observations,
W77-08084 7B

WATER POLICY

Objective Function and Constraints in Water Resources Systems,
W77-08046 6A

WATER POLLUTION

Energy Development and Its Effect on Ground Water,
W77-07691 5B

Waste Management for the Coastal Zone: Concepts for the Assessment of Ocean Outfalls,
W77-07747 5E

WATER POLLUTION CONTROL

Glossary of Water Resource Terms,
W77-07613 10C

Characteristics of the Areas in Which Fast Current Oil Control is Needed,
W77-07741 5G

Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

German Pollution Control,
W77-07863 5G

Survey Predicts 33 Percent Municipal Compliance with 1977 Deadline,
W77-07877 5G

Recreational Use of Small Streams in Wisconsin,
W77-08008 5G

Moving Belt-Type Oil Skimmer with Propulsion Induced Flow, Method and Apparatus,
W77-08012 5G

Method of Filtering Liquids Containing Dissolved Carbon Dioxide,
W77-08013 5D

The Problem of the Sanitary Protection of the Waters of Ports and Coastal Zones of the Black Sea Basin, (In Russian),
W77-08014 5G

Oil Separator Device,
W77-08015 5G

Sewage Sludge Treatment System,
W77-08030 5D

WATER POLLUTION EFFECTS

Characteristics of the Areas in Which Fast Current Oil Control is Needed,
W77-07741 5G

Impacts of Offshore Oil on North East Scotland,
W77-07752 5C

The ARGO MERCHANT Oil Spill. A Preliminary Scientific Report,
W77-07807 5C

Effects of Pollutants on Eggs, Embryos and Larvae of Amphibian Species,
W77-07820 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium.
W77-07830 5C

Ultrastructural Study of Lesions in Gills of a Marine Shrimp Exposed to Cadmium,
W77-07845 5C

WATER POLLUTION SOURCES

Risk of Drinking Water Contamination in Rural Tennessee,
W77-07701 5G

Monitoring Dissolved Hydrocarbons as a Function of the Tidal Cycle (New York Harbor),
W77-07740 5B

Verification by Remote Sensing of an Oil Slick Movement Prediction Model,
W77-07745 5B

A Method for Determining Oil in Water,
W77-07756 5A

Tar Ball Distribution in the Western North Atlantic,
W77-07757 5B

Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

Determination of the Leeway of Oil Slicks,
W77-07800 5B

A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

Rum Jungle Environmental Studies, Summary Report,
W77-07822 5B

Mercury in the Biogeochemical Environment,
W77-07823 5B

Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

Israel's Use of Nonionic Surfactants,
W77-07929 5B

Changes in the Properties of E. Coli Under the Influence of Water Environments,
W77-07997 5A

WATER POLLUTION TREATMENT

Method of Filtering Oil from Liquids,
W77-08011 5G

Moving Belt-Type Oil Skimmer with Propulsion Induced Flow, Method and Apparatus,
W77-08012 5G

WATER PROPERTIES

Hydrologic Optics. Volume I. Introduction,
W77-07956 1A

Hydrologic Optics, Volume II. Foundations,
W77-07957 1A

Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

Hydrologic Optics. Volume IV. Imbeddings,
W77-07959 1A

Hydrologic Optics. Volume V. Properties,
W77-07960 1A

WATER PURIFICATION

Direct and Indirect Waste Water Reuse for Municipal Purposes,
W77-07866 5D

Lakes Will Take the Pollution Load Off Old Father Tame,
W77-07913 5G

Composition and Method for Flocculating Suspended Solids,
W77-08031 5D

WATER QUALITY

Water Quality Requirements of Fishes and Effects of Toxic Substances,
W77-07715 5C

Mobile Fish Cage and Depth Distribution Studies, Columbia and Snake Rivers,
W77-07723 5C

A Decision Support System for Area-Wide Quality Planning,
W77-07810 6A

Extensions and Corrections for the CODASYL Approach to Data Base Management,
W77-07811 6A

Implementation of a Decision Support for Regional Water Quality Planning,
W77-07812 6A

Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

Use of State Estimation Techniques in Water Resource System Modeling, by Dennis P. Lettenmaier and Stephen J. Burges,
W77-08035 5B

Adjustment Costs and Optimal Waste Treatment,
W77-08045 5G

Utilization of LANDSAT Data for Water Quality Surveys in the Choptank River,
W77-08072 5A

WATER QUALITY CONTROL

Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

Hierarchical Modeling for the Planning and Management of a Total Regional Water Resource System: Joint Consideration of the Supply and Quality of Ground and Surface Water Resources,
W77-07793 4B

German Pollution Control,
W77-07863 5G

Community Water Supply and Excreta Disposal in the Developing Countries,
W77-07865 5G

WATER QUALITY CONTROL

Improvement and Expansion of the Drainage System of Hamburg,
W77-07890 5D

Lakes Will Take the Pollution Load Off Old Father Tame,
W77-07913 5G

Easier Identification with MPN Procedure,
W77-07928 5A

1776-1976: Notes on Water Quality Planning,
W77-07938 5G

Water and Waste Water Engineering for Low Income Communities in Developing Countries,
W77-07939 5G

Watershed Management and Water Quality,
W77-07951 5G

Composition and Method of Inhibiting Growth of Slime in Water,
W77-08027 5G

WATER QUALITY STANDARDS

Oregon's Long-Range Requirements for Water. Water Quality Control Projections, Appendix VI.
W77-07626 5G

Experimental Data for the Hygienic Standardization of Diphenylamine and Diphenyldiethylurea in Water Bodies, (In Russian),
W77-07700 5G

Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

Waste Water Plants Use Less Instrumentation than Related Industries,
W77-07872 5D

Survey Predicts 33 Percent Municipal Compliance with 1977 Deadline,
W77-07877 5G

1976 Needs Survey Markedly Lower,
W77-07878 5G

Recreational Use of Small Streams in Wisconsin,
W77-08008 5G

Hygienic Criteria of the Complex Action of Chemical Environmental Pollutants, (In Russian),
W77-08029 5G

WATER REQUIREMENTS

Oregon's Long-Range Requirements for Water. Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6D

Oregon's Long-Range Requirements for Water. Forest Products Projections and Recreation Projections, Appendices IV and V,
W77-07625 6D

Optimization of Water Use for Irrigation,
W77-07851 3F

WATER RESOURCES

Glossary of Water Resource Terms,
W77-07613 10C

Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

Water Resources and Water-Supply Development in Trinidad and Tobago,
W77-07785 6D

Objective Function and Constraints in Water Resources Systems,
W77-08046 6A

Optimal Operation of Water Resources Systems--II,
W77-08048 4A

Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Water Resources, Volume I-D,
W77-08062 7B

Urban Land Use: Remote Sensing of Groundbasin Permeability,
W77-08065 7B

Remote Sensing Applications in Water Resources Management by the California Department of Water Resources,
W77-08078 7B

WATER RESOURCES DEVELOPMENT

Appraisal of Areawide Waste Water Planning,
W77-07874 5G

Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

Optimal Operation of Water Resources Systems--1,
W77-08047 4A

Planning of Systems for Regional Development in Water Resources,
W77-08049 6A

Modeling Multiple-Use in Natural Areas: Part II - The Santee Swamp Study,
W77-08050 6A

WATER REUSE

Direct and Indirect Waste Water Reuse for Municipal Purposes,
W77-07866 5D

Waste Water Reclamation in St. Croix,
W77-07875 5D

A Second Look at Water Reuse,
W77-07908 5D

Cost of High Quality Waste Water Treatment for Reuse,
W77-07930 5D

Waste Water Reclamation at St. Croix, U.S. Virgin Islands,
W77-08086 4B

Waste-Water Process,
W77-08100 5D

WATER SAMPLING

Interlaboratory Quality Control Studies Nos. 12 and 13, Aluminum, Cadmium, Chromium, Cobalt, Copper, Lead, Iron, Manganese, Nickel and Zinc,
W77-07616 5A

Liquid Sampler,
W77-08024 7B

WATER SPORTS

Oregon's Long-Range Requirements for Water. Forest Products Projections and Recreation Projections, Appendices IV and V,
W77-07625 6D

WATER SUPPLY

Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

Oregon's Long-Range Requirements for Water. Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6D

Oregon's Long-Range Requirements for Water. Protection of Areas of Origin, Appendix VII,
W77-07627 6D

Manuel Technique Du Village, (Village Technology Handbook), (Vols. 1 and 2).
W77-07628 3F

Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

Some Experiments on the Gas-Disease in Freshwater Fishes, (In Japanese),
W77-07714 5C

Trout and Salmon Culture (Hatchery Methods) Hatchery Water Supply,
W77-07726 5G

Water Resources and Water-Supply Development in Trinidad and Tobago,
W77-07785 6D

Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

Community Water Supply and Excreta Disposal in the Developing Countries,
W77-07865 5G

Water and Waste Water Engineering for Low Income Communities in Developing Countries,
W77-07939 5G

Watershed Management and Water Quality,
W77-07951 5G

Study of Free Living Amoebae in the Waters of Strabourg: Preliminary Report, (In French),
W77-08016 5A

Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

WATER SUPPLY DEVELOPMENT

Water Resources and Water-Supply Development in Trinidad and Tobago,
W77-07785 6D

WATER TEMPERATURE

Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

Snake River, 1973 Dissolved Gas Studies.
W77-07710 5A

Dissolved Gas Supersaturation in the Salmon River, 1972-74,
W77-07719 5A

Gas Disease in Fishes - A Review,
W77-07727 5C

An Experimental and Theoretical Study of the Turbulent and Laminar Convection Generated

Under a Horizontal Ice Sheet Floating on Warm Salty Water,
W77-07773 2C

Temperature Regime in Lake Superior at Silver Bay, Minnesota,
W77-07970 1A

Influence of Suspended Sediment on the Temperatures of Surface Waters of Reservoirs,
W77-07975 5C

Low Frequency Turbulence and Vertical Temperature Microstructure in Lake Tahoe, California-Nevada,
W77-07984 2H

The Influence of Temperature and Bacterial Numbers on the Heterotrophic Uptake of C14 Glucose in West Blue Lake, Manitoba,
W77-07995 5C

WATER TRANSFER
Oregon's Long-Range Requirements for Water. Protection of Areas of Origin, Appendix VII,
W77-07627 6D

WATER TREATMENT
Drainage--Who Pays, Responsibilities After the 1973 Water Act,
W77-07932 5G

Composition and Method of Inhibiting Growth of Slime in Water,
W77-08027 5G

Composition and Method for Flocculating Suspended Solids,
W77-08031 5D

WATER USERS
Oregon's Long-Range Requirements for Water. Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6D

WATER UTILIZATION
Oregon's Long-Range Requirements for Water. Selected Major Water Using Industries and Population Projections, Appendix III.
W77-07624 6D

WATER WELLS
Manuel Technique Du Village, (Village Technology Handbook), (Vols. 1 and 2).
W77-07628 3F

E.L.C. Water Development Project, Betul (M.P.) India: Fifth Annual Report, 1975-1976,
W77-07696 8B

Water Sampling from Unpumped Wells with Static Water Levels Deeper than 10 Metres,
W77-07787 5A

WATER YIELD IMPROVEMENT
Watershed Management and Water Quality,
W77-07951 5G

WATERSHED MANAGEMENT
Watershed Management and Water Quality,
W77-07951 5G

Watershed Organizations--Impact on Water Quality Management: An Analysis of Selected Michigan Watershed Councils,
W77-08093 4D

WATERSHEDS (BASINS)
Frequency Analysis of Water Balance Components in Relation to Climatic Factors,
W77-07668 2A

Flood Frequency Studies of Rivers in the Federal Republic of Germany,
W77-07670 2E

Statistical Analysis Applied to the Study of the Components of a Flood Wave,
W77-07674 2E

Optimal Spatial Interpolation and Its Errors in the Case of Various Distances Between Observation Points or Watershed Centres,
W77-07677 4D

Representative and Experimental Basins - Where Next,
W77-07781 2A

Hydrologic Land Use Classification of the Patuxent River Watershed Using Remotely Sensed Data,
W77-08073 7B

Remote Sensing Techniques for Prediction of Watershed Runoff,
W77-08075 7B

Watershed Organizations--Impact on Water Quality Management: An Analysis of Selected Michigan Watershed Councils,
W77-08093 4D

WAVES (WATER)
The Scaling of Velocity Fluctuations in the Surface Mixed Layer,
W77-07768 2L

Observations of Wave Height and Wave Celerity in the Surf Zone,
W77-07770 2L

Observational and Numerical Evidence for Wind-Forced Coastal Trapped Long Waves,
W77-07771 2L

WELL CASING
Cementing Oil and Gas Wells, Including Casing Handling Procedures: Part 1,
W77-07697 8F

WELL CASINGS
Slurry and Pumping Guidelines Smooth Casing-Cementing Jobs,
W77-07699 8F

WELL REGULATIONS
Law, Rules, and Regulations Pertaining to Groundwater in Nebraska,
W77-07695 4B

WELL SEALING
Eliminating Iron-Bearing Water from Well No. 7,
W77-07702 5G

WELLS
Some Experiments on the Gas-Disease in Freshwater Fishes, (In Japanese),
W77-07714 5C

WEST BLUE LAKE (MANITOBA)
The Influence of Temperature and Bacterial Numbers on the Heterotrophic Uptake of C14 Glucose in West Blue Lake, Manitoba,
W77-07995 5C

WEST GERMANY
Flood Frequency Studies of Rivers in the Federal Republic of Germany,
W77-07670 2E

The Invertebrate Fauna of the Broel and Its Tributary Brooks, (In German),
W77-07746 5C

German Pollution Control,
W77-07863 5G

WEST VIRGINIA
Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

WESTERN NORTH ATLANTIC OCEAN
Tar Ball Distribution in the Western North Atlantic,
W77-07757 5B

WET OXIDATION
Disposal of Feedlot Wastes Using a Two-Stage Process with Net Energy Production,
W77-07816 5D

WHETSTONE BROOK (VT)
An Analysis of Alternative Flood Management Plans in Upstream Watersheds. Connecticut River Basin Supplemental Flood Management Study, Phase 2,
W77-07632 6F

WHITE MOUNTAINS
Snow Survey from Space, with Emphasis on the Results of the Analysis of Skylab EREP S192 Multispectral Scanner Data,
W77-08082 7B

WHITE RIVER (IND)
Stochastic Difference Equation Modelling of Hydrological Processes,
W77-07663 2E

WICHITA FALLS (TX)
Flood Plain Information: Wichita River and Tributaries, Wichita Falls, Texas,
W77-07643 4A

WICHITA RIVER (TX)
Flood Plain Information: Wichita River and Tributaries, Wichita Falls, Texas,
W77-07643 4A

WIND RIVER MOUNTAINS (WYO)
Operational Water Management Applications of Snowcovered Area Observations,
W77-08084 7B

WINDS
The Scaling of Velocity Fluctuations in the Surface Mixed Layer,
W77-07768 2L

Ice Movements in the Beaufort Sea 1973-1975: Determination by ERTS Imagery,
W77-07769 2C

Observational and Numerical Evidence for Wind-Forced Coastal Trapped Long Waves,
W77-07771 2L

WISCONSIN
Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

Sedimentation in Lower Green Bay, Wisconsin,
W77-07980 2J

Local Control of Land Use: Profile of a Problem,
W77-08003 6F

Recreational Use of Small Streams in Wisconsin,
W77-08008 5G

WYOMING
Clastic Sedimentation in a Modern Alpine Lake,
W77-07791 2J

The Use of Skylab and LANDSAT in a Geohydrological Study of the Paleozoic Section, West-Central Bighorn Mountains, Wyoming,
W77-08063 7B

Operational Water Management Applications of Snowcovered Area Observations,
W77-08084 7B

XYLENE
Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

YEASTS
Utilization of Mixed Hydrocarbon Substrate by Petroleum-Degrading Microorganisms,
W77-07749 5C

YENISEI BASIN (SIBERIA-USSR)
Biological Assessment of the Water Quality of the Small Rivers Sora and Byurya (Yenisei Basin), (In Russian),
W77-07755 5C

YOLK SAC FRY
Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

YUGOSLAVIA
Simulation of Daily Rainfall Series Using Markov Chain Models,
W77-07660 2A

Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

ZAPADNA MORAVA RIVER BASIN (YUGOSLAVIA)
Simulation of Daily Rainfall Series Using Markov Chain Models,
W77-07660 2A

ZEOLITES
Biological Regeneration of Ammonium-Saturated Clinoptilolite. I. Initial Observations,
W77-07942 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

ZINC
Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

ZONING
Local Control of Land Use: Profile of a Problem,
W77-08003 6F

ZOOPLANKTON
Biological Assessment of the Water Quality of the Small Rivers Sora and Byurya (Yenisei Basin), (In Russian),
W77-07755 5C

Phosphorus Regeneration by Natural Populations of Limnetic Zooplankton,
W77-07972 5C

AUTHOR INDEX

ABELLA, C.
Optimal Growth Temperatures and Media Parameters of Bacterial Communities from Lakes of Different Trophic States,
W77-07994 5C

ADAMS, A. E.
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

ADAMS, E. E.
A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

AGARKOV, S. G.
Cyclical Structure of the Hydrological Series and the Nature of Individual Components,
W77-07656 2E

AKAOGI, T.
The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

ALBERTSON, O. E.
Cost of High Quality Waste Water Treatment for Reuse,
W77-07930 5D

ALDRIDGE, R.
The Measurement of Rainfall at Ground Level,
W77-08061 2B

ALESHNYA, E. P.
Experimental Study of the Action of Pesticides on the Microflora of Bodies of Water, (In Russian),
W77-07982 5B

ALEXEEV, G. A.
Optimal Spatial Interpolation and Its Errors in the Case of Various Distances Between Observation Points or Watershed Centres,
W77-07677 4D

ALLEN, H. E.
Cycling of Dissolved Organic Phosphorus Compounds in Natural Waters,
W77-07608 5C

ALLPORT, D.
Flow Controller Device,
W77-08017 3F

ALVARES DA SILVA, M. O. S.
Stabilization Lagoons Including Experience in Brazil,
W77-07940 5D

AMIARD, J. C.
Experimental Study of Acute Toxicity of Salts of Cobalt, Antimony, Strontium and Silver Crustaceans and Their Larvae and in Some Teleosts, (In French),
W77-07728 5C

ANAND, A. S.
Cost of High Quality Waste Water Treatment for Reuse,
W77-07930 5D

ANDERSON, D.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

ANDREW, R. W.
Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

ANTONIELLI, M.
The Availability of Chlorophyllide in Hydrophytes and Algas of Lake Trasimeno and the Variability of Pigment Content in Spirogyra, (In Italian),
W77-08044 5C

ARMSTRONG, J. G.
Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

ARMSTRONG, N. E.
Waste Management for the Coastal Zone: Concepts for the Assessment of Ocean Outfalls,
W77-07747 5E

ARON, G.
Penn State Urban Runoff Model--User's Manual,
W77-07797 4D

ARSEN'EVA, M. V.
Experimental Data for the Hygienic Standardization of Diphenylamine and Diphenyldiethylurea in Water Bodies, (In Russian),
W77-07700 5G

ASHTON, P. M.
Citizen Attitudes Toward Management of the Chesapeake Bay,
W77-07796 6B

ASPILA, K. I.
Interlaboratory Quality Control Studies Nos. 12 and 13, Aluminum, Cadmium, Chromium, Cobalt, Copper, Lead, Iron, Manganese, Nickel and Zinc,
W77-07616 5A

AULENBACH, D. B.
Chemical Interactions in a Eutrophic Lake,
W77-08002 5C

The Effect of Highway Deicing Salt on Chloride Budgets at Lake George, NY,
W77-08000 5B

AUSTEN, K.
Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

AUSTIN, H. F.
Utilization of Mixed Hydrocarbon Substrate by Petroleum-Degrading Microorganisms,
W77-07749 5C

BABCOCK, R. H.
Waste Water Plants Use Less Instrumentation than Related Industries,
W77-07872 5D

BAHIAH, S. J.
Studies on Adsorption with Activated Carbon,
W77-07855 5D

BAKER, V. R.
Flood Hazard Studies in Central Texas Using Orbital and Suborbital Remote Sensing Imagery,
W77-08069 7B

BARNES, I.
Metamorphic Reactions in Flysch Rocks,
W77-07609 2K

BARNES, J. C.
Snow Survey from Space, with Emphasis on the Results of the Analysis of Skylab EREP S192 Multispectral Scanner Data,
W77-08082 7B

BARTLEY, T. R.
Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

BARTON, B. M. J.
The Generation of Synthetic Monthly Runoff Records for Ungauged British Catchments,
W77-07661 2A

BASKERVILLE, R. C.
Continuous Thickening of Biological Sludges, and the Influence of Stability,
W77-07923 5D

BATLIVALA, P. P.
Microwave Remote Sensing of Soil Moisture,
W77-08066 7B

BATTERS, W.
Some Reflections of a Sewage Works Manager,
W77-07952 5D

BAUGHCOM, E. J.
Oil Separator Device,
W77-08015 5G

BAXTER, D. O.
Risk of Drinking Water Contamination in Rural Tennessee,
W77-07701 5G

BEHRENDT, G. H.
Marine Sanitation Method and Device,
W77-07891 5D

BELL, A. E.
The Application of Remote Sensing Technology to the Inventory of Playa Lakes in the High Plains of Texas,
W77-08077 7B

BELL, B. A.
Evaluation of Alternate Solids Handling Methods for Advanced Waste Treatment,
W77-07902 5D

BENFIELD, E. F.
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

BENGTSSON, L.
Phosphorus Release from a Highly Eutrophic Lake Sediment,
W77-07999 5C

BENHAM, J. F.
AWT Plant Meets Tough Demands,
W77-07918 5D

BENSON, A.
Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

BENTLEY, C. R.
Electrical Resistivity Measurements on the Ross Ice Shelf,
W77-08051 2C

BERMAN, T.
Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

BEYER, D. L.
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

BEYERS, R. J.
Reductions in Biomass and Diversity Resulting from Exposure to Mercury in Artificial Streams,
W77-07838 5C

BIESINGER, K. E.
Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

BIRNIE, R. V.
A Snow-Bank Push Mechanism for the Formation of Some 'Annual' Moraine Ridges,
W77-08054 2C

BISHOP, J. M.
An Analytical Sea Current Model for Coastal Regions with Application to the New York Bight,
W77-07744 2L

BISHOP, K. A.
Disposal of Feedlot Wastes Using a Two-Stage Process with Net Energy Production,
W77-07816 5D

BISKNER, C. D.
Two-Stage Filtration of Secondary Effluent,
W77-07907 5D

BLAHM, T. H.
Effects of Gas Supersaturated Columbia River Water on the Survival of Juvenile Chinook and Coho Salmon,
W77-07708 5C

BLANCHARD, B. J.
Remote Sensing Techniques for Prediction of Watershed Runoff,
W77-08075 7B

BLOOMER, R. J. G.
Problems Encountered in Synthetic River Flow Generation Procedures,
W77-07657 2A

BLUNT, B. R.
Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

BOCK, P.
The Use of LANDSAT DCS and Imagery in Reservoir Management and Operation,
W77-08076 7B

BOGARDI, I.
Determination of the Degree of Protection Offered by Flood Control Systems on the Basis of Distribution Functions,
W77-07673 8B

BONCHARUK, E. I.
Hygenic Assessment of Tertiary Adsorption Treatment of Domestic Sewage and Industrial Effluents (Gigienicheskaya Otsenka Tretichnoyi Adsorbtsionnoyi Ochistki Bytovykh I Promyshlennikh Stochnykh Vod),
W77-07906 5D

BONCZEK, R.
Implementation of a Decision Support for Regional Water Quality Planning,
W77-07812 6A

BONCZEK, R. H.
Aiding Decision Makers with a Generalized Data Base Management System: An Application to Inventory Management,
W77-07814 6A

Extensions and Corrections for the CODASYL Approach to Data Base Management,
W77-07811 6A

Information Transferral within a Distributed Data Base Via a Generalized Mapping Language,
W77-07813 6A

Mathematical Programming within the Context of a Generalized Data Base Management System,
W77-07850 6A

Observations on a Generalized Intelligent Query Processor for Decision Support,
W77-07849 6A

BOOTH, A. C.
Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

BORGMAN, L. E.
Clastic Sedimentation in a Modern Alpine Lake,
W77-07791 2J

BORN, S. M.
Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

BOUCK, G. R.
Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

BOVIS, M. J.
Statistical Forecasting of Snow Avalanches, San Juan Mountains, Southern Colorado, U.S.A.,
W77-08055 2C

BOYLEN, C. W.
Studies on the Role of Detritus in Fresh Water Lakes,
W77-08001 5C

BRACKEN, B. D.
What's Up with Oxygen,
W77-07919 5D

BRADFORD, J. M.
Gully Wall Stability in Loess-Derived Alluvium,
W77-07764 4D

BRADLEY, R. M.
Stabilization Lagoons Including Experience in Brazil,
W77-07940 5D

BRAJKORIC, M.
Simulation of Daily Rainfall Series Using Markov Chain Models,
W77-07660 2A

BRANDT, L.
The Influence of Temperature and Bacterial Numbers on the Heterotrophic Uptake of C14 Glucose in West Blue Lake, Manitoba,
W77-07995 5C

BRETT, J. R.
Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

BRINDLE, M. P.
Effects of Sample Handling on the Composition of Marine Sedimentary Pore Water,
W77-07742 5A

BRINGMANN, G.
Biological Phosphate Elimination of Preliminarily Cleaned Communal Waste Water by Use of Iron Bacteria (Biologische Entphosphatung vorgereinigten kommunalen Abwassers unter Mitwirkung von Eisenbakterian),
W77-07856 5D

BRISBIN, T. D.
Cycling of Dissolved Organic Phosphorus Compounds in Natural Waters,
W77-07608 5C

BROOKSHIRE, D. S.
The Valuation of Aesthetic Preferences,
W77-08041 6G

BROWN, B.
Remote Sensing Applications in Water Resources Management by the California Department of Water Resources,
W77-08078 7B

BROWZIN, B. S.
Frequency Analysis of Water Balance Components in Relation to Climatic Factors,
W77-07668 2A

Mathematical Models Resulting from Statistical Analysis of the Mean Monthly Flow,
W77-07669 2E

BRUMAGIN, T. E.
Study of In-Service Bituminized Fiber Sewer Pipe,
W77-07884 8G

BRUTON, J. E.
The Application of ERTS-1 Digital Data to Water Transport Phenomena in the Point Pelee-Rondeau Area,
W77-07981 2J

BUCHELE, W. F.
A Technique to Index Soil Pores and Aggregates Larger than 20 Micrometers,
W77-08059 2G

BUCKLE, K. A.
Reduction in Sewage Contamination in Sydney Rock Oysters,
W77-07946 5G

BUKATA, R. P.
The Application of ERTS-1 Digital Data to Water Transport Phenomena in the Point Pelee-Rondeau Area,
W77-07981 2J

BURAS, N.
Planning of Systems for Regional Development in Water Resources,
W77-08049 6A

BURNISON, B. K.
Microbial ATP Studies,
W77-07978 5C

Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

BUROS, O. K.
Waste Water Reclamation at St. Croix, U.S. Virgin Islands,
W77-08086 4B

Waste Water Reclamation in St. Croix,
W77-07875 5D

BURROWS, D.
Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

BUSCH, C. D.
Simulation of Impoundment Terrace Hydraulics,
W77-07767 8B

BUSH, A. W.
The Effect of Time Delay and Growth Rate Inhibition in the Bacterial Treatment of Waste Water,
W77-07924 5D

CABRIC, M.
Simulation of Daily Rainfall Series Using Markov Chain Models,
W77-07660 2A

CAGIOTTI, M. R.
The Availability of Chlorophyllide in Hydrophytes and Algas of Lake Trasimeno and the Variability of Pigment Content in Spirogyra, (In Italian),
W77-08044 5C

CAHOON, J. S.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

CAIRNS, J. JR.
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

CALABRESE, A.
Physiological Response of the Cunner, Tautogolabrus adspersus, To Cadmium. I. Introduction and Experimental Design,
W77-07831 5C

CAMPOS, J. G.
Incineration Method and System,
W77-08098 5E

CARRON, J. M.
Interlaboratory Quality Control Studies Nos. 12 and 13, Aluminum, Cadmium, Chromium, Cobalt, Copper, Lead, Iron, Manganese, Nickel and Zinc,
W77-07616 5A

CASE, L. S.
Tolls: Efficiency and Equity Issues for Inland Waterways,
W77-08039 6C

CATANA, C.
Statistical Analysis Applied to the Study of the Components of a Flood Wave,
W77-07674 2E

CHAMBERLAND, E.
Nitrates in Some Soil-Water Systems in Quebec, (In French),
W77-07858 5B

CHAPMAN, D. C.
Best Practicable Waste Treatment Screening Model,
W77-08037 5D

CHARLTON, M. N.
Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

Sedimentation: Measurements in Experimental Enclosures,
W77-07990 5C

CHARNES, A.
A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

CHEMERENKO, E. P.
Objective Analysis of Snow Cover Fields,
W77-07678 2C

CHERKHANOV, P. Y.
Migration of 90Sr with Runoff Waters from Soils, (In Russian),
W77-07971 5B

CHIANG, C. H.
Process Stability of Activity Sludge Processes,
W77-07857 5D

CHOW, T. L.
Fritted Glass Bead Materials as Tensiometers and Tension Plates,
W77-07760 2G

CHOW, V. T.
Optimal Operation of Water Resources Systems--1,
W77-08047 4A

CHURBANOVA, I. V.
Influence of Mussel Metabolites on the Dynamics of Nutrients in the Coastal Waters of the Eastern Murman Coast, (In Russian),
W77-08043 5C

CHYNOWETH, D. P.
Bacterial Populations and End Products During Anaerobic SLudge Fermentation of Glucose,
W77-07944 5D

CIHLAR, J.
Microwave Remote Sensing of Soil Moisture,
W77-08066 7B

CLARKE, A. J.
Observational and Numerical Evidence for Wind-Forced Coastal Trapped Long Waves,
W77-07771 2L

CLARKE, R. T.
The Representation of a Short Period of Experimental Catchment Data by a Linear Stochastic Difference Equation,
W77-07646 2

CLEMENT, C.
Slurry and Pumping Guidelines Smooth Casing-Cementing Jobs,
W77-07699 8F

CLESCERI, L. S.
Studies on the Role of Detritus in Fresh Water Lakes,
W77-08001 5C

CLOUGH, G. F. G.
Physico-Chemical Treatment of Sewage and the Coleshill Project,
W77-07922 5D

COLBY, L.
Oil Spill at Deception Bay, Hudson Strait,
W77-07731 5G

COLE, J. A.
Optimal Operation of Water Resources Systems--II,
W77-08048 4A

COLEMAN, J. M.
Mangrove Ecology and Deltaic-Estuarine Geomorphology: Cambridge Gulf-Ord River, Western Australia,
W77-07738 2L

COLLIER, R. S.
Physiological Response of the Cunner, Tautogolabrus adspersus, To Cadmium. I. Introduction and Experimental Design,
W77-07831 5C

COLWELL, J. A.
Study of In-Service Bituminized Fiber Sewer Pipe,
W77-07884 8G

COLWELL, R. R.
Degradation of Petroleum by an Alga, Prototheca Zopfii,
W77-07737 5C

Effect of South Louisiana Crude Oil and No. 2 Fuel Oil on Growth of Heterotrophic Microorganisms, Including Proteolytic, Lipolytic, Chitinolytic and Celluloytic Bacteria,
W77-07736 5C

Utilization of Mixed Hydrocarbon Substrate by Petroleum-Degrading Microorganisms,
W77-07749 5C

CONNOR, J. R.
Method for Improving the Quality of Contaminated Waste Water,
W77-08090 5D

CONNORS, D. N.
Effect of Major Ion Variations in the Marine Environment on the Specific Gravity--Conductivity--Chlorinity--Salinity Relationship,
W77-07802 2K

COOK, A. E.
The Effect of Time Delay and Growth Rate Inhibition in the Bacterial Treatment of Waste Water,
W77-07924 5D

COOPER, C. K.
A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

COOPER, S.
The Use of LANDSAT DCS and Imagery in Reservoir Management and Operation,
W77-08076 7B

COOPER, W. W.
A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

COUCH, J. A.
Ultrastructural Study of Lesions in Gills of a Marine Shrimp Exposed to Cadmium,
W77-07845 5C

COYLE, A.
Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

CRAIG, J. A.
Waste-Water Process,
W77-08100 5D

CRAMER, F. K.
Passing Fish Through Hydraulic Turbines,
W77-07713 8I

CRAWFORD, N. H.
Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

CRESSY, P.
Utilization of LANDSAT Data for Water Quality Surveys in the Choptank River,
W77-08072 5A

CULVER, D. A.
Physical, Chemical, and Biological Factors in the Initiation and Destruction of Biogenic Meromixis in a Soft-Water Lake,
W77-07963 5C

CUNNANE, C.
Bayesian Estimation of Frequency of Hydrological Events,
W77-07650 2E

CZARNECKI, A. J.
Liquid Sampler,
W77-08024 7B

D'AOUST, B. G.
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

DACRE, J. C.
Toxicity to Aquatic Organism and Chemistry of Nine Selected Waterborne Pollutants from Munitions Manufacture- A Literature Evaluation,
W77-07821 5C

DAIGGER, G. T.
Factors Affecting Nitrification,
W77-07854 5D

DAKKAK, A. R.
Simulation of Daily Rainfall Series Using Markov Chain Models,
W77-07660 2A

DALE, J.
Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

DALLAM, W. C.
Hydrologic Land Use Classification of the Patuxent River Watershed Using Remotely Sensed Data,
W77-08073 7B

Utilization of LANDSAT Data for Water Quality Surveys in the Choptank River,
W77-08072 5A

DAUBNER, I.
Changes in the Properties of E. Coli Under the Influence of Water Environments,
W77-07997 5A

DAVIDSON, J. M.
Transport of Reactive Solutes Through Multilayered Soils,
W77-07758 2G

DAVIES, J.
Drainage--Who Pays, Responsibilities After the 1973 Water Act,
W77-07932 5G

DAVIS, G.
Verification by Remote Sensing of an Oil Slick Movement Prediction Model,
W77-07745 5B

DAVYDOVA, A. I.
Spectral Analysis of the Structure of Hydrological Series,
W77-07653 2E

DAWSON, M. A.
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

DEHADRAI, P. V.
Mechanism of Gaseous Exopthalmia in the Atlantic Cod, Gadus Morhua L.,
W77-07712 5C

DEJONG, J. F.
Runoff, Erosion, and Nutrient Movement from Interrill Areas,
W77-07766 2J

DEPUY, G. W.
Concrete-Polymer Materials--Final Report (USBR-BNL-AEC-OSW Cooperative Program),
W77-07803 8F

DERR-HARF, C.
Study of Free Living Amoebae in the Waters of Strabourg: Preliminary Report, (In French),
W77-08016 5A

DESAIAH, D.
Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

DEVOL, A. H.
Diel Phosphate Flux in Lake Washington, U.S.A.,
W77-07968 5C

DICKMAN, S. V.
Tidewater Power System,
W77-08022 8C

DICKSON, K. L.
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

DIKEOU, J. T.
Concrete-Polymer Materials--Final Report (USBR-BNL-AEC-OSW Cooperative Program),
W77-07803 8F

DILLON, T. M.
Low Frequency Turbulence and Vertical Tem
perature Microstructure in Lake Taho
California-Nevada,
W77-07984 2

DIXON, R. E.
Drainage--Who Pays, Responsibilities After th
1973 Water Act,
W77-07932 5

DOKULIL, M.
Planktonic Primary and Bacterial Productivi
in Shallow Waters Within a Large Phragmit
Community (Neusiedlersee, Austria),
W77-07977 5

DOLLAR, STEVEN J.
Inventory of Benthic Organisms and Plankto
at Mokapu, Oahu,
W77-07798 2

DONIGIAN, A. S. JR.
Modeling Nonpoint Pollution from the Lan
Surface,
W77-07818 5

DORNEY, R. S.
Environmental Assessment: The Ecologic
Dimension,
W77-08034 6

DORNFEST, A.
Easier Identification with MPN Procedure,
W77-07928 5

DORRATCAGUE, D. E.
Remote Sensing of Mississippi River Chara
teristics,
W77-08070 7

DOUDOROFF, P.
Water Quality Requirements of Fishes and E
fects of Toxic Substances,
W77-07715 5

DRNEVICH, R. F.
Autothermal Aerobic Digestion,
W77-07898 5

DRUZHININ, I. P.
Cyclical Structure of the Hydrological Seri
and the Nature of Individual Components,
W77-07656 2

DUBACK, M.
Method for Eliminating Organic and Inorgan
Bound Nitrogen from Domestic and Industri
Waste Water,
W77-08099 5

DUCHENE, A.
Water Quality Status and Trends in Minnesot
-Indices for Water Supply and Ground Wat
Pollution,
W77-07794 5

DUCHINSKII, B. M.
A Rapid Volumetric Method of Determini
Fluorine in Water, (In Russian),
W77-07950 5

DUCKSTEIN, L.
Time and Frequency-Domain Identification
a Casual Bivariate Stochastic Process,
W77-07680 2

DUGAN, G. L.
A Second Look at Water Reuse,
W77-07908 5

DUNSON, W. A.
Aquatic Insect Diversity and Biomass in a Stream Marginally Polluted by Acid Strip Mine Drainage,
W77-07846 5C

DUNSTALL, T. G.
Extracellular Release in Planktonic Bacteria,
W77-07996 5C

DURKIN, P. R.
Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

DYCK, S.
Investigations on the Structure of Frequency Distributions of Floods,
W77-07649 2E

DYSART, B. C. III
Modeling Multiple-Use in Natural Areas: Part II - The Santee Swamp Study,
W77-08050 6A

EADIE, B. J.
A Carbon Budget for Lake Ontario,
W77-07967 5C

EAGLEMAN, J. R.
Soil Moisture Detection from Skylab,
W77-08067 7B

EDWARDS, R. A.
Reduction in Sewage Contamination in Sydney Rock Oysters,
W77-07946 5G

EGUSA, S.
Some Experiments on the Gas-Disease in Freshwater Fishes, (In Japanese),
W77-07714 5C

EHEART, J. W.
Application of Thermal Scanning to the Study of Transverse Mixing in Rivers,
W77-08071 5B

EILTS, L. E.
Electronic Isolation Simulator for Hydraulic Turbine Governor Alinement,
W77-07804 8C

ELGIZAWI, M. G.
Use of Cross-Correlation Techniques for Determining the Relationship Between Groundwater Levels and Sources in the Nile Delta Area,
W77-07679 2F

ELLIS, D. B.
Composition and Method of Inhibiting Growth of Slime in Water,
W77-08027 5G

ELLIS, M. L.
The Application of Remote Sensing Technology to the Inventory of Playa Lakes in the High Plains of Texas,
W77-08077 7B

ELLIS, R. C.
Cementing Oil and Gas Wells, Including Casing Handling Procedures: Part 1,
W77-07697 8F

EMERY, W. J.
The Errors Involved in Inferring Salinity from Sound Velocity,
W77-07774 2L

EMREY, R. C.
Municipal Information Systems: Evaluation of Policy Related Research. Volume 2. Computer Utilization in Local Government,
W77-07631 6B

ENGELHORN, O. L.
The Gas Bubble Disease of Fish, (Die Gasblasen Krankheit Bei Fischen,
W77-07716 5C

ESTES, J. E.
Remote Sensing Inputs to Water Demand Modeling,
W77-08080 7B

Urban Land Use: Remote Sensing of Groundbasin Permeability,
W77-08065 7B

EVSTIGNEYEV, V. M.
Spatial and Time Analysis and Estimation of River Flow,
W77-07654 2E

FAIRBANKS, F. A.
Water Waste Treatment,
W77-08092 5D

FARRELL, T. R.
Waste-Water Process,
W77-08100 5D

FEDDES, R. A.
An Integrated Model-Approach to the Effect of Water Management on Crop Yield,
W77-08038 3F

FERRAZ, L. A.
Tidal and Current Prediction for the Amazon's North Channel Using a Hydrodynamical-Numerical Model,
W77-07743 2L

FERTL, W. H.
Open-Hole Porosity Logs Can Be Used in Cased Holes,
W77-07698 8G

FETKOVICH, J. G.
Method and Apparatus for Obtaining Electrical Power from Sea Water,
W77-08032 8C

FILIP, D. S.
Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

FITCH, W. N.
Appraisal of Areawide Waste Water Planning,
W77-07874 5G

FLEGG, A. T.
Methodological Problems in Estimating Recreational Demand Functions and Evaluating Recreational Benefits,
W77-08007 6B

FLUET, C. V.
Sewage Sludge Disposal: A Sticky Problem with No Fail-Safe Answer,
W77-07948 5E

FORAN, D.
The Use of LANDSAT DCS and Imagery in Reservoir Management and Operation,
W77-08076 7B

FORDE, L.
Water Resources and Water-Supply Development in Trinidad and Tobago,
W77-07785 6D

FOSTER, J. L.
Operational Water Management Applications of Snowcovered Area Observations,
W77-08084 7B

FOSTER, W. S.
How to Determine Waste Water Flow,
W77-07881 5F

FOX, R. D.
Cost of High Quality Waste Water Treatment for Reuse,
W77-07930 5D

FRADKIN, B. I.
The Determination of Nitrates in Water, (In Russian),
W77-07966 5A

FRANK, P. A.
Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

FRANZMEIER, D. P.
Soil Formation on Loess in Southwestern Indiana: I. Loess Stratigraphy and Soil Morphology,
W77-07762 2G

Soil Formation on Loess in Southwestern Indiana: II. Distribution of Clay and Free Oxides and Fragipan Formation,
W77-07763 2G

FRIEDRICH, G.
Limnologic-Geologic Excursion in the Territory of the Lower Erft River, (In German),
W77-07799 5B

GAHAN, L. W.
Modeling Multiple-Use in Natural Areas: Part II - The Santee Swamp Study,
W77-08050 6A

GALE, J. E.
Mechanical and Hydraulic Properties of Rocks Related to Induced Seismicity,
W77-07779 8E

GAMSON, R. M.
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

GANTCHEFF, G. S.
Oil Spill at Deception Bay, Hudson Strait,
W77-07731 5G

GARKAVAYA, G. P.
Influence of Mussel Metabolites on the Dynamics of Nutrients in the Coastal Waters of the Eastern Murman Coast, (In Russian),
W77-08043 5C

GARRETT, J. T.
Effects of Polyelectrolytes and Clay Colloids on Carbon Adsorption,
W77-07926 5D

GASS, T. E.
Energy Development and Its Effect on Ground Water,
W77-07691 5B

Ground Water Energy and the Ground Water Heat Pump,
W77-07694 8C

GEISLER, C. C.
Local Control of Land Use: Profile of a Problem,
W77-08003 6F

GERHART, D. Z.
Nutrient Limitation in a Small Oligotrophic Lake in New Hampshire,
W77-07974 5C

GERHOLD, H. D.
Effect of Air Pollution on Pinus Strobus L. and Genetic Resistance - A Literature Review,
W77-07829 5C

GERVAIS, J. T.
R and D Project Provides Phys/Chem Data, Foxborough (Mass) State Hospital Plant Can Produce 'Superior Effluent Quality',
W77-07937 5D

GEYER, J. C.
Waste Management for the Coastal Zone: Concepts for the Assessment of Ocean Outfalls,
W77-07747 5E

GEZEN, A.
Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

GINZBURG, A.
Determination of Salt-Water Interface by Electric Resistivity Depth Soundings,
W77-07783 2F

GIRIN, V. N.
Hygenic Assessment of Tertiary Adsorption Treatment of Domestic Sewage and Industrial Effluents (Gigienicheskaya Otsenka Tretichnoyi Adsorbtsionnoyi Ochistki Bytovykh I Promyshlennikh Stochnykh Vod),
W77-07906 5D

GLASS, G. E.
Effects of Inorganic Complexing on the Toxicity of Copper to Daphnia Magna,
W77-07842 5C

GLOYNA, E. F.
Waste Management for the Coastal Zone: Concepts for the Assessment of Ocean Outfalls,
W77-07747 5E

GLUECKERT, A. J.
Macerator-Sterilizer Sewage Treatment System,
W77-07895 5D

GOL'D, Z. G.
Biological Assessment of the Water Quality of the Small Rivers Sora and Byurya (Yenisei Basin), (In Russian),
W77-07755 5C

GOLOVKIN, A. N.
Influence of Mussel Metabolites on the Dynamics of Nutrients in the Coastal Waters of the Eastern Murman Coast, (In Russian),
W77-08043 5C

GOODMAN, A.
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

GOODRICH, R. R. JR.
Biological Regeneration of Ammonium-Saturated Clinoptilolite. I. Initial Observations,
W77-07942 5D

GOPPERS, V. M.
Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

GORDON, D. C. JR.
Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

GORSLINE, D. S.
Flooding Frequence of Hypersaline Coastal Environments Determined by Orbital Imagery: Geologic Implications,
W77-07751 2L

GOULD, E.
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

GRADY, C. P. L. JR.
Factors Affecting Nitrification,
W77-07854 5D

Simplified Optimization of Activated Sludge Process,
W77-08036 5D

GRAM, H. R.
Petroleum Oil Detection Buoy System,
W77-07750 5A

GREENHOUSE, G.
Effects of Pollutants on Eggs, Embryos and Larvae of Amphibian Species,
W77-07820 5C

GREIG, R. A.
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

GRIMES, E. L.
Moving Belt-Type Oil Skimmer with Propulsion Induced Flow, Method and Apparatus,
W77-08012 5G

GRINEVICH, A. G.
Multidimensional Statistic Modelling of Hydrological Processes on the Basis of Structural Analysis of the Empirical Hydrographs of Runoff,
W77-07662 2A

GRINEVICH, G. A.
Multidimensional Statistic Modelling of Hydrological Processes on the Basis of Structural Analysis of the Empirical Hydrographs of Runoff,
W77-07662 2A

GUERRERO, R.
Optimal Growth Temperatures and Media Parameters of Bacterial Communities from Lakes of Different Trophic States,
W77-07994 5C

GUJER, W.
Process Technological Background Regarding New Protective Regulations for Water Bodies-Results of Experiments on Nitrification and Phosphorus Elimination in Zurich and Bern. II. Process Technological Background of Nitrification in Activated Sludge Plants (Verfahrenstechnische Unterlagen im Hinblick auf die neuen Gewaesserschutz-Anforderungen-Ergebnisse der Versuche ueber die Nitrifikation und Phosphorelimination in Zuerich und Bern. II. Verfahrenstechnische Grundlagen der Nitrifikation in Belebtschlammanlagen),
W77-07953 5D

HAAKSTAD, M.
The Lateral Movement of the Coastal Water and Its Relation to Vertical Diffusion,
W77-08058 2L

HACKATHORN, R. D.
Municipal Information Systems: Evaluation of Policy Related Research. Volume 2. Computer Utilization in Local Government,
W77-07631 6E

HADEED, S. J.
Survey Predicts 33 Percent Municipal Compliance with 1977 Deadline,
W77-07877 5C

HAIMES, Y. Y.
Hierarchical Modeling for the Planning and Management of a Total Regional Water Resource System: Joint Consideration of the Supply and Quality of Ground and Surface Water Resources,
W77-07793 4B

HAITH, D. A.
Best Practicable Waste Treatment Screening Model,
W77-08037 5D

HALL, M. J.
Stochastic Analysis of Velocity Fluctuations in a Natural Stream Channel,
W77-07648 2E

HALL, V. L.
Evaluation of Potential Use of Vegetation for Erosion Abatement Along the Great Lakes Shoreline,
W77-07788 4D

HALVORSON, A. D.
Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

HAMID, K. S.
Comparisons of Two Models for Predicting the Relative Hydraulic Conductivity of Salt-Affected Swelling Soils,
W77-07777 2G

HAMLIN, M. J.
Some Applications of Stochastic Flow Generation,
W77-07647 2A

HAMMER, W. F.
Characteristics of the Areas in Which Fast Current Oil Control is Needed,
W77-07741 5G

HANKS, R. J.
Model of Salt Flow in Soil with a Source-Sink Term,
W77-07761 2G

HANSEN, R. P.
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

HARAS, W. S.
The Application of ERTS-1 Digital Data to Water Transport Phenomena in the Point Pelee-Rondeau Area,
W77-07981 2L

HARFORD, J. D.
Adjustment Costs and Optimal Waste Treatment,
W77-08045 5G

HARGRAVE, B. T.
Stability in Structure and Function of the Mud-Water Interface,
W77-07985 5C

HARLAN, P. W.
Soil Formation on Loess in Southwestern Indiana: I. Loess Stratigraphy and Soil Morphology,
W77-07762 2G

Soil Formation on Loess in Southwestern Indiana: II. Distribution of Clay and Free Oxides and Fragipan Formation,
W77-07763 2G

HARMONY, R. C.
Fluid Flow Regulator,
W77-08018 3F

HARRALD, J.
A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

HARRIS, P. G.
Vertical Mixing Mechanisms and Their Effects on Primary Production of Phytoplankton,
W77-07733 5C

HARRIS, S. E.
Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

HART, G.
The Current State of Environmental Policy,
W77-08005 6G

HARVEY, H. H.
Gas Disease in Fishes - A Review,
W77-07727 5C

HEAMAN, J. D.
Composting--An Approach to Using Sewage Waste,
W77-07876 5E

HEATH, G. R.
Results of R/V Yaquina Cruise Yaloc-74, Leg 3: Seabed Disposal Program, North Pacific Study Area MPG-2, 33 degrees 20'N, 151 degrees 00'W, Nov. 30 - Dec. 21, 1974,
W77-07739 5E

HEISS, H. W.
Research Foundation Utilizes Ground Water Heat Pumps,
W77-07693 8C

HELLE, S. C.
Estimating Costs of Waste Water Sludge Disposal,
W77-07861 5E

HELLER, J. M.
Extraction and Separation of Polychlorinated Biphenyls from Pesticide Monitoring Samples,
W77-07826 5A

HENEFELD-FURIE, S.
Israel's Use of Nonionic Surfactants,
W77-07929 5B

HEUSCHMANN, O.
Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

HEY, D. L.
1776-1976: Notes on Water Quality Planning,
W77-07938 5G

HIEB, A. J.
Irrigation System,
W77-08019 3F

HILL, D. W.
Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

HINTON, M. F.
Flow Controller Device,
W77-08017 3F

HIRS, G.
Method of Filtering Oil from Liquids,
W77-08011 5G

HOCKENBURY, M. R.
Factors Affecting Nitrification,
W77-07854 5D

HODSON, P. V.
Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

HOGARTH, L. N.
The Conception, Design, and Construction of Metropolitan Toronto Mid-Toronto Sewer,
W77-07888 8B

HOLSAPPLE, C.
Implementation of a Decision Support for Regional Water Quality Planning,
W77-07812 6A

HOLSAPPLE, C. W.
Aiding Decision Makers with a Generalized Data Base Management System: An Application to Inventory Management,
W77-07814 6A

A Decision Support System for Area-Wide Quality Planning,
W77-07810 6A

Extensions and Corrections for the CODASYL Approach to Data Base Management,
W77-07811 6A

Information Transferral within a Distributed Data Base Via a Generalized Mapping Language,
W77-07813 6A

Mathematical Programming within the Context of a Generalized Data Base Management System,
W77-07850 6A

Observations on a Generalized Intelligent Query Processor for Decision Support,
W77-07849 6A

HOLZ, R. K.
Flood Hazard Studies in Central Texas Using Orbital and Suborbital Remote Sensing Imagery,
W77-08069 7B

HOOD, E. J.
Watershed Organizations--Impact on Water Quality Management: An Analysis of Selected Michigan Watershed Councils,
W77-08093 4D

HOROWITZ, J.
The Use of LANDSAT DCS and Imagery in Reservoir Management and Operation,
W77-08076 7B

HORTON, M. L.
Evaluation of Thermal X/5-Detector Skylab S-192 Data for Estimating Evapotranspiration and Thermal Properties of Soils for Irrigation Management,
W77-08079 7B

HOVEY, W. H.
Analysis of Activated Sludge Process Performance,
W77-08096 5D

HOWARD, C.
Easier Identification with MPN Procedure,
W77-07928 5A

HOWARD, P. H.
Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

HUANG, J-C.
Effects of Polyelectrolytes and Clay Colloids on Carbon Adsorption,
W77-07926 5D

HUFFORD, G. L.
Tar Ball Distribution in the Western North Atlantic,
W77-07757 5B

HULAK, P.
Method of Separation of Fission and Corrosion Products and of Corresponding Isotopes from Liquid Waste,
W77-08020 5D

HULBERT, M. H.
Effects of Sample Handling on the Composition of Marine Sedimentary Pore Water,
W77-07742 5A

HUMPHRIS, T. H.
The Use of Sewage Effluent as Power Station Cooling Water,
W77-07949 5G

HUNG, Y.-T.
Utilization of Fly Ash in Polishing Oxidation Pond Effluents,
W77-07815 5D

HUTTON, J.
Impacts of Offshore Oil on North East Scotland,
W77-07752 5C

ISAKI, L. I.
Mutagenic Potential of Petroleum Byproducts in Chesapeake Bay Waters,
W77-07606 5B

ISBISTER, J. D.
Mutagenic Potential of Petroleum Byproducts in Chesapeake Bay Waters,
W77-07606 5B

ISHIDA, Y.
Floating Breakwater,
W77-08009 8A

ITTIHADIEH, F.
Waste Water Treatment by Upflow Sand Filtration,
W77-08087 5D

IVANOVA, A. T.
A Rapid Volumetric Method of Determining Fluorine in Water, (In Russian),
W77-07950 5A

IVES, B. C.
The Valuation of Aesthetic Preferences,
W77-08041 6G

IVES, K.
Water and Waste Water Engineering for Low Income Communities in Developing Countries,
W77-07939 5G

JACKSON, R. C.
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

JACKSON, R. M.
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

JACKSON, T. J.
Land Use Classification for Hydrologic Models using Interactive Machine Classification of Landsat Data,
W77-08074 7B

JAMIESON, A. W.
Energy Exchange at a Glacier Surface: An Alternative to Aerodynamic Methods of Measurement,
W77-08053 2C

JAY, F. A.
State Park Gets Good Treatment, Effluents Will Be Used for Irrigation to Reduce Extensive Requirements,
W77-07936 5D

JENSEN, D. S.
Characteristics of the Areas in Which Fast Current Oil Control is Needed,
W77-07741 5G

JENSEN, J. R.
Remote Sensing Inputs to Water Demand Modeling,
W77-08080 7B

Urban Land Use: Remote Sensing of Groundbasin Permeability,
W77-08065 7B

JILEK, R.
Method of Separation of Fission and Corrosion Products and of Corresponding Isotopes from Liquid Waste,
W77-08020 5D

JOHANSON, R. C.
Study of the Rio Grande, Bolivia Highlights Some Basic Questions About Simulation,
W77-07945 2A

JOHNSON, J. M.
Utilization of LANDSAT Data for Water Quality Surveys in the Choptank River,
W77-08072 5A

JOHNSON, R. W.
Prefabricated Panels for Sub-Surface Sewage Effluent and Waste Water Disposal,
W77-08091 5E

JOHNSTON, P. M.
Stochastic Analysis of Velocity Fluctuations in a Natural Stream Channel,
W77-07648 2E

JONASSON, P. M.
Population Ecology and Production of Benthic Detritivores,
W77-07979 5C

JONES, I. S. F.
The Scaling of Velocity Fluctuations in the Surface Mixed Layer,
W77-07768 2L

JOUROLMAN, L.
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

JOVANOVIC, S.
Simulation of Daily Rainfall Series Using Markov Chain Models,
W77-07660 2A

KACZMAREK, Z.
Some Problems of Stochastic Storage with Correlated Inflow,
W77-07689 4A

KADDAH, M. T.
Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

KALFF, J.
Phytoplankton Production in Lake Memphremagog, Quebec (Canada)--Vermont (U.S.A.),
W77-07962 5C

KALININ, G. P.
Spatial and Time Analysis and Estimation of River Flow,
W77-07654 2E

KALININ, Y. S.
Experience of the Pavlodar Oblast Public Health Service in Sanitary Protection of the Irtysh River, (In Russian),
W77-07686 5G

KALNICKY, R. A.
Recreational Use of Small Streams in Wisconsin,
W77-08008 5G

KALVINSKAS, J. J.
Sewage Sludge Treatment System,
W77-08030 5D

KANIA, H. J.
Reductions in Biomass and Diversity Resulting from Exposure to Mercury in Artificial Streams,
W77-07838 5C

KANTOR, W.
Hydrogeological Investigations in the Pampa of Argentina,
W77-08064 7B

KARALEKAS, P. C. JR.
Watershed Management and Water Quality,
W77-07951 5G

KAROLUS, J. J.
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. V. Observations on the Biochemistry,
W77-07835 5C

KARTVELISHVILI, N. A.
On Deterministic Components in Natural Streamflow,
W77-07658 2E

KARWAN, K. R.
A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

KASANSKY, A. B.
A Statistical Filtration Model for the Inseepage of Melt Water into Frozen Ground,
W77-07672 2G

KASHYAP, R. L.
Stochastic Difference Equation Modelling of Hydrological Processes,
W77-07663 2E

KATIBAH, E. F.
Areal Extent of Snow Estimation in the Northern Sierra Nevada Mountains Using LANDSAT-1 Imagery,
W77-08081 7B

KATZER, J.
Method of Separation of Fission and Corrosion Products and of Corresponding Isotopes from Liquid Waste,
W77-08020 5D

KAUFFMAN, P.
An Experimental and Theoretical Study of the Turbulent and Laminar Convection Generated Under a Horizontal Ice Sheet Floating on Warm Salty Water,
W77-07773 2C

KAVANAUGH, M. C.
Mechanisms and Kinetic Parameters in Granular Media Filtration,
W77-08097 5D

KAY, E. A.
Inventory of Benthic Organisms and Plankton at Mokapu, Oahu,
W77-07798 2L

KEIZER, P. D.
Hydrocarbons in Eastern Canadian Marine Waters Determined by Fluorescence Spectroscopy and Gas-Liquid Chromatography,
W77-08060 5A

KELL, R. M.
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

KELLER, E. A.
Channelization: Environmental, Geomorphic, and Engineering Aspects,
W77-07809 8B

KELLER, J.
Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Licensing Procedures, Volume II, Environmental Laws and Siting and Licensing Procedures,
W77-07602 6E

Laws Needed to Expedite Electric Generation Schedules for the Pacific Northwest: Financing, Environmental Laws and Siting and Licensing Procedures, Volume I, Financing Pacific Northwest Electric Generation,
W77-07601 8C

KENDRICK, P. J.
1976 Needs Survey Markedly Lower,
W77-07878 5G

KENNEY, B. C.
The Scaling of Velocity Fluctuations in the Surface Mixed Layer,
W77-07768 2L

KERNS, WALDON R.
Implementation of Non-Structural Alternatives in Flood Damage Abatement,
W77-07795 6F

KESTER, D. R.
Effect of Major Ion Variations in the Marine Environment on the Specific Gravity--Conductivity--Chlorinity--Salinity Relationship,
W77-07802 2K

KHALEEL, R.
A Multivariate Mathematical Model of Monthly River Flow,
W77-07675 2E

KHOMERIKI, I. B.
Elements of Runoff Periodicity in Tasks of Modelling,
W77-07655 2E

KIMM, C.
Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

KINZIRSKII, A. S.
Experimental Data for the Hygienic Standardization of Diphenylamine and Diphenyldiethylurea in Water Bodies, (In Russian),
W77-07700 5G

KIORTSIS, V.
Comparative Study of Cladocera from the 1st Meter of Sea Water, Collected in a Polluted Zone and in Another Relatively Clean Zone, (In French),
W77-07730 5C

KIRKHAM, M. B.
Organic Matter and Heavy Metal Uptake,
W77-07870 5E

KISIEL, C. C.
Objective Function and Constraints in Water Resources Systems,
W77-08046 6A

Time and Frequency-Domain Identification of a Casual Bivariate Stochastic Process,
W77-07680 2E

KLEMAS, V.
Verification by Remote Sensing of an Oil Slick Movement Prediction Model,
W77-07745 5B

KLETT, R. J.
Waste-Water Process,
W77-08100 5D

KLUGE, C.
Investigations on the Structure of Frequency Distributions of Floods,
W77-07649 2E

KNOX, E. G.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

KOBAYASHI, S.
Studies on the Role of Detritus in Fresh Water Lakes,
W77-08001 5C

KOBURGER, C. W.
Characteristics of the Areas in Which Fast Current Oil Control is Needed,
W77-07741 5G

KOCH, R. B.
Influence of Solvents on the Pesticide Inhibition of ATPase Activities in Fish and Insect Tissue Homogenates,
W77-07847 5C

KOGANOVSKY, A. M.
Hygenic Assessment of Tertiary Adsorption Treatment of Domestic Sewage and Industrial Effluents (Gigienicheskaya Otsenka Tretichnoyi Adsorbtsionnoyi Ochistki Bytovykh I Promyshlennikh Stochnykh Vod),
W77-07906 5D

KOL'KOVSKI, P.
The Problem of the Behavior of Chemical Pollutants in the Environment, (In Russian),
W77-08028 5B

KONOVALENKO, Z. P.
Cyclical Structure of the Hydrological Series and the Nature of Individual Components,
W77-07656 2E

KONTUR, I.
Application of Stochastic Hydrological Models in the Design of Lake Level Control,
W77-07681 4A

KORDIC, M.
Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

KORGANOVA, N. S.
On Deterministic Components in Natural Streamflow,
W77-07658 2E

KOROLEV, A. A.
Experimental Data for the Hygienic Standardization of Diphenylamine and Diphenyldiethylurea in Water Bodies, (In Russian),
W77-07700 5G

KOSAKA, M.
The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

KOTSAR, N. T.
Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

KOTTEGODA, N. T.
Some Applications of Stochastic Flow Generation,
W77-07647 2A

KOVACS, G.
The Use of Lysimeters in the Hydrological Investigation of the Unsaturated Zone,
W77-07780 2D

KOVALENKO, O. I.
A Rapid Volumetric Method of Determining Fluorine in Water, (In Russian),
W77-07950 5A

KRABACH, M. H.
An Analysis of the Feasibility of Using Air Agitation to Reduce Gas Saturations in Sea Water at Pilgrim Nuclear Power Station,
W77-07720 5G

KRAEMER, K. L.
Municipal Information Systems: Evaluation of Policy Related Research. Volume 2. Computer Utilization in Local Government,
W77-07631 6B

KRASNYKH, A. A.
Determination of Morestan in Water, Soil, and Cucumbers by Thin-Layer Chromatography, (In Russian),
W77-07688 5A

KRAUSE, B.
Eliminating Iron-Bearing Water from Well No. 7,
W77-07702 5G

KREMER, M.
Study of Free Living Amoebae in the Waters of Strabourg: Preliminary Report, (In French),
W77-08016 5A

KRITSKY, S. N.
Finding Regularities in Long-Term Streamflow Fluctuations by Analysis of Hydrological Ensembles,
W77-07676 2E

KROESCHE, J. L.
State Park Gets Good Treatment, Effluents Will Be Used for Irrigation to Reduce Extensive Requirements,
W77-07936 5D

KRUCK, W.
Hydrogeological Investigations in the Pampa of Argentina,
W77-08064 7B

KUNTZE, E.
Improvement and Expansion of the Drainage System of Hamburg,
W77-07890 5D

KUO, C. Y.
Evaluation of Sediment Yields Due to Urban Development,
W77-07705 4D

LAKATOS, D. F.
Penn State Urban Runoff Model--User's Manual,
W77-07797 4D

LAMBANA, L. A.
Incineration Method and System,
W77-08098 5E

LANG, M.
Waste Management for the Coastal Zone: Concepts for the Assessment of Ocean Outfalls,
W77-07747 5E

LAVE, L. B.
Tolls: Efficiency and Equity Issues for Inland Waterways,
W77-08039 6C

LEAN, D. R. S.
Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

LECKIE, J. O.
Mercury in the Biogeochemical Environment,
W77-07823 5B

LECLERC, H.
Concentration of Bacteria in Water Using the Ultrafiltration Method, (In French),
W77-07860 5D

LEE, D. C. SR.
Oil Separator Device,
W77-08015 5G

LEE, J. H.
Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

LEHR, J. H.
Ground Water Energy and the Ground Water Heat Pump,
W77-07694 8C

LEITRITZ, E.
Trout and Salmon Culture (Hatchery Methods) Hatchery Water Supply,
W77-07726 5G

LERCH, D. W.
Moving Belt-Type Oil Skimmer with Propulsion Induced Flow, Method and Apparatus,
W77-08012 5G

LEVANON, A.
Determination of Salt-Water Interface by Electric Resistivity Depth Soundings,
W77-07783 2F

LEWIS, R. C.
Trout and Salmon Culture (Hatchery Methods) Hatchery Water Supply,
W77-07726 5G

LI, P. E.
Experience of the Pavlodar Oblast Public Health Service in Sanitary Protection of the Irtysh River, (In Russian),
W77-07686 5G

LIANG, C. N.
Effects of Trace Elements on Nitrogen Mineralization in Soils,
W77-07864 5B

LIN, W. C.
Soil Moisture Detection from Skylab,
W77-08067 7B

LIN, Y. S.
Operating Policy Simulation or a Reservoir Systems, (Phase II),
W77-07604 4A

LINDSAY, M. G.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

LINSLEY, R. K.
Representative and Experimental Basins - Where Next,
W77-07781 2A

LIPKA, G. S.
The Effect of Highway Deicing Salt on Chloride Budgets at Lake George, NY,
W77-08000 5B

LISSAUER, I. M.
Preliminary Projections of Oil Spill Movement for Three Potential Deepwater Port Sites in the Gulf of Mexico,
W77-07753 5B

LOCKMAN, W. T.
Concrete-Polymer Materials--Final Report (USBR-BNL-AEC-OSW Cooperative Program),
W77-07803 8F

LOCKYEAR, C. F.
Continuous Thickening of Biological Sludges, and the Influence of Stability,
W77-07923 5D

LOVELL, B. B.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

LOVELY, W. G.
A Technique to Index Soil Pores and Aggregates Larger than 20 Micrometers,
W77-08059 2G

LUBETKIN, S. A.
Financing: There Must be a Better Way,
W77-07873 5G

LUCAS, H. C.
Municipal Information Systems: Evaluation of Policy Related Research. Volume 2. Computer Utilization in Local Government,
W77-07631 6B

LUDWIG, J. D.
Evaluation of Potential Use of Vegetation for Erosion Abatement Along the Great Lakes Shoreline,
W77-07788 4D

MACLEAN, S. A.
Physiological Response of the Cunner, Tautogolabrus Adspersus, to Cadmium. VI. Histopathology,
W77-07836 5C

MACPHERSON, E.
Process for Eliminating Reactive Chlorinated Organic Compounds from Aqueous Solutions,
W77-08021 5D

MADSEN, O. S.
A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

MAELGI, U.
Hydrochemistry of the Nigula Swamp, (In Estonian),
W77-07859 2H

MAGUIRE, J.
Enzyme Kinetics--A Review with Emphasis on Inhibition of Enzymes,
W77-07732 5B

MAH, R. A.
Bacterial Populations and End Products During Anaerobic SLudge Fermentation of Glucose,
W77-07944 5D

MALOMAN, P. N.
The Problem of the Sanitary Protection of the Waters of Ports and Coastal Zones of the Black Sea Basin, (In Russian),
W77-08014 5G

MANIAK, U.
Flood Frequency Studies of Rivers in the Federal Republic of Germany,
W77-07670 2E

MANKIEWICZ, D.
Clastic Sedimentation in a Modern Alpine Lake,
W77-07791 2J

MARCELLO, R. A. JR.
An Analysis of the Feasibility of Using Air Agitation to Reduce Gas Saturations in Sea Water at Pilgrim Nuclear Power Station,
W77-07720 5G

MARELLI, H. J.
Runoff, Erosion, and Nutrient Movement from Interrill Areas,
W77-07766 2J

MARTIN, G. N.
Water Sampling from Unpumped Wells with Static Water Levels Deeper than 10 Metres,
W77-07787 5A

MARTIN, S.
An Experimental and Theoretical Study of the Turbulent and Laminar Convection Generated Under a Horizontal Ice Sheet Floating on Warm Salty Water,
W77-07773 2C

MARTINSON, O. B.
Local Control of Land Use: Profile of a Problem,
W77-08003 6F

MATALAS, N. C.
Generation of Multivariate Synthetic Flows,
W77-07610 2A

In Hydrology h is a Household Word,
W77-07667 2A

MATSCH, L. C.
Autothermal Aerobic Digestion,
W77-07898 5D

MCCARTY, P. L.
Mercury in the Biogeochemical Environment,
W77-07823 5B

MCCOMMAS, M. D.
Mutagenic Potential of Petroleum Byproducts in Chesapeake Bay Waters,
W77-07606 5B

MCCONNELL, R. J.
Effects of Gas Supersaturated Columbia River Water on the Survival of Juvenile Chinook and Coho Salmon,
W77-07708 5C

MCCUEN, R. H.
Land Use Classification for Hydrologic Models using Interactive Machine Classification of Landsat Data,
W77-08074 7B

MCDANNALD, R. B.
Pumping Systems: Part II,
W77-07704 8C

MCFARLAND, M. J.
The Correlation of Skylab L-Band Brightness Temperatures with Antecedent Precipitation,
W77-08068 7B

MCGAUHEY, P. H.
A Second Look at Water Reuse,
W77-07908 5D

MCGINNIS, D. F. JR.
Factors Affecting Snow Assessment from LANDSAT Data,
W77-08083 7B

MCGIVERN, R. F.
Skimmer Apparatus for Sewage Settling Tanks and the Like,
W77-08088 5G

MCGOWAN, W. E.
Monitoring Dissolved Hydrocarbons as a Function of the Tidal Cycle (New York Harbor),
W77-07740 5B

Tar Ball Distribution in the Western North Atlantic,
W77-07757 5B

MCHENRY, J. R.
Influence of Suspended Sediment on the Temperatures of Surface Waters of Reservoirs,
W77-07975 5C

MCKINNEY, R. E.
Experiences in Evaluating and Specifying Aeration Equipment,
W77-07899 5D

MCMAHON, R. O.
Oregon's Long-Range Requirements for Water. Forest Products Projections and Recreation Projections, Appendices IV and V,
W77-07625 6D

MCMANUS, B. R.
Risk of Drinking Water Contamination in Rural Tennessee,
W77-07701 5G

MCMILLAN, M. C.
Factors Affecting Snow Assessment from LANDSAT Data,
W77-08083 7B

MEADE, T. L.
Protective Effect of Chloride on Nitrite Toxicity to Coho Salmon (Oncorhynchus Kisutch),
W77-07840 5C

MELAMED, D.
Model of Salt Flow in Soil with a Source-Sink Term,
W77-07761 2G

MELCHER, A. G.
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

MENKEL, M. F.
Finding Regularities in Long-Term Streamflow Fluctuations by Analysis of Hydrological Ensembles,
W77-07676 2E

MEYER, L. D.
Runoff, Erosion, and Nutrient Movement from Interrill Areas,
W77-07766 2J

MIDDLEBROOKS, E. J.
Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

MIGNONE, N. A.
Survey of Anaerobic Digestion Supernatant Treatment Alternatives,
W77-07903 5D

MILLARD, S. E.
Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

MILLER, J. E.
Physiological Response of the Cunner, Tautogolabrus adspersus, To Cadmium. I. Introduction and Experimental Design,
W77-07831 5C

MITOSEK, H. JR.
Stochastic Structure of a Process of Average Monthly Flows,
W77-07651 2E

MOLET, B.
Study of Free Living Amoebae in the Waters of Strabourg: Preliminary Report, (In French),
W77-08016 5A

MOLINSKI, M.
The Contribution of Autochthonous and Allochthonous Matter to the Trophy of a River in the Barbel Region,
W77-07986 5C

MOLNAR, S. E.
Apparatus for Power Generation in Deep Seawater,
W77-08023 8C

MOLVAR, A. E.
Waste Water Plants Use Less Instrumentation than Related Industries,
W77-07872 5D

MONHEIMER, R. H.
Planktonic Microbial Heterotrophy: Its Significance to Community Biomass Production,
W77-07993 5C

MONKE, E. J.
Runoff, Erosion, and Nutrient Movement from Interrill Areas,
W77-07766 2J

MOORE, D. G.
Evaluation of Thermal X/5-Detector Skylab S-192 Data for Estimating Evapotranspiration and Thermal Properties of Soils for Irrigation Management,
W77-08079 7B

MORAITOU-APOSTOLOPOULOU, M.
Comparative Study of Cladocera from the 1st Meter of Sea Water, Collected in a Polluted Zone and in Another Relatively Clean Zone, (In French),
W77-07730 5C

MORI, K.
The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

MOROSOFF, N.
Preparation of Composite Reverse Osmosis Membranes by Plasma Polymerization,
W77-07792 3A

MUELLER, L.
The Activated Sludge Process Without Preliminary Purification. Results of Pilot Experiments in the Purification Plant Karlsruhe (Das Belebungsverfahren ohne Vorreinigung. Ergebnisse der Versuche im halbtechnischen Massstab im Klaerwerk Karlsruhe),
W77-07927 5D

MUELLER, W. A.
Sewage Sludge Treatment System,
W77-08030 5D

MUIA, R. A.
Composition and Method for Flocculating Suspended Solids,
W77-08031 5D

MULLEN, G. J.
Predictions of the Soil Water Flux Based Upon Field-Measured Soil-Water Properties,
W77-07772 2G

MURDOCK, J. P.
Method of Filtering Liquids Containing Dissolved Carbon Dioxide,
W77-08013 5D

MURPHY, T. P.
Phosphorus: Changes in Ecosystem Metabolism from Reduced Loading,
W77-07989 5C

MUSTAFA, M. A.
Comparisons of Two Models for Predicting the Relative Hydraulic Conductivity of Salt-Affected Swelling Soils,
W77-07777 2G

MYERS, V. I.
Evaluation of Thermal X/5-Detector Skylab S-192 Data for Estimating Evapotranspiration and Thermal Properties of Soils for Irrigation Management,
W77-08079 7B

MYRUP, L. O.
Low Frequency Turbulence and Vertical Temperature Microstructure in Lake Tahoe, California-Nevada,
W77-07984 2H

NACHAZEL, K.
Multiple Markov Processes in Hydrology and Their Importance for Stochastic Analysis of Water Accumulation Problems,
W77-07684 4A

NALEWAJKO, C.
Extracellular Release in Planktonic Bacteria,
W77-07996 5C

NARKIS, N.
Israel's Use of Nonionic Surfactants,
W77-07929 5B

NASH, C. E.
Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

NASH, J. E.
Bayesian Estimation of Frequency of Hydrological Events,
W77-07650 2E

NEAME, P. A.
Oxygen Uptake of Sediments in Castle Lake, California,
W77-07976 5C

NEBEKER, A. V.
Effects of Air-Supersaturated Water on Survival of Pacific and Steelhead Smolts,
W77-07707 5C

NELSON, B. A.
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

NEWMAN, M. W.
Physiological Response of the Cunner, Tautogolabrus Adspersus, to Cadmium. VI. Histopathology,
W77-07836 5C

NICHOLS, M. M.
Development of the Turbidity Maximum in Rappahannock Estuary; Summary,
W77-07789 2L

NIEBAUER, H. J.
Temperature Regime in Lake Superior at Silver Bay, Minnesota,
W77-07970 1A

NIELSEN, D. R.
Predictions of the Soil Water Flux Based Upon Field-Measured Soil-Water Properties,
W77-07772 2G

Solute Movement in a Field Soil,
W77-07759 2G

NIGRELLI, R. F.
Preliminary Studies of Menhaden and Their Mass Mortalities in Long Island and New Jersey Waters,
W77-07724 5C

NIKOLSKAYA, N. V.
Spatial and Time Analysis and Estimation of River Flow,
W77-07654 2E

NITKOWSKI, M. F.
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

NORGREN, J. A.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

O'BRIEN, W. J.
Feeding of Forage Fish in Turbid Kansas Reservoirs,
W77-07817 2H

O'CONNELL, P. E.
A Simple Stochastic Modelling of Hurst's Law,
W77-07666 2E

O'NEIL, J. R.
Metamorphic Reactions in Flysch Rocks,
W77-07609 2K

OBRADOVIC, D.
Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

OGURA, M.
The Study of the Benthos Community Around the Mouth of the Port of Tagonoura in Suruga Bay, (In Japanese),
W77-07735 5C

OLIGHER, R. C.
Passing Fish Through Hydraulic Turbines,
W77-07713 8I

OPAVSKY, W.
Process for Eliminating Reactive Chlorinated Organic Compounds from Aqueous Solutions,
W77-08021 5D

ORLANDO, J. R.
Biochemical and Physical-Chemical Treatment of Weak Municipal Waste Water,
W77-07916 5D

ORR, R. H.
Risk of Drinking Water Contamination in Rural Tennessee,
W77-07701 5G

PAERL, H. W.
Visual Observations of Phosphorus Movement Between Algae, Bacteria, and Abiotic Particles in Lake Waters,
W77-07983 5C

PAETH, R. C.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

PARK, J. B.
Relationship Between BOD5 and Fats, Oils and Grease,
W77-07925 5G

PARK, R.
Studies on the Role of Detritus in Fresh Water Lakes,
W77-08001 5C

PARKER, P.
Slurry and Pumping Guidelines Smooth Casing-Cementing Jobs,
W77-07699 8F

PARKHURST, J. D.
Waste Management for the Coastal Zone: Concepts for the Assessment of Ocean Outfalls,
W77-07747 5E

PARKS, G. A.
Mercury in the Biogeochemical Environment,
W77-07823 5B

PATTON, P. C.
Flood Hazard Studies in Central Texas Using Orbital and Suborbital Remote Sensing Imagery,
W77-08069 7B

PAVLOV, N. V.
The Problem of the Sanitary Protection of the Waters of Ports and Coastal Zones of the Black Sea Basin, (In Russian),
W77-08014 5G

PEARSON, F. J. JR.
14C Evidence for the Origin of Arid Region Groundwater, Northeastern Province, Kenya,
W77-07611 7B

PENCZAK, T.
The Contribution of Autochthonous and Allochthonous Matter to the Trophy of a River in the Barbel Region,
W77-07986 5C

PERKINS, M. A.
Diel Phosphate Flux in Lake Washington, U.S.A.,
W77-07968 5C

PERRONE, S. J.
Protective Effect of Chloride on Nitrite Toxicity to Coho Salmon (Oncorhynchus Kisutch),
W77-07840 5C

PETERS, R. H.
Phosphorus Regeneration by Natural Populations of Limnetic Zooplankton,
W77-07972 5C

PETRAKIS, L.
Degradation of Petroleum by an Alga, Prototheca Zopfii,
W77-07737 5C

PETRUSKA, J. A.
High Gradient Magnetic Separation of Food Processing Wastewater,
W77-07852 5D

PETTIGREW, N. R.
Observations of Wave Height and Wave Celerity in the Surf Zone,
W77-07770 2L

PEZZETTA, J. M.
Sedimentation in Lower Green Bay, Wisconsin,
W77-07980 2J

PIERCE, M.
Effects of Chlorine and Chloramine on Uptake of Inorganic Nitrogen by Phytoplankton,
W77-07843 5C

PIEST, R. F.
Gully Wall Stability in Loess-Derived Alluvium,
W77-07764 4D

PILOLLA, J. J.
Sewage Treatment Apparatus,
W77-07896 5D

PINIGIN, M. A.
Hygienic Criteria of the Complex Action of Chemical Environmental Pollutants, (In Russian),
W77-08029 5G

PINKAYAN, S.
A Multivariate Mathematical Model of Monthly River Flow,
W77-07675 2E

POLLACK, A. M.
A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

POLLINGHER, U.
Temporal and Spatial Patterns of Dinoflagellate Blooms in Lake Kinneret, Israel (1969-1974),
W77-07973 5C

POLOSKY, R. J.
Method for Improving the Quality of Contaminated Waste Water,
W77-08090 5D

POMERENING, J. A.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

PONOMAREVA, S. A.
Effect of Salinity on the Fresh-Water Shrimp Dikerogammarus Haemobaphes (Eichwald) from the Mouth of the Dnepr,
W77-07848 5C

POPOV, V. V.
Experience of the Pavlodar Oblast Public Health Service in Sanitary Protection of the Irtysh River, (In Russian),
W77-07686 5G

PORTER, S. C.
Present and Past Glaciation Threshold in the Cascade Range, Washington, U.S.A.: Topographic and Climatic Controls, and Paleoclimatic Implications,
W77-08056 2C

POSMENTIER, E. S.
The Generation of Salinity Finestructure by Vertical Diffusion,
W77-07775 2L

POTTER, J. L.
Marine Sanitation Method and Device,
W77-07891 5D

POWELL, T. M.
Low Frequency Turbulence and Vertical Temperature Microstructure in Lake Tahoe, California-Nevada,
W77-07984 2H

POWER, W. E.
Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

PRATHER, R. J.
Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

PREISENDORFER, R. W.
Hydrologic Optics. Volume I. Introduction,
W77-07956 1A

Hydrologic Optics, Volume II. Foundations,
W77-07957 1A

Hydrologic Optics. Volume III. Solutions,
W77-07958 1A

Hydrologic Optics. Volume IV. Imbeddings,
W77-07959 1A

Hydrologic Optics. Volume V. Properties,
W77-07960 1A

Hydrologic Optics. Volume VI. Surfaces,
W77-07961 1A

PRESTON, J. N.
Gravity-Measuring Device for Water and Mineral Detection,
W77-08010 7B

PROCHAZKA, H.
Method of Separation of Fission and Corrosion Products and of Corresponding Isotopes from Liquid Waste,
W77-08020 5D

PULLEN, K. G.
Trials on the Operation of Biological Filters,
W77-07954 5D

PULLIN, J.
Lakes Will Take the Pollution Load Off Old Father Tame,
W77-07913 5G

QADRI, R. B.
Reduction in Sewage Contamination in Sydney Rock Oysters,
W77-07946 5G

QUIMPO, R. G.
Structural Relation Between Parametric and Stochastic Hydrology Models,
W77-07664 2A

RAGAN, R. M.
Land Use Classification for Hydrologic Models using Interactive Machine Classification of Landsat Data,
W77-08074 7B

RAGOTZKIE, R. A.
Temperature Regime in Lake Superior at Silver Bay, Minnesota,
W77-07970 1A

RAMSELER, R. O.
Oil Spill at Deception Bay, Hudson Strait,
W77-07731 5G

RANGO, A.
Hydrologic Land Use Classification of the Patuxent River Watershed Using Remotely Sensed Data,
W77-08073 7B

RANGO, R.
Operational Water Management Applications of Snowcovered Area Observations,
W77-08084 7B

RAO, P. S. C.
Transport of Reactive Solutes Through Multilayered Soils,
W77-07758 2G

RAO, R. A.
Stochastic Difference Equation Modelling of Hydrological Processes,
W77-07663 2E

RAUSCH, E. G.
Composition and Method for Flocculating Suspended Solids,
W77-08031 5D

RECTOR, M.
Remote Sensing Inputs to Water Demand Modeling,
W77-08080 7B

REDMOND, M. C.
Concrete-Polymer Materials--Final Report (USBR-BNL-AEC-OSW Cooperative Program),
W77-07803 8F

REICHARDT, W.
Bacterial Decomposition of Different Polysaccharides in a Eutrophic Lake,
W77-07991 5C

REYNOLDS, J. H.
Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

RHOADES, J. D.
Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

RICHEY, J. E.
Diel Phosphate Flux in Lake Washington, U.S.A.,
W77-07968 5C

RILEY, S. J.
Aspects of Bankfull Geometry in a Distributary System of Eastern Australia,
W77-07782 2E

RITCHIE, J. C.
Influence of Suspended Sediment on the Temperatures of Surface Waters of Reservoirs,
W77-07975 5C

ROBERTSON, A.
A Carbon Budget for Lake Ontario,
W77-07967 5C

ROBINSON, G. G. C.
The Influence of Temperature and Bacterial Numbers on the Heterotrophic Uptake of C14 Glucose in West Blue Lake, Manitoba,
W77-07995 5C

ROBOHM, R. A.
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. IV. Effects on the Immue System,
W77-07834 5C

ROCHESTER, E. W.
Simulation of Impoundment Terrace Hydraulics,
W77-07767 8B

RODA, F.
Optimal Growth Temperatures and Media Parameters of Bacterial Communities from Lakes of Different Trophic States,
W77-07994 5C

ROESER, B.
The Invertebrate Fauna of the Broel and Its Tributary Brooks, (In German),
W77-07746 5C

ROESLER, J. F.
Waste Water Plants Use Less Instrumentation than Related Industries,
W77-07872 5D

ROSS, P. E.
Phytoplankton Production in Lake Memphremagog, Quebec (Canada)--Vermont (U.S.A.),
W77-07962 5C

ROSSON, H. F.
Disposal of Feedlot Wastes Using a Two-Stage Process with Net Energy Production,
W77-07816 5D

ROTH, C. B.
Soil Formation on Loess in Southwestern Indiana: II. Distribution of Clay and Free Oxides and Fragipan Formation,
W77-07763 2G

ROVINSKII, F. Y.
Migration of 90Sr with Runoff Waters from Soils, (In Russian),
W77-07971 5B

ROZHDESTVENSKY, A. V.
Methods for the Mathematical Description of the Structure of River Runoff Variations,
W77-07652 2E

RUFF, J. F.
Remote Sensing of Mississippi River Characteristics,
W77-08070 7B

RUKVICHAI, C.
Operating Policy Adaptations for a Reservoir Systems, (Phase I),
W77-07603 4A

Operating Policy Simulation or a Reservoir Systems, (Phase II),
W77-07604 4A

RUSH, R. J.
Review of Colour Removal Technology in the Pulp and Paper Industry,
W77-07734 5D

RUSSELL, M. J.
Evaluation of Thermal X/5-Detector Skylab S-192 Data for Estimating Evapotranspiration and Thermal Properties of Soils for Irrigation Management,
W77-08079 7B

RUSSO, A. R.
Inventory of Benthic Organisms and Plankton at Mokapu, Oahu,
W77-07798 2L

RYKBOST, K.
Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

SACHS, S. B.
Waste Water Renovation by Sewage Ultrafiltration,
W77-07941 5D

SAIGH, P. A.
Macerator-Sterilizer Sewage Treatment System,
W77-07895 5D

SAIN, I. I.
Experience of the Pavlodar Oblast Public Health Service in Sanitary Protection of the Irtysh River, (In Russian),
W77-07686 5G

SALATA, O. V.
Hygenic Assessment of Tertiary Adsorption Treatment of Domestic Sewage and Industrial Effluents (Gigienicheskaya Otsenka Tretichnoyi Adsorbtsionnoyi Ochistki Bytovykh I Promyshlennikh Stochnykh Vod),
W77-07906 5D

SALMAN, H. A.
Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

SALOMONSON, V. V.
Operational Water Management Applications of Snowcovered Area Observations,
W77-08084 7B

SANER, W. A.
Tar Ball Distribution in the Western North Atlantic,
W77-07757 5B

SARMANOV, I. O.
New Forms of Correlation Relationships Between Positive Quantities Applied in Hydrology,
W77-07659 2A

SATOMI, Y.
Hydrochemical Observation of the Ground Water for Trout Culture Around Hino-Town, Tokyo, (In Japanese),
W77-07709 5C

SAUER, E. K.
A Valley Crossing in Pleistocene Deposits,
W77-07778 8E

SAUNIER, B. M.
Kinetics of Breakpoint Chlorination and Disinfection,
W77-08095 5D

SAWICKI, J. E.
Method of Filtering Liquids Containing Dissolved Carbon Dioxide,
W77-08013 5D

SCHACH, H.
Die Kunstliche Aufzucht Von Clupea Harengus L., (The Artificial Propagation of Clupea Harengus L.),
W77-07711 5C

SCHAEFFER, D. J.
Relationship Between BOD5 and Fats, Oils and Grease,
W77-07925 5G

SCHERLER, A.
Method for Eliminating Organic and Inorganic Bound Nitrogen from Domestic and Industrial Waste Water,
W77-08099 5D

SCHEURING, L.
Ein Forellen Brutsterben Unter Eigenartigen Begleiterscheinungen (A Mortality of Trout Fry Caused by Unusual Circumstances),
W77-07717 5C

SCHIEBE, F. R.
Influence of Suspended Sediment on the Temperatures of Surface Waters of Reservoirs,
W77-07975 5C

SCHINDLER, D. W.
Whole-Lake Eutrophication Experiments with Phosphorus, Nitrogen and Carbon.
W77-07965 5C

SCHMUGGE, T.
Microwave Remote Sensing of Soil Moisture,
W77-08066 7B

SCHREIBER, J. E.
Study of Free Living Amoebae in the Waters of Strabourg: Preliminary Report, (In French),
W77-08016 5A

SCHULZE, W. D.
The Valuation of Aesthetic Preferences,
W77-08041 6G

SEESMAN, P. A.
Effect of South Louisiana Crude Oil and No. 2 Fuel Oil on Growth of Heterotrophic Microorganisms, Including Proteolytic, Lipolytic, Chitinolytic and Celluloytic Bacteria,
W77-07736 5C

SELIM, H. M.
Transport of Reactive Solutes Through Multilayered Soils,
W77-07758 2G

SELLIN, R. H. J.
Increasing Sewer Capacity by Polymer Dosing,
W77-07883 8G

SEMMENS, M. J.
Biological Regeneration of Ammonium-Saturated Clinoptilolite. I. Initial Observations,
W77-07942 5D

Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

SEXTON, J. R.
Problems Encountered in Synthetic River Flow Generation Procedures,
W77-07657 2A

SHABMAN, L. A.
Citizen Attitudes Toward Management of the Chesapeake Bay,
W77-07796 6B

SHANNON, E. E.
Review of Colour Removal Technology in the Pulp and Paper Industry,
W77-07734 5D

SHEARER, M. N.
Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

SHELLEY, P. E.
Sediment Measurement in Estuarine and Coastal Areas,
W77-07748 2L

SHERBERGER, F. F.
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

SHIH, C-Y.
Investigation of Dynamic Performance of Waste Water Treatment Plants,
W77-08094 5D

SHIMA, L.
Hydrologic Land Use Classification of the Patuxent River Watershed Using Remotely Sensed Data,
W77-08073 7B

SHIMADA, M.
Characteristics of the Severe Rainstorm,
W77-07784 2B

SHUBINSKI, R. P.
Appraisal of Areawide Waste Water Planning,
W77-07874 5G

SHUSTROV, V. S.
Determination of Morestan in Water, Soil, and Cucumbers by Thin-Layer Chromatography, (In Russian),
W77-07688 5A

SHUVAL, H. I.
Direct and Indirect Waste Water Reuse for Municipal Purposes,
W77-07866 5D

SIDORENKO, G. I.
Hygienic Criteria of the Complex Action of Chemical Environmental Pollutants, (In Russian),
W77-08029 5G

SIGMON, C. F.
Reductions in Biomass and Diversity Resulting from Exposure to Mercury in Artificial Streams,
W77-07838 5C

SIMONS, D. B.
Remote Sensing of Mississippi River Characteristics,
W77-08070 7B

SIMONSON, G. H.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Goose and Summer Lakes Drainage Basin, Appendix I-13,
W77-07618 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Klamath Drainage Basin, Appendix I-14,
W77-07619 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Rogue Drainage Basin, Appendix I-15,
W77-07620 2G

Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, Umpqua Drainage Basin, Appendix I-16,
W77-07621 2G

SINITSYNA, Z. L.
Migration of 90Sr with Runoff Waters from Soils, (In Russian),
W77-07971 5B

SKELTON, W. H. JR.
Study of In-Service Bituminized Fiber Sewer Pipe,
W77-07884 8G

SKINNER, M. M.
Remote Sensing of Mississippi River Characteristics,
W77-08070 7B

SMALL, S. S.
Joint Municipal Corporation Waste Water Treatment,
W77-07920 5D

SMALLWOOD, M. D.
Snow Survey from Space, with Emphasis on the Results of the Analysis of Skylab EREP S192 Multispectral Scanner Data,
W77-08082 7B

SMITH, C. G.
Saltwater-Freshwater Interfaces in the '2,000-' and '2,800-Foot' Sands in the Capital Area Ground Water Conservation District,
W77-07703 4B

SMITH, C. L.
Determination of the Leeway of Oil Slicks,
W77-07800 5B

SMITH, G.
The Effect of Organophosphorus Insecticides on Nerve Agent Detector Tickets,
W77-07824 5C

SMITH, L. S.
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

SNEED, R. E.
Optimization of Water Use for Irrigation,
W77-07851 3F

SNODGRASS, J. D.
Sewage Treatment Apparatus,
W77-07896 5D

SNYDER, G. R.
Effects of Gas Supersaturated Columbia River Water on the Survival of Juvenile Chinook and Coho Salmon,
W77-07708 5C

SNYDER, R.
Oregon's Long-Range Requirements for Water. Forest Products Projections and Recreation Projections, Appendices IV and V,
W77-07625 6D

SOBCZAK, L. W.
Ice Movements in the Beaufort Sea 1973-1975: Determination by ERTS Imagery,
W77-07769 2C

SOLOVJOVA, A. F.
Multidimensional Statistic Modelling of Hydrological Processes on the Basis of Structural Analysis of the Empirical Hydrographs of Runoff,
W77-07662 2A

SOSZKA, G. J.
The Invertebrates on Submerged Macrophytes in Three Masurian Lakes,
W77-07987 5C

SOWELL, R. S.
Optimization of Water Use for Irrigation,
W77-07851 3F

SPRY, D. J.
Evaluation of Erythrocyte delta amino Levulinic Acid Dehydratase as a Short-Term Indicator in Fish of a Harmful Exposure to Lead,
W77-07837 5C

SRINIVASAN, S.
Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

SRINIVASAN, S. K.
Emptiness of a Finite Dam--Time Dependent Theory,
W77-07683 8B

STAMBERG, K.
Method of Separation of Fission and Corrosion Products and of Corresponding Isotopes from Liquid Waste,
W77-08020 5D

STAMULIS, A.
A Method for Determining Oil in Water,
W77-07756 5A

STANESCU, V.
Statistical Analysis Applied to the Study of the Components of a Flood Wave,
W77-07674 2E

STAVSKAYA, S. S.
Degradation of Sodium Dodecylsulfate by Bacteria in Waste Waters, (In Russian),
W77-07801 5B

STEEL, P. H.
Bristol Regional Sewage Treatment Works--Past, Present and Future,
W77-07901 5D

STEIDTMANN, J. R.
Clastic Sedimentation in a Modern Alpine Lake,
W77-07791 2J

STEPHENSON, D. A.
Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

STOCK, T.
Relationship Between BOD5 and Fats, Oils and Grease,
W77-07925 5G

STOLZENBACH, K. D.
A Review and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks,
W77-07808 5B

STONES, T.
A Study on the Strength of Sewage,
W77-07853 5B

STRAUB, C. P.
Water Quality Status and Trends in Minnesota--Indices for Water Supply and Ground Water Pollution,
W77-07794 5A

STROUD, R.K.
Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

STUKENBERG, J. R.
Experiences in Evaluating and Specifying Aeration Equipment,
W77-07899 5D

SUBRAHMANYAM, D. V.
Community Water Supply and Excreta Disposal in the Developing Countries,
W77-07865 5G

SUBRAHMANYAN, T. P.
Examination of Sewage Sludge for Enteroviruses, Volume 2,
W77-07615 5B

SUHAYDA, J. N.
Observations of Wave Height and Wave Celerity in the Surf Zone,
W77-07770 2L

SUMAN, G. O. JR.
Cementing Oil and Gas Wells, Including Casing Handling Procedures: Part 1,
W77-07697 8F

SVANIDZE, G. G.
Mathematical Models of Runoff for the Computation of Storage Reservoirs,
W77-07685 4A

SVESHNIKOVA, E. V.
Experience of the Pavlodar Oblast Public Health Service in Sanitary Protection of the Irtysh River, (In Russian),
W77-07686 5G

SWARZENKI, W. V.
14C Evidence for the Origin of Arid Region Groundwater, Northeastern Province, Kenya,
W77-07611 7B

SWERED, P.
Composition and Method of Inhibiting Growth of Slime in Water,
W77-08027 5G

SYLVESTER, J. R.
Effects of Mirex and Methoxychlor on Striped Mullet, Mugil Cephalus L.,
W77-07825 5C

SZOLLOSI-NAGY, A.
Use of State Estimation Techniques in Water Resource System Modeling, by Dennis P. Lettenmaier and Stephen J. Burges,
W77-08035 5B

TABATABAI, M. A.
Effects of Trace Elements on Nitrogen Mineralization in Soils,
W77-07864 5B

TAH-SUN, L.
Mechanism for Tapping the Surf Energy,
W77-08026 8C

TANSONY, J. R.
Save Sludge Handling Costs by Level Control,
W77-07868 5D

TARANOVA, L. A.
Degradation of Sodium Dodecylsulfate by Bacteria in Waste Waters, (In Russian),
W77-07801 5B

TAZAKI, S.
Floating Breakwater,
W77-08009 8A

TEBBUTT, T. H. Y.
Studies on Adsorption with Activated Carbon,
W77-07855 5D

TESTA, J. E.
Sprinkler Adapted for Attachment to the Ground,
W77-08025 3F

THIRUMURTHI, D.
Biochemical and Physical-Chemical Treatment of Weak Municipal Waste Water,
W77-07916 5D

THOM, B. G.
Mangrove Ecology and Deltaic-Estuarine Geomorphology: Cambridge Gulf-Ord River, Western Australia,
W77-07738 2L

THOMAS, B. R.
Oregon's Long-Range Requirements for Water. General Soil Map Report with Irrigable Areas, North, Mid-, and South Coast Drainage Basins, Appendix I-17, and 18,
W77-07622 2G

THOMAS, T.
Influence of Environmental Factors on Selected Amelioration Techniques for Discharges of Hazardous Chemicals,
W77-07828 5G

THOME, K. N.
Limnologic-Geologic Excursion in the Territory of the Lower Erft River, (In German),
W77-07799 5B

THOMOPULOS, A. A.
The Development of Costs Recovery Scheme: Suggested Approaches for Municipal or Regional Waste Water Treatment Plants,
W77-08085 6C

THOMSEN, K. O.
Cycling of Dissolved Organic Phosphorus Compounds in Natural Waters,
W77-07608 5C

THURBERG, F. P.
Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
W77-07833 5C

TILSNER, F.
Industry Monitors County Storm Sewer Water,
W77-07933 5D

TINNEY, L. R.
Remote Sensing Inputs to Water Demand Modeling,
W77-08080 7B

Urban Land Use: Remote Sensing of Groundbasin Permeability,
W77-08065 7B

TITELBAUM, O. A.
Glossary of Water Resource Terms,
W77-07613 10C

TOEBES, G. H.
Operating Policy Adaptations for a Reservoir Systems, (Phase I),
W77-07603 4A

Operating Policy Simulation or a Reservoir Systems, (Phase II),
W77-07604 4A

TOETZ, D.
Effects of Chlorine and Chloramine on Uptake of Inorganic Nitrogen by Phytoplankton,
W77-07843 5C

TOMASINI, L. M.
A Note on the Fair Division of Pollution Rights,
W77-08006 6G

TOMES, B. J.
The Use of Skylab and LANDSAT in a Geohydrological Study of the Paleozoic Section, West-Central Bighorn Mountains, Wyoming,
W77-08063 7B

TOMKIEWICZ, S. M. JR.
Aquatic Insect Diversity and Biomass in a Stream Marginally Polluted by Acid Strip Mine Drainage,
W77-07846 5C

TORRELLA, F.
Optimal Growth Temperatures and Media Parameters of Bacterial Communities from Lakes of Different Trophic States,
W77-07994 5C

TRINEL, P. A.
Concentration of Bacteria in Water Using the Ultrafiltration Method, (In French),
W77-07860 5D

TROJNAR, J. R.
Egg Hatchability and Tolerance of Brook Trout (Salvelinus fontinalis) Fry at Low pH,
W77-07844 5C

ULABY, F. T.
Microwave Remote Sensing of Soil Moisture,
W77-08066 7B

VAN DE POL, R. M.
Solute Movement in a Field Soil,
W77-07759 2G

VAN DEMAN, J. M.
Optimization of Water Use for Irrigation,
W77-07851 3F

VAN LOON, J. C.
Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges, Volume 4, (Analytical Methods for Sewage Sludge Analysis),
W77-07614 5A

VAN WIJK, A. L. M.
An Integrated Model-Approach to the Effect of Water Management on Crop Yield,
W77-08038 3F

VARGA, L.
Effects of Chlorine and Chloramine on Uptake of Inorganic Nitrogen by Phytoplankton,
W77-07843 5C

VERSTRETE, V.
Heterotrophic Nitrification in Soils and Aquatic Environments, (In Russian),
W77-07754 5C

VISCUSI, W. K.
Environmental Policy Choice Under Uncertainty,
W77-08004 6G

VITBITSKAYA, B. R.
Experimental Data for the Hygienic Standardization of Diphenylamine and Diphenyldiethylurea in Water Bodies, (In Russian),
W77-07700 5G

VITTANDS, J. P.
Three Case Studies on the Application of the Storm Water Management Model,
W77-07955 5B

VOITENKO, A. M.
The Problem of the Sanitary Protection of the Waters of Ports and Coastal Zones of the Black Sea Basin, (In Russian),
W77-08014 5G

VOLL, M. J.
Mutagenic Potential of Petroleum Byproducts in Chesapeake Bay Waters,
W77-07606 5B

VONDER HAAR, S. P.
Flooding Frequence of Hypersaline Coastal Environments Determined by Orbital Imagery: Geologic Implications,
W77-07751 2L

WAGER, A. C.
Energy Exchange at a Glacier Surface: An Alternative to Aerodynamic Methods of Measurement,
W77-08053 2C

WAGGY, W. H.
1776-1976: Notes on Water Quality Planning,
W77-07938 5G

WAHBEH, V. N.
Experiences in Evaluating and Specifying Aeration Equipment,
W77-07899 5D

WALIN, G.
A Theoretical Framework for the Description of Estuaries,
W77-08057 2L

WALKER, J. D.
Degradation of Petroleum by an Alga, Prototheca Zopfii,
W77-07737 5C

Effect of South Louisiana Crude Oil and No. 2 Fuel Oil on Growth of Heterotrophic Microorganisms, Including Proteolytic, Lipolytic, Chitinolytic and Celluloytic Bacteria,
W77-07736 5C

Utilization of Mixed Hydrocarbon Substrate by Petroleum-Degrading Microorganisms,
W77-07749 5C

WALLACE, W. A.
A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

WALLIS, J. R.
In Hydrology h is a Household Word,
W77-07667 2A

WALSH, D. F.
Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

WANG, H.
Verification by Remote Sensing of an Oil Slick Movement Prediction Model,
W77-07745 5B

WANG, J. T.
Biological Regeneration of Ammonium-Saturated Clinoptilolite. II. Mechanism of Regeneration and Influence of Salt Concentration,
W77-07943 5D

WARREN, R. E.
Treating Urban Drainage as a Utility,
W77-07947 5G

WARRICK, A. W.
Predictions of the Soil Water Flux Based Upon Field-Measured Soil-Water Properties,
W77-07772 2G

WATSON, G. M.
Rum Jungle Environmental Studies, Summary Report,
W77-07822 5B

WEBER, E.
Model of a Lake Reservoir,
W77-07687 4A

WEBER, J. E.
Heat and Salt Transfer Associated with Formation of Sea-Ice,
W77-07786 2C

WEERTMAN, J.
Penetration Depth of Closely Spaced Water-Free Crevasses,
W77-08052 2C

WEISS, L. A.
Floodflow Formulas for Urbanized and Nonurbanized Areas of Connecticut,
W77-07612 4C

WELSH, J. P.
Preliminary Projections of Oil Spill Movement for Three Potential Deepwater Port Sites in the Gulf of Mexico,
W77-07753 5B

WESTMAN, J. R.
Preliminary Studies of Menhaden and Their Mass Mortalities in Long Island and New Jersey Waters,
W77-07724 5C

WHINSTON, A.
Implementation of a Decision Support for Regional Water Quality Planning,
W77-07812 6A

WHINSTON, A. B.
Aiding Decision Makers with a Generalized Data Base Management System: An Application to Inventory Management,
W77-07814 6A

A Decision Support System for Area-Wide Quality Planning,
W77-07810 6A

Extensions and Corrections for the CODASYL Approach to Data Base Management,
W77-07811 6A

Information Transferral within a Distributed Data Base Via a Generalized Mapping Language,
W77-07813 6A

Mathematical Programming within the Context of a Generalized Data Base Management System,
W77-07850 6A

Observations on a Generalized Intelligent Query Processor for Decision Support,
W77-07849 6A

WHITE, M. J. D.
Continuous Thickening of Biological Sludges, and the Influence of Stability,
W77-07923 5D

WHITLOCK, W. W. JR.
Analyzing Nitrates in Well Water,
W77-07690 5A

WICHMANN, P. A.
Open-Hole Porosity Logs Can Be Used in Cased Holes,
W77-07698 8G

WICKERSHAM, K.
A Land Use Decision Methodology for Environmental Control,
W77-07629 6G

WIEBE, A. H.
Notes on the Exposure of Several Species of Fish to Sudden Changes in the Hydrogen Ion Concentration of the Water and to an Atmosphere of Pure Oxygen,
W77-07725 5C

WIEBKING, R. D.
Optimal Engineering Design Under Uncertainty by Geometric Programming,
W77-08040 8C

WIERENGA, P. J.
Solute Movement in a Field Soil,
W77-07759 2G

WIESNET, D. R.
Factors Affecting Snow Assessment from LANDSAT Data,
W77-08083 7B

WILKINS, D. E.
A Technique to Index Soil Pores and Aggregates Larger than 20 Micrometers,
W77-08059 2G

WILLARDSON, L. S.
Model of Salt Flow in Soil with a Source-Sink Term,
W77-07761 2G

WILLEN, T.
Biological Long-Term Investigations of Swedish Lakes,
W77-07998 5C

WILLIAMS, S.
Analysis of IFYGL Rawinsonde Baseline Measurements,
W77-07790 2B

WILLIAMS, T. C.
Phosphorus is Removed at Low Cost,
W77-07915 5D

WILLIAMS, V.
Easier Identification with MPN Procedure,
W77-07928 5A

WILSON, D. O.
Nitrification in Soil Treated with Domestic and Industrial Sewage Sluge,
W77-07862 5E

WINKLEY, B. R.
Remote Sensing of Mississippi River Characteristics,
W77-08070 7B

WINTER, J.
Stochastic Analysis of Short-Time Rainfalls,
W77-07671 2B

WISE, R. H.
Waste Water Plants Use Less Instrumentation than Related Industries,
W77-07872 5D

WITHERSPOON, P. A.
Mechanical and Hydraulic Properties of Rocks Related to Induced Seismicity,
W77-07779 8E

WOLKE, R. E.
Gas-Bubble Disease: A Review in Relation to Modern Energy Production,
W77-07721 5C

WOOD, H. B.
Hydrologic Differences Between Selected Forested and Agricultural Soils in Hawaii,
W77-07765 2G

WRIGHT, L. D.
Mangrove Ecology and Deltaic-Estuarine Geomorphology: Cambridge Gulf-Ord River, Western Australia,
W77-07738 2L

WYATT, A. W.
The Application of Remote Sensing Technology to the Inventory of Playa Lakes in the High Plains of Texas,
W77-08077 7B

YAROSHENKO, N. A.
Degradation of Sodium Dodecylsulfate by Bacteria in Waste Waters, (In Russian),
W77-07801 5B

YASUDA, H.
Preparation of Composite Reverse Osmosis Membranes by Plasma Polymerization,
W77-07792 3A

YEVJEVICH, V.
Significance Tests of Periodicity in Hydrological Time Series,
W77-07665 2A

YORK, D. W.
Modeling Multiple-Use in Natural Areas: Part II - The Santee Swamp Study,
W77-08050 6A

YOUMANS, R. C.
Oregon's Long-Range Requirements for Water. Irrigation and Food Products Projections, Appendix II,
W77-07623 6D

YOUNG, J. C.
Two-Stage Filtration of Secondary Effluent,
W77-07907 5D

YUKHNENKO, S. G.
Degradation of Sodium Dodecylsulfate by Bacteria in Waste Waters, (In Russian),
W77-07801 5B

ZAFERATOS, T. M.
Evaluation of Alternate Solids Handling Methods for Advanced Waste Treatment,
W77-07902 5D

ZAKHAROVA, T. A.
Experimental Data for the Hygienic Standardization of Diphenylamine and Diphenyldiethylurea in Water Bodies, (In Russian),
W77-07700 5G

ZALEWSKI, M.
The Contribution of Autochthonous and Allochthonous Matter to the Trophy of a River in the Barbel Region,
W77-07986 5C

ZAWADSKI, E. A.
Method for Improving the Quality of Contaminated Waste Water,
W77-08090 5D

ZDANOWSKI, B.
The Influence of Mineral Fertilization on Phytoplankton Production in Lakes of Various Trophic Types,
W77-07988 5C

ZECKHAUSER, R.
Environmental Policy Choice Under Uncertainty,
W77-08004 6G

ZENER, C.
Method and Apparatus for Obtaining Electrical Power from Sea Water,
W77-08032 8C

ZHUK, V. A.
Spatial and Time Analysis and Estimation of River Flow,
W77-07654 2E

ZIKIC, M.
Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

ZIMMERMAN, A. P.
Electron Transport Analysis as an Indicator of Biological Oxidation in Freshwater Sediments,
W77-07992 5C

ZIMONJA, B.
Mathematical Modeling of Regional Water-Supply Systems in Yugoslavia,
W77-08033 4A

ZISNER, E.
Waste Water Renovation by Sewage Ultrafiltration,
W77-07941 5D

ZORIKI, T.
On the Relation of the Diatiom FLora and Water Quality in the Uji River Kyoto, (In Japanese),
W77-08089 5

ZSUFFA, I.
Some Arithmetical Relations of a Matrix for a Calculus of Reservoirs, (Quelques Relations Arithmetiques de Matrice dans le Calcul des Reservoirs),
W77-07682 4A

ORGANIZATIONAL INDEX

ABERDEEN UNIV. (SCOTLAND). DEPT. OF GEOGRAPHY.
A Snow-Bank Push Mechanism for the Formation of Some 'Annual' Moraine Ridges,
W77-08054 2C

ABWASSENTECHNISCHE VEREINIGUNG E. V., BONN (WEST GERMANY).
Improvement and Expansion of the Drainage System of Hamburg,
W77-07890 5D

AGRICULTURAL RESEARCH SERVICE, COLUMBIA, MO.
Gully Wall Stability in Loess-Derived Alluvium,
W77-07764 4D

AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF. SALINITY LAB.
Establishing Soil Electrical Conductivity-Salinity Calibrations Using Four-Electrode Cells Containing Undisturbed Soil Cores,
W77-07776 2G

AGRICULTURAL RESEARCH SERVICE, SALINAS, CALIF.
A Technique to Index Soil Pores and Aggregates Larger than 20 Micrometers,
W77-08059 2G

AKADEMIYA NAUK ESTONSKOI SSR, TARTU. INST. OF ZOOLOGY AND BOTANY.
Hydrochemistry of the Nigula Swamp, (In Estonian),
W77-07859 2H

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT VODNYKH PROBLEM.
New Forms of Correlation Relationships Between Positive Quantities Applied in Hydrology,
W77-07659 2A

A Statistical Filtration Model for the Inseepage of Melt Water into Frozen Ground,
W77-07672 2G

Finding Regularities in Long-Term Streamflow Fluctuations by Analysis of Hydrological Ensembles,
W77-07676 2E

AKADEMIYA NAUK SSSR, MOSCOW. SCIENTIFIC RESEARCH INST. OF ELECTROENERGETICS.
On Deterministic Components in Natural Streamflow,
W77-07658 2E

AKADEMIYA NAUK URSR, KIEV. INST. OF COLLOIDAL CHEMISTRY AND WATER.
Degradation of Sodium Dodecylsulfate by Bacteria in Waste Waters, (In Russian),
W77-07801 5B

AKADEMIYA NAUK URSR, KIEV. INSTYTUT HIDROBIOLOGII.
Apparatus for Prolonged Maintenance of Specific Gas Concentration in the Water of Experimental Aquaria,
W77-07841 7B

Effect of Salinity on the Fresh-Water Shrimp Dikerogammarus Haemobaphes (Eichwald) from the Mouth of the Dnepr,
W77-07848 5C

AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK. COMMITTEE ON WATER POLLUTION MANAGEMENT.
Plastic Sewer Pipe Materials.
W77-07931 8G

ARIZONA UNIV., TUCSON.
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W77-07772 2G

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W77-07680 2E

Objective Function and Constraints in Water Resources Systems,
W77-08046 6A

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Flood Plain Information: Thompsons Creek and Tributaries, Bryan, Texas,
W77-07634 4A

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W77-07635 4A

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Special Flood Hazard Report: Jersey Creek, Kansas City, Kansas.
W77-07636 4A

ARMY ENGINEER DISTRICT, NORFOLK, VA.
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W77-07637 4A

Flood Plain Information, North Anna River, Hanover County, Va.
W77-07638 4A

ARMY ENGINEER DISTRICT, OMAHA, NEBR.
Flood Plain Information, Cherry Creek-Cherry Creek Lake Through Franktown, Colorado.
W77-07639 4A

ARMY ENGINEER DISTRICT, PITTSBURGH, PA.
Flood Plain Information: Allegheny River, Warren County, Pennsylvania,
W77-07640 4A

Flood Plain Information: Allegheny River, Venango County, Pennsylvania,
W77-07641 4A

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W77-07718 5A

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Flood Plain Information: Northwest Stream Group, Stockton, California,
W77-07642 4A

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W77-07643 4A

ARMY ENGINEER DISTRICT, WALLA WALLA, WASH.
Passing Fish Through Hydraulic Turbines,
W77-07713 8I

ARMY ENGINEER DISTRICT, WALTHAM, MASS.
Flood Plain Information: Merrimack and Souhegan Rivers, Litchfield and Merrimack, New Hampshire.
W77-07645 4A

ARMY ENGINEER DISTRICT, WALTHAM, MASS. NEW ENGLAND DIV.
Flood Plain Information: Ipswich River, North Reading and Wilmington, Massachusetts,
W77-07644 4A

The Use of LANDSAT DCS and Imagery in Reservoir Management and Operation,
W77-08076 7B

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W77-07826 5A

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W77-08039 6C

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W77-07730 5C

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W77-07767 8B

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W77-07940 5D

BATTELLE COLUMBUS LABS., OHIO.
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W77-07828 5G

BAYERISCHE BIOLOGISCHE VERSUCHSANSTALT, MUNICH (WEST GERMANY).
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W77-07717 5C

BEATRICE FOODS CO., MOONACHIE, N.J. (ASSIGNEE).
Sprinkler Adapted for Attachment to the Ground,
W77-08025 3F

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BENHAM-BLAIR AND AFFILIATES, INC., OKLAHOMA CITY, OKLA.
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BETZ LAB., INC., TREVOSE, PA. (ASSIGNEE).
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W77-07855 5D

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W77-07899 5D

BLACK, CROW AND EIDSNESS, GAINESVILLE, FLA.
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W77-07875 5D

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W77-08014 5G

BOYLE ENGINEERING CORP., ORLANDO, FLA.
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W77-07861 5E

BRIDGESTONE TIRE CO., LTD., TOKYO (JAPAN). (ASSIGNEE).
Floating Breakwater,
W77-08009 8A

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W77-07883 8G

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W77-07919 5D

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W77-08064 7B

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W77-07803 8F

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W77-07804 8C

Residues of Emulsified Xylene in Aquatic Weed Control and Their Impact on Rainbow Trout, Salmo gairdneri,
W77-07805 5G

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W77-07806 5C

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W77-08030 5D

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W77-08078 7B

CALIFORNIA UNIV., BERKELEY.
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W77-08095 5D

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W77-08097 5D

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W77-08081 7B

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W77-08096 5D

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W77-07820 5C

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W77-07631 6B

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W77-08065 7B

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W77-08080 7B

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W77-07786 2C

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W77-08099 5D

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W77-07949 5G

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W77-07757 5B

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W77-08070 7B

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W77-08055 2C

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W77-07697 8F

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W77-07983 5C

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W77-07731 5G

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W77-07732 5B

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W77-07733 5C

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W77-07748 2L

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W77-08033 4A

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W77-08082 7B

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W77-07842 5C

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W77-07930 5D

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W77-08073 7B

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W77-07907 5D

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W77-07612 4C

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W77-07609 2K

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
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W77-07610 2A

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W77-07781 2A

Modeling Nonpoint Pollution from the Land Surface,
W77-07818 5B

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W77-07938 5G

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W77-07945 2A

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W77-07865 5G

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W77-07864 5B

ISRAEL DESALINATION ENGINEERING LTD., TEL AVIV.
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W77-07941 5D

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Microwave Remote Sensing of Soil Moisture,
W77-08066 7B

Soil Moisture Detection from Skylab,
W77-08067 7B

The Development of Costs Recovery Scheme: Suggested Approaches for Municipal or Regional Waste Water Treatment Plants,
W77-08085 6C

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Feeding of Forage Fish in Turbid Kansas Reservoirs,
W77-07817 2H

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W77-07816 5D

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W77-07601 8C

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W77-07950 5A

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W77-07849 6A

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W77-07810 6A

Extensions and Corrections for the CODASYL Approach to Data Base Management,
W77-07811 6A

Implementation of a Decision Support for Regional Water Quality Planning,
W77-07812 6A

Information Transferral within a Distributed Data Base Via a Generalized Mapping Language,
W77-07813 6A

Aiding Decision Makers with a Generalized Data Base Management System: An Application to Inventory Management,
W77-07814 6A

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W77-07799 5B

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W77-07742 5A

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W77-07936 5D

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W77-07703 4B

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W77-08012 5G

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W77-07868 5D

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W77-08074 7B

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W77-07606 5B

Effect of South Louisiana Crude Oil and No. 2 Fuel Oil on Growth of Heterotrophic Microorganisms, Including Proteolytic, Lipolytic, Chitinolytic and Celluloytic Bacteria,
W77-07736 5C

Degradation of Petroleum by an Alga, Prototheca Zopfii,
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Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. II. Uptake of Cadmium by Organs and Tissues,
W77-07832 5C

Physiological Response of the Cunner, Tautogolabrus adspersus, to Cadmium. III. Changes in Osmoregulation and Oxygen Consumption,
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W77-07834 5C

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W77-07695 4B

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W77-07724 5C

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W77-07760 2G

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W77-08058 2L

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W77-07617 2G

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W77-07619 2G

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W77-07620 2G

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W77-08016 5A

SYBRON CORP., ROCHESTER, N.Y. (ASSIGNEE).
Skimmer Apparatus for Sewage Settling Tanks and the Like,
W77-08088 5G

SYRACUSE UNIV. RESEARCH CORP., N.Y. LIFE SCIENCES DIV.
Benzene Sources of Contamination, Ambient Levels, and Fate of Benzene in the Environment,
W77-07819 5B

TBILISSKII GOSUDARSTVENNYI UNIVERSITET (USSR). DEPT. OF HYDROLOGY.
Mathematical Models of Runoff for the Computation of Storage Reservoirs,
W77-07685 4A

TECHNICAL UNIV. OF BUDAPEST (HUNGARY).
Stochastic Analysis of Short-Time Rainfalls,
W77-07671 2B

Application of Stochastic Hydrological Models in the Design of Lake Level Control,
W77-07681 4A

TECHNICAL UNIV. OF PRAGUE (CZECHOSLOVAKIA).
Multiple Markov Processes in Hydrology and Their Importance for Stochastic Analysis of Water Accumulation Problems,
W77-07684 4A

TECHNICAL UNIV. OF WARSAW (POLAND).
Stochastic Structure of a Process of Average Monthly Flows,
W77-07651 2E

TECHNICAL UNIV. OF WARSAW (POLAND). INST. OF ENVIRONMENTAL ENGINEERING.
Some Problems of Stochastic Storage with Correlated Inflow,
W77-07689 4A

TECHNION - ISRAEL INST. OF TECH., HAIFA. ENVIRONMENTAL ENGINEERING LABS.
Israel's Use of Nonionic Surfactants,
W77-07929 5B

TECHNION-ISRAEL INST. OF TECH., HAIFA. LOWDERMILK FACULTY OF AGRICULTURAL ENGINEERING.
Planning of Systems for Regional Development in Water Resources,
W77-08049 6A

TECHNISCHE UNIVERSITAET, BRUNSWICK (WEST GERMANY). LEICHTWEISS INST. FOR WATER RESEARCH.
Flood Frequency Studies of Rivers in the Federal Republic of Germany,
W77-07670 2E

TECHNISCHE UNIVERSITAET, DRESDEN (EAST GERMANY).
Investigations on the Structure of Frequency Distributions of Floods,
W77-07649 2E

TEESSIDE POLYTECHNIC, MIDDLESBROUGH (ENGLAND). DEPT. OF MATHEMATICS AND STATISTICS.
The Effect of Time Delay and Growth Rate Inhibition in the Bacterial Treatment of Waste Water,
W77-07924 5D

TEL AVIV UNIV. (ISRAEL). DEPT. OF ENVIRONMENTAL SCIENCES.
Determination of Salt-Water Interface by Electric Resistivity Depth Soundings,
W77-07783 2F

TENNESSEE UNIV., KNOXVILLE. DEPT. OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY.
Risk of Drinking Water Contamination in Rural Tennessee,
W77-07701 5G

TEXAS A AND M UNIV., COLLEGE STATION.
Remote Sensing Techniques for Prediction of Watershed Runoff,
W77-08075 7B

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF OCEANOGRAPHY.
The Errors Involved in Inferring Salinity from Sound Velocity,
W77-07774 2L

TEXAS UNIV. AT AUSTIN. CENTER FOR CYBERNETIC STUDIES.
A Goal Interval Programming Model for Resource Allocation in a Marine Environmental Protection Program,
W77-08042 6G

TEXAS UNIV., AUSTIN. DEPT. OF GEOLOGICAL SCIENCES.
Flood Hazard Studies in Central Texas Using Orbital and Suborbital Remote Sensing Imagery,
W77-08069 7B

TEXAS WATER DEVELOPMENT BOARD, AUSTIN.
The Application of Remote Sensing Technology to the Inventory of Playa Lakes in the High Plains of Texas,
W77-08077 7B

TOKYO AVIATION WEATHER SERVICE (JAPAN).
Characteristics of the Severe Rainstorm,
W77-07784 2B

TORONTO UNIV. (ONTARIO). DEPT. OF ZOOLOGY.
Gas Disease in Fishes - A Review,
W77-07727 5C

TORONTO UNIV. (ONTARIO). INST. OF ENVIRONMENTAL SCIENCES.
Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges, Volume 4, (Analytical Methods for Sewage Sludge Analysis),
W77-07614 5A

TULANE UNIV., NEW ORLEANS, LA.
Waste Water Treatment by Upflow Sand Filtration,
W77-08087 5D

UNION CARBIDE CORP., TONAWANDA, N.Y.
Autothermal Aerobic Digestion,
W77-07898 5D

UNIVERSITY OF SOUTH FLORIDA, TAMPA. DEPT. OF STRUCTURES, MATERIALS, FLUIDS.
Study of In-Service Bituminized Fiber Sewer Pipe,
W77-07884 8G

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. DEPT. OF GEOLOGICAL SCIENCES.
Flooding Frequence of Hypersaline Coastal Environments Determined by Orbital Imagery: Geologic Implications,
W77-07751 2L

UNTERNEHMENSBERATUNG SCHUMANN G.M.B.H., COLOGNE (WEST GERMANY).
Optimal Engineering Design Under Uncertainty by Geometric Programming,
W77-08040 8C

UTAH STATE UNIV., LOGAN. DEPT. OF SOIL SCIENCE.
Model of Salt Flow in Soil with a Source-Sink Term,
W77-07761 2G

UTAH WATER RESEARCH LAB., LOGAN.
Intermittent Sand Filtration for Upgrading Waste Stabilization Pond Effluents,
W77-07900 5D

VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
Development of the Turbidity Maximum in Rappahannock Estuary; Summary,
W77-07789 2L

Determination of the Leeway of Oil Slicks,
W77-07800 5B

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF AGRICULTURAL ECONOMICS.
Citizen Attitudes Toward Management of the Chesapeake Bay,
W77-07796 6B

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
High Gradient Magnetic Separation of Food Processing Wastewater,
W77-07852 5D

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. VA. DEPT. OF BIOLOGY.
Effects of Thermal Shocks on Drifting Aquatic Insects: A Laboratory Simulation,
W77-07839 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. VIRGINIA WATER RESOURCES RESEARCH CENTER.
Implementation of Non-Structural Alternatives in Flood Damage Abatement,
W77-07795 6F

VOLUNTEERS IN TECHNICAL ASSISTANCE, MT. RAINIER, MD.
Manuel Technique Du Village, (Village Technology Handbook), (Vols. 1 and 2).
W77-07628 3F

VSEROSSIISKII NAUCHNO-ISSLEDOVATELSKII INSTITUT ZASHCHITY RASTENII, RAMON (USSR). LAB. OF TOXICOLOGY.
Determination of Morestan in Water, Soil, and Cucumbers by Thin-Layer Chromatography, (In Russian),
W77-07688 5A

WACKER-CHEMIE G.M.B.H, MUNICH (WEST GERMANY). (ASSIGNEE).
Process for Eliminating Reactive Chlorinated Organic Compounds from Aqueous Solutions,
W77-08021 5D

WARSAW UNIV. (POLAND). DEPT. OF HYDROBIOLOGY.
The Invertebrates on Submerged Macrophytes in Three Masurian Lakes,
W77-07987 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF GEOLOGICAL SCIENCES; AND WASHINGTON UNIV., SEATTLE. QUATERNARY RESEARCH CENTER.
Present and Past Glaciation Threshold in the Cascade Range, Washington, U.S.A.: Topographic and Climatic Controls, and Paleoclimatic Implications,
W77-08056 2C

WASHINGTON UNIV., SEATTLE, DEPT. OF OCEANOGRAPHY.
An Experimental and Theoretical Study of the Turbulent and Laminar Convection Generated Under a Horizontal Ice Sheet Floating on Warm Salty Water,
W77-07773 2C

WASHINGTON UNIV., SEATTLE. FISHERIES RESEARCH INST.
Decompression - Induced Bubble Formation in Salmonids: Comparison to Gas Bubble Disease,
W77-07706 5C

WASSERWIRTSCHAFTSDIREKTION, HALLE, (EAST GERMANY).
Model of a Lake Reservoir,
W77-07687 4A

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
Continuous Thickening of Biological Sludges, and the Influence of Stability,
W77-07923 5D

WATER RESEARCH ASSOCIATION, MARLOW (ENGLAND).
Optimal Operation of Water Resources Systems--II,
W77-08048 4A

WATER RESOURCES BOARD, READING (ENGLAND).
Problems Encountered in Synthetic River Flow Generation Procedures,
W77-07657 2A

WATER RESOURCES CENTRE, BUDAPEST (HUNGARY).
Determination of the Degree of Protection Offered by Flood Control Systems on the Basis of Distribution Functions,
W77-07673 8B

WATER RESOURCES ENGINEERS, INC., SPRINGFIELD, VA.
Appraisal of Areawide Waste Water Planning,
W77-07874 5G

WELSH NATIONAL WATER DEVELOPMENT AUTHORITY, CARDIFF. DEE AND CLWYD SEWAGE DIV.
Drainage--Who Pays, Responsibilities After the 1973 Water Act,
W77-07932 5G

WENDELL AND SCHWAN, WASHINGTON, D.C.
Oregon's Long-Range Requirements for Water. Protection of Areas of Origin, Appendix VII,
W77-07627 6D

WESSEX WATER AUTHORITY, BRISTOL (ENGLAND). DEVELOPMENT AND PLANNING DIV.
Bristol Regional Sewage Treatment Works--Past, Present and Future,
W77-07901 5D

WEST VIRGINIA UNIV., MORGANTOWN.
Investigation of Acid Mine Drainage Effects on Reservoir Fishery Populations,
W77-07827 5C

WESTERN CO., CORPUS CHRISTI, TEX.
Slurry and Pumping Guidelines Smooth Casing-Cementing Jobs,
W77-07699 8F

WILLIAMS AND WORKS, GRAND RAPIDS, MICH.
Phosphorus is Removed at Low Cost,
W77-07915 5D

WISCONSIN DEPT. OF ADMINISTRATION, MADISON. STATE PLANNING OFFICE.
Environmental Geologic Aspects of Planning, Constructing, and Regulating Recreational Land Developments,
W77-07630 6G

WISCONSIN DEPT. OF NATURAL RESOURCES, MADISON.
Recreational Use of Small Streams in Wisconsin,
W77-08008 5G

WISCONSIN UNIV., MADISON.
Application of Thermal Scanning to the Study of Transverse Mixing in Rivers,
W77-08071 5B

Investigation of Dynamic Performance of Waste Water Treatment Plants,
W77-08094 5D

WISCONSIN UNIV., MADISON. DEPT. OF CIVIL ENGINEERING.
Water Resources and Water-Supply Development in Trinidad and Tobago,
W77-07785 6D

WISCONSIN UNIV. MADISON. DEPT. OF GEOLOGY AND GEOPHYSICS.
Electrical Resistivity Measurements on the Ross Ice Shelf,
W77-08051 2C

WISCONSIN UNIV., MADISON. DEPT. OF RURAL SOCIOLOGY.
Local Control of Land Use: Profile of a Problem,
W77-08003 6F

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
The Scaling of Velocity Fluctuations in the Surface Mixed Layer,
W77-07768 2I

WYOMING UNIV., LARAMIE. DEPT. OF ECONOMICS.
The Valuation of Aesthetic Preferences,
W77-08041 6C

WYOMING UNIV., LARAMIE, DEPT. OF GEOLOGY.
Clastic Sedimentation in a Modern Alpine Lake,
W77-07791 2

The Use of Skylab and LANDSAT in a Geohydrological Study of the Paleozoic Section, West-Central Bighorn Mountains, Wyoming,
W77-08063 7I

YANKEE ATOMIC ELECTRIC CO., WESTBOROUGH MASS. ENVIRONMENTAL SCIENCES GROUP.
An Analysis of the Feasibility of Using Air Agitation to Reduce Gas Saturations in Sea Water at Pilgrim Nuclear Power Station, W77-07720 5G

ACCESSION NUMBER INDEX

W77-07601 8C
W77-07602 6E
W77-07603 4A
W77-07604 4A
W77-07605 5A
W77-07606 5B
W77-07607 5D
W77-07608 5C
W77-07609 2K
W77-07610 2A
W77-07611 7B
W77-07612 4C
W77-07613 10C
W77-07614 5A
W77-07615 5B
W77-07616 5A
W77-07617 2G
W77-07618 2G
W77-07619 2G
W77-07620 2G
W77-07621 2G
W77-07622 2G
W77-07623 6D
W77-07624 6D
W77-07625 6D
W77-07626 5G
W77-07627 6D
W77-07628 3F
W77-07629 6G
W77-07630 6G
W77-07631 6B
W77-07632 6F
W77-07633 6G
W77-07634 4A
W77-07635 4A
W77-07636 4A
W77-07637 4A
W77-07638 4A
W77-07639 4A
W77-07640 4A
W77-07641 4A
W77-07642 4A
W77-07643 4A
W77-07644 4A
W77-07645 4A
W77-07646 2
W77-07647 2A
W77-07648 2E
W77-07649 2E
W77-07650 2E
W77-07651 2E
W77-07652 2E
W77-07653 2E
W77-07654 2E
W77-07655 2E
W77-07656 2E
W77-07657 2A
W77-07658 2E
W77-07659 2A
W77-07660 2A
W77-07661 2A
W77-07662 2A
W77-07663 2E
W77-07664 2A
W77-07665 2A
W77-07666 2E
W77-07667 2A
W77-07668 2A
W77-07669 2E
W77-07670 2E
W77-07671 2B
W77-07672 2G
W77-07673 8B
W77-07674 2E
W77-07675 2E
W77-07676 2E
W77-07677 4D
W77-07678 2C
W77-07679 2F
W77-07680 2E
W77-07681 4A
W77-07682 4A
W77-07683 8B
W77-07684 4A
W77-07685 4A
W77-07686 5G
W77-07687 4A
W77-07688 5A
W77-07689 4A
W77-07690 5A
W77-07691 5B
W77-07692 8C
W77-07693 8C
W77-07694 8C
W77-07695 4B
W77-07696 8B
W77-07697 8F
W77-07698 8G
W77-07699 8F
W77-07700 5G
W77-07701 5G
W77-07702 5G
W77-07703 4B
W77-07704 8C
W77-07705 4D
W77-07706 5C
W77-07707 5C
W77-07708 5C
W77-07709 5C
W77-07710 5A
W77-07711 5C
W77-07712 5C
W77-07713 8I
W77-07714 5C
W77-07715 5C
W77-07716 5C
W77-07717 5C
W77-07718 5A
W77-07719 5A
W77-07720 5G
W77-07721 5C
W77-07722 5B
W77-07723 5C
W77-07724 5C
W77-07725 5C
W77-07726 5G
W77-07727 5C
W77-07728 5C
W77-07729 5C
W77-07730 5C
W77-07731 5G
W77-07732 5B
W77-07733 5C
W77-07734 5D
W77-07735 5C
W77-07736 5C
W77-07737 5C
W77-07738 2L
W77-07739 5E
W77-07740 5B
W77-07741 5G
W77-07742 5A
W77-07743 2L
W77-07744 2L
W77-07745 5B
W77-07746 5C
W77-07747 5E
W77-07748 2L
W77-07749 5C
W77-07750 5A
W77-07751 2L
W77-07752 5C
W77-07753 5B
W77-07754 5C
W77-07755 5C
W77-07756 5A
W77-07757 5B
W77-07758 2G
W77-07759 2G
W77-07760 2G
W77-07761 2G
W77-07762 2G
W77-07763 2G
W77-07764 4D
W77-07765 2G
W77-07766 2J
W77-07767 8B
W77-07768 2L
W77-07769 2C
W77-07770 2L
W77-07771 2L
W77-07772 2G
W77-07773 2C
W77-07774 2L
W77-07775 2L
W77-07776 2G
W77-07777 2G
W77-07778 8E
W77-07779 8E
W77-07780 2D
W77-07781 2A
W77-07782 2E
W77-07783 2F
W77-07784 2B
W77-07785 6D
W77-07786 2C
W77-07787 5A
W77-07788 4D
W77-07789 2L
W77-07790 2B
W77-07791 2J
W77-07792 3A
W77-07793 4B
W77-07794 5A
W77-07795 6F
W77-07796 6B
W77-07797 4D
W77-07798 2L
W77-07799 5B
W77-07800 5B
W77-07801 5B
W77-07802 2K
W77-07803 8F
W77-07804 8C
W77-07805 5G
W77-07806 5C
W77-07807 5C
W77-07808 5B
W77-07809 8B
W77-07810 6A
W77-07811 6A
W77-07812 6A
W77-07813 6A
W77-07814 6A
W77-07815 5D
W77-07816 5D
W77-07817 2H
W77-07818 5B
W77-07819 5B
W77-07820 5C
W77-07821 5C
W77-07822 5B
W77-07823 5B
W77-07824 5C
W77-07825 5C
W77-07826 5A
W77-07827 5C
W77-07828 5G
W77-07829 5C
W77-07830 5C
W77-07831 5C
W77-07832 5C
W77-07833 5C
W77-07834 5C
W77-07835 5C
W77-07836 5C
W77-07837 5C
W77-07838 5C
W77-07839 5C
W77-07840 5C
W77-07841 7B
W77-07842 5C
W77-07843 5C
W77-07844 5C
W77-07845 5C
W77-07846 5C
W77-07847 5C
W77-07848 5C
W77-07849 6A
W77-07850 6A
W77-07851 3F
W77-07852 5D
W77-07853 5B
W77-07854 5D
W77-07855 5D
W77-07856 5D
W77-07857 5D
W77-07858 5B
W77-07859 2H
W77-07860 5D
W77-07861 5E
W77-07862 5E
W77-07863 5G
W77-07864 5B
W77-07865 5G
W77-07866 5D
W77-07867 5D
W77-07868 5D
W77-07869 5E
W77-07870 5E
W77-07871 5E
W77-07872 5D
W77-07873 5G
W77-07874 5G
W77-07875 5D
W77-07876 5E
W77-07877 5G
W77-07878 5G
W77-07879 8F
W77-07880 5A
W77-07881 5F
W77-07882 5D
W77-07883 8G
W77-07884 8G
W77-07885 8F
W77-07886 8G
W77-07887 8G
W77-07888 8B
W77-07889 5E
W77-07890 5D
W77-07891 5D
W77-07892 5D
W77-07893 5D
W77-07894 5D
W77-07895 5D
W77-07896 5D
W77-07897 5D
W77-07898 5D
W77-07899 5D
W77-07900 5D
W77-07901 5D
W77-07902 5D
W77-07903 5D
W77-07904 5D
W77-07905 5D
W77-07906 5D
W77-07907 5D
W77-07908 5D
W77-07909 5A
W77-07910 5D
W77-07911 5E
W77-07912 5D

W77-07913	5G
W77-07914	5D
W77-07915	5D
W77-07916	5D
W77-07917	5D
W77-07918	5D
W77-07919	5D
W77-07920	5D
W77-07921	5D
W77-07922	5D
W77-07923	5D
W77-07924	5D
W77-07925	5G
W77-07926	5D
W77-07927	5D
W77-07928	5A
W77-07929	5B
W77-07930	5D
W77-07931	8G
W77-07932	5G
W77-07933	5D
W77-07934	5D
W77-07935	8G
W77-07936	5D
W77-07937	5D
W77-07938	5G
W77-07939	5G
W77-07940	5D
W77-07941	5D
W77-07942	5D
W77-07943	5D
W77-07944	5D
W77-07945	2A
W77-07946	5G
W77-07947	5G
W77-07948	5E
W77-07949	5G
W77-07950	5A
W77-07951	5G
W77-07952	5D
W77-07953	5D
W77-07954	5D
W77-07955	5B
W77-07956	1A
W77-07957	1A
W77-07958	1A
W77-07959	1A
W77-07960	1A
W77-07961	1A
W77-07962	5C
W77-07963	5C
W77-07964	4A
W77-07965	5C
W77-07966	5A
W77-07967	5C
W77-07968	5C
W77-07969	5C
W77-07970	1A
W77-07971	5B
W77-07972	5C
W77-07973	5C
W77-07974	5C
W77-07975	5C
W77-07976	5C
W77-07977	5C
W77-07978	5C
W77-07979	5C
W77-07980	2J
W77-07981	2J
W77-07982	5B
W77-07983	5C
W77-07984	2H
W77-07985	5C
W77-07986	5C
W77-07987	5C
W77-07988	5C
W77-07989	5C
W77-07990	5C
W77-07991	5C
W77-07992	5C
W77-07993	5C
W77-07994	5C
W77-07995	5C
W77-07996	5C
W77-07997	5A
W77-07998	5C
W77-07999	5C
W77-08000	5B
W77-08001	5C
W77-08002	5C
W77-08003	6F
W77-08004	6G
W77-08005	6G
W77-08006	6G
W77-08007	6B
W77-08008	5G
W77-08009	8A
W77-08010	7B
W77-08011	5G
W77-08012	5G
W77-08013	5D
W77-08014	5G
W77-08015	5G
W77-08016	5A
W77-08017	3F
W77-08018	3F
W77-08019	3F
W77-08020	5D
W77-08021	5D
W77-08022	8C
W77-08023	8C
W77-08024	7B
W77-08025	3F
W77-08026	8C
W77-08027	5G
W77-08028	5B
W77-08029	5G
W77-08030	5D
W77-08031	5D
W77-08032	8C
W77-08033	4A
W77-08034	6G
W77-08035	5B
W77-08036	5D
W77-08037	5D
W77-08038	3F
W77-08039	6C
W77-08040	8C
W77-08041	6G
W77-08042	6G
W77-08043	5C
W77-08044	5C
W77-08045	5G
W77-08046	6A
W77-08047	4A
W77-08048	4A
W77-08049	6A
W77-08050	6A
W77-08051	2C
W77-08052	2C
W77-08053	2C
W77-08054	2C
W77-08055	2C
W77-08056	2C
W77-08057	2L
W77-08058	2L
W77-08059	2G
W77-08060	5A
W77-08061	2B
W77-08062	7B
W77-08063	7B
W77-08064	7B
W77-08065	7B
W77-08066	7B
W77-08067	7B
W77-08068	7B
W77-08069	7B
W77-08070	7B
W77-08071	5B
W77-08072	5A
W77-08073	7B
W77-08074	7B
W77-08075	7B
W77-08076	7B
W77-08077	7B
W77-08078	7B
W77-08079	7B
W77-08080	7B
W77-08081	7B
W77-08082	7B
W77-08083	7B
W77-08084	7B
W77-08085	6C
W77-08086	4B
W77-08087	5D
W77-08088	5G
W77-08089	5
W77-08090	5D
W77-08091	5E
W77-08092	5D
W77-08093	4D
W77-08094	5D
W77-08095	5D
W77-08096	5D
W77-08097	5D
W77-08098	5E
W77-08099	5D
W77-08100	5D

ABSTRACT SOURCES

OURCE	ACCESSION NUMBER	TOTAL
. CENTERS OF COMPETENCE		
Cornell University, Policy Models for Water Resources Systems	W77-07681--07685 07687, 07689 08033--08042 08045--08050	23
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W77-07853--07857 07861--07949 07951--07955 08085--08088 08090--08100	114
Illinois State Water Survey, Hydrology	W77-07646--07680 07758--07791 08051--08084	103
National Water Well Association, Water Well Construction Technology	W77-07690--07699 07701--07704	14
University of North Carolina, Metropolitan Water Resources Planning and Management	W77-07617--07645	29
University of Wisconsin, Eutrophication	W77-07962--07965 07967--07970 07972--07981 07983--08002	38
University of Wisconsin, Water Resources Economics	W77-08003--08008	6
. STATE WATER RESOURCES RESEARCH INSTITUTES	W77-07606--07608 07705 07793--07798 07809--07817 07849--07852	23
. OTHER		31
BioSciences Information Service	W77-07686, 07688 07700, 07728 07730, 07735 07746	25

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER (CONTINUED)		
BioSciences Information Service	07754--07755 07799, 07801 07858--07860 07950, 07966 07971, 07982 08014, 08016 08028--08029 08043--08044 08089	
Bureau of Reclamation	W77-07803--07806	
Environmental Information Services, Inc. (Gas Bubble Disease)	W77-07706--07727 07729	2
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W77-07818--07829 07831--07848	3
Environment Canada (WATDOC)	W77-07614--07616 07731--07734	
National Oceanic and Atmospheric Administration	W77-07807--07808 07830 07956--07961	
Ocean Engineering Information Service (Patents)	W77-08009--08013 08015 08017--08027 08030--08032	2
Ocean Engineering Information Service (Outer Continental Shelf)	W77-07736--07745 07747--07753 07756--07757 07800, 07802	1
Office of Water Research and Technology	W77-07601--07605 07792	
U. S. Geological Survey	W77-07609--07612	

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.

- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
- WATER RESOURCES PLANNING
- RESOURCES DATA
- ENGINEERING WORKS
- MANPOWER, GRANTS, AND FACILITIES
- SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

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A17	10.75	E17	40.00	T17	850.00
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VOLUME 10, NUMBER 17
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 17
SEPTEMBER 1, 1977

W77-08101 -- W77-08600

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

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Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
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CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

MEASUREMENT OF THE ATTENUATION OF ELECTROMAGNETIC RADIATION BY WATER IN THE VISIBLE REGION OF THE SPECTRUM,
Missouri Univ., Kansas City. Dept. of Physics.
P. G. Cary.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 916, Price codes: A05 in paper copy, A01 in microfiche. M.S. Degree, 1976. 69 p, 6 fig, 2 tab, 16 ref. OWRT A-091-MO(1), 14-34-0001-6026.

Descriptors: Attenuation, Measurement, *Electromagnetic waves, *Radiation, *Absorption, Methodology, Analytical techniques, Water properties.
Identifiers: *Attenuation coefficient(Water), Wave length region(418-640 nm).

The attenuation coefficient of water was measured for the 418-640nm wave-length region of the electromagnetic spectrum. The extinction coefficient of water was calculated from the attenuation coefficient. The use of a 5.Om long sample cell and a 0.25m long reference cell provided an attenuation path length of approximately 9.5m. A wavelength tuneable organic dye laser provided a source of quasimonochromatic electromagnetic radiation. The results were displayed graphically, tabulated, and compared to values reported by previous investigators. (Waring-Missouri)
W77-08293

2. WATER CYCLE

2A. General

ON THE RELATIONSHIP BETWEEN THE FINITE ELEMENT AND FINITE DIFFERENCE METHODS,
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 7A.
W77-08168

APPLICATION OF THREE DAILY-RAINFALL RUNOFF MODELS TO FOUR AUSTRALIAN CATCHMENTS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
I. D. Moore, and R. G. Mein.
Research Report 3/76, May 1976. 48 p, 15 fig, 18 tab, 17 ref.

Descriptors: *Hydrology, *Australia, *Rainfall-runoff relationships, *Model studies, Streamflow, *Computer models, Synthesis, Watersheds(Basins), Surface runoff.
Identifiers: *Monash Model, *Boughton Model, *Stanford Watershed Model.

Three mathematical rainfall-runoff models, the Boughton Model, the Monash Model, and the Stanford Watershed Model, were applied to four rural catchments in Australia. The models were comparatively evaluated based on their data requirements, their computer processor time, their ability to predict streamflow, and the effort required by an independent user to achieve competence with the models. A split record technique was employed to calibrate and test the models. No one model performed better than any of the others in all cases. Results showed that the Monash and Stanford Models performed about equally well for daily flow prediction, and that all three gave comparable results for monthly flow prediction. Although the Boughton Model was inferior in predicting the daily flows, it had the advantage in that its data requirements were the most easily satisfied. It required less computer processor time, nd, in addition, it was conceptually the simplest model and was the easiest to operate. Although the Monash and Stanford Models were comparable in many respects, the routing routine in the Monash Model and the groundwater discharge routine in the Stanford Model appeared superior to the corresponding routines in the other models. Results also indicated the limitations of using daily inpuut data and models operating on daily time increments to predict daily streamflow. (Jones-ISWS)
W77-08218

LOW FLOW ANALYSES OF STREAMS: DETAILS OF COMPUTATIONAL PROCEDURES AND ANNOTATED BIBLIOGRAPHY,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-08219

A NEW CLIMATIC MODEL FOR GLACIER BEHAVIOR OF THE AUSTRIAN ALPS,
Rider Coll., Trenton, N.J. Dept. of Geosciences.
For primary bibliographic entry see Field 2C.
W77-08235

REGIONAL SIMULATION OF STREAMFLOW DATA,
North Carolina Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
E. H. Wiser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 910, Price codes: A03 in paper copy, A01 in microfiche. Paper presented at ASAE Meeting, University of Nebraska, Lincoln, Nebraska, June 27-30, 1976. 38 p, 6 fig, 1 tab. OWRT B-064-NC(1), 14-31-0001-4112.

Descriptors: *Streamflow forecasting, *Computer models, *Computer programs, *Simulation analysis, Rainfall, Streamflow, River basins, Drainage basins, Model studies.
Identifiers: *Watershed models, Hydrologic Information Storage and Retrieval System(HISARS), Streamflow Synthesis and Reservoir Regulation(SSARR).

The North Carolina Streamflow Synthesis and Reservoir Regulation (NCSSARR) system was tested first in the Neuse River basin. Calibration runs were made on two watersheds, one in the Piedmont and the other in the Coastal Plain. On the basis of the parameter values thus obtained, parameters were estimated for all other subbasins, and simulation results obtained for a 25-year period at 123 points in the basin. Results were compared with measured flows at 16 gaging stations. The tests showed that the quantity of the flow was reliable, and the monthly totals agreed quite well, but timing of the flow was causing some problems and low flow estimates were too low to be useful. Watersheds with topographic conditions intermediate between the Piedmont and Coastal Plain also caused some problems. Potential applications of the system are considerable. It will be possible to estimate streamflow into the estuaries; to estimate streamflow at a point where a sewage treatment plant is proposed; to estimate the effect of interbasin transfers of water such as the proposed diversion of water from the Roanoke River to Norfolk; to determine the effect of alternate reservoir operating policies on downstream flow. (See also W76-12250) (Stewart-NC State)
W77-08298

DETERMINING AREAL PRECIPITATION IN THE BASIN AND RANGE PROVINCE OF SOUTHERN ARIZONA - SONOITA CREEK BASIN,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2B.
W77-08308

THE EFFECTS OF URBANIZATION ON LOW FLOWS AND TOTAL RUNOFF,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
R. W. Shanks, and A. R. Rao.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 046, Price codes: A06 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center, Lafayette Technical Report No. 94, May 1977, 101 p., 14 fig, 17 tab, 16 ref. OWRT C-6106(No. 5213) (1).

Descriptors: *Rainfall-Runoff relationships, *Urban runoff, *Urban hydrology, Storm runoff, Urban drainage, *Urbanization, *Low flow, Mass curves, Flow duration, Stream flow, Stream flow forecasting, Rainfall.
Identifiers: Linearized Model, 7-Day Low Flow, 1-Day Low Flow.

The objective was to investigate the effects of urbanization on the low flow and total runoff characteristics of streams. The data used in the analysis included the 1 and 7-day flows and total annual runoff sequences from six urban streams located throughout the United States. The observed flow sequences were analyzed by using mass curve analysis in order to determine the time at which changes in the flow sequence patterns took place. The year in which these changes became evident was then used to separate the flows into two groups. The period before the year of change represented the flows unaffected by the urbanization process. The period after the year of change represented the affected flows. In an attempt to explain these changes in the observed flow sequences, rainfall data were examined by similar mass curve methods. The rainfall characteristics remained approximatley the same through the periods of record. The rainfall-runoff relationships for each water shed were analyzed in order to determine the extent of the changes in the total annual runoff. The analysis was accomplished by linearizing the rainfall-runoff relationships by the transformation technique developed by Box and Cox. The slopes of the relationships for the unaffected and affected periods were compared to determine the magnitude of the changes which had taken place. Models of only the observed flows were also developed and analyzed.
W77-08335

2B. Precipitation

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR NEW ORLEANS, LOUISIANA (LAKE PONTCHARTRAIN, LOUISIANA, AND VICINITY HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 8D.
W77-08165

RAINFALL INFILTRATION CHARACTERISTICS FOR A SEMI-ARID WATERSHED SOIL,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2G.
W77-08206

APPLICATION OF THREE DAILY-RAINFALL RUNOFF MODELS TO FOUR AUSTRALIAN CATCHMENTS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-08218

THE AFGWC SNOW COVER ANALYSIS MODEL,
Air Force Global Weather Central, Offutt AFB, Nebr.
For primary bibliographic entry see Field 2C.
W77-08223

NITROGEN AND PHOSPHORUS ANALYSES OF RAINFALL AT ROTORUA, NEW ZEALAND,
Marine Dept., Rotorua (New Zealand). Fisheries Research Div.
For primary bibliographic entry see Field 5A.
W77-08242

THE FALLOUT OF NITROGEN AND PHOSPHORUS COMPOUNDS FROM THE ATMOSPHERE AT NGAPUNA, NEAR ROTORUA, NEW ZEALAND,
Marine Dept., Rotorua (New Zealand). Fisheries Research Div.
For primary bibliographic entry see Field 5A.
W77-08243

FLASH FLOODS IN THE WESTERN MEDITERRANEAN (LES CRUES CATASTROPHIQUES SUR LA MEDITERRANEE OCCIDENTALE),
Servicio Meteorologico Nacional, Madrid (Spain).
For primary bibliographic entry see Field 2E.
W77-08245

FLASH FLOODS IN SPAIN (LES CRUES BRUTALES EN ESPAGNE),
Consejo Superior di Investigaciones Cientificas, Madrid (Spain). Instituto de Hidrologia.
For primary bibliographic entry see Field 2E.
W77-08247

DETERMINING AREAL PRECIPITATION IN THE BASIN AND RANGE PROVINCE OF SOUTHERN ARIZONA - SONOITA CREEK BASIN,
Arizona Water Resources Research Center, Tucson.
J. Ben-Asher, J. Randall, and S. Resnick.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1976 meetings of the Amer. Water Resources Association, Arizona Section, and the Ariz. Academy of Science, Hydrology Section, Tucson, AZ., 4/28-5/1/76. 7 p, 6 fig, 5 ref. OWRT A-069-ARIZ(1), 14-34-0001-6003.

Descriptors: *Isohyets, Areal, *Precipitation(Atmospheric), *Arizona, *Simulated rainfall, Simulation analysis, Maps, Seasonal, Model studies.
Identifiers: *Areal precipitation, Four point interpolation, *Sonoita Creek basin(Ariz).

A linear relationship between point precipitation and elevation in conjunction with a computer four-point interpolation technique was used to simulate areal rainfall over Sonoita Creek Basin, Arizona. The simulation's sensitivity and accuracy were checked against the official isohyetal map of Arizona (1965) by changing the density of the interpolation nodes. The simulation was in good agreement with the official map. The average areal-rainfall was calculated by integration. Cumulative rainfall amounts were assumed to be stochastically independent from one season to another. The seasonal precipitations of forty years (1932-1972) were subdivided into five groups to check for binomial distribution. The binomial model fits the historical data adequately. The binomial model for cumulative seasonal areal-precipitation provides one way to compute the return period. This information will be necessary for decision-makers and hydrologists to predict the area's future water balance.
W77-08308

A NOTE ON THE STUDY OF RAINY DAYS AND WET SPELLS AT BIJAPUR,
University of Agricultural Sciences, Bangalore (India).
B. V. Rao Ramana, P. S. Kavi, and P. C. Sridharan.
Annals of Arid Zone, Vol 14, No 4, p 371-372, December, 1975.

Descriptors: *Frequency analysis, *Monsoons, *Wet seasons, *Rainfall, *Climatic data, Rain, Precipitation(Atmospheric), Meteorology, Meteorological data, Weather patterns, Thunderstorms, Storm, Probability.
Identifiers: *India(Bijapur).

Bijapur, located in the Indian state of Karnataka, has an annual rainfall of about 59 centimeters received mainly during the months April to December. The daily rainfall data collected at Bijapur for all years from 1921 to 1970 were analyzed to study the distribution of rainy days and wet spells during these months. The frequencies of wet spells of different lengths are estimated monthwise using logarithmic series and the results are discussed. It was found that the southwest monsoon rains persist more in the month of September. Although the probability of occurrence of a rainy day is less during November than in the months of April and May, the persistency is more in November than in April and May. (Jamail-Arizona)
W77-08455

2C. Snow, Ice, and Frost

THE AFGWC SNOW COVER ANALYSIS MODEL,
Air Force Global Weather Central, Offutt AFB, Nebr.
S. A. Luces, S. J. Hall, and J. D. Martens.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 942, Price codes: A03 in paper copy, A01 in microfiche. Report AFGWCTM 75-1, June 1975. 22 p, 1 tab, 12 ref, 3 append.

Descriptors: *Snow cover, *Mathematical models, *Computer programs, Analytical techniques, Numerical analysis, Weather data, Remote sensing, Satellites(Artificial), Snow, Sea ice, Climatology, Data collections, Climatic data, Computers, Weather, Model studies, Meteorology.
Identifiers: *Snow cover analysis.

This report documented the Air Force Global Weather Central (AFGWC) Automated Snow Cover Analysis Model. It described the data input, analysis procedures, problems, possible improvements, and potential uses of the model. The hemispheric model became operational in March 1975. It uses hourly surface synoptic data, meteorological satellite video brightness data, and climatological data to determine the depth and age of snow on the ground on a hemispheric grid with 25 nautical miles spacing. The resulting daily analyses provide a Northern Hemisphere data base which is stored on high speed computers and is available for many meteorological and other scientific applications. (Sims-ISWS)
W77-08223

VERTICAL STRAIN-RATE MEASUREMENTS IN AN ARCTIC ICE CAP AND DEDUCTIONS FROM THEM,
Department of Energy, Mines, and Resources, Ottawa (Ontario). Polar Continental Shelf Project.
W. S. B. Paterson.
Journal of Glaciology, Vol. 17, No. 75, p 3-12, 1976. 4 fig, 1 tab, 22 ref.

Descriptors: *Ice, *Strain measurement, *On-site tests, *Glaciology, *Arctic, Strain, Velocity, Movement, Measurement, On-site investigations, Rheology, Dating, Analytical techniques, Analysis, Mechanical properties.
Identifiers: *Devon Island Ice Cap(Canada), Ice cap.

Closely spaced measurements of diameter of thermally drilled boreholes revealed a pattern of small variations. The patterns served to identify points on the borehole wall; thus the change in length of sections of borehole can be determined as a function of time. The method was used to measure vertical strain-rate as a function of depth in two boreholes near the crest of the Devon Island ice cap. The measured strain-rate, corrected for firn compaction, varied significantly with depth. The vertical component of velocity at the surface was determined from the contraction rate of a borehole that penetrated to the base of the ice. Comparison of this velocity with the present accumulation rate suggested that the ice cap, in the vicinity of the bore-hole, is thickening slightly at present. The age of the ice at various depths, as calculated from the measured vertical velocities, is in broad agreement with radiocarbon dates covering the past 6000 years, which suggests that the flow of the ice cap has not varied significantly over this period. Thus the present accumulation rate, which is causing thickening, must be slightly above the average for the period. (Humphreys-ISWS)
W77-08226

RESURVEY OF THE 'BYRD' STATION, ANTARCTICA, DRILL HOLE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. E. Garfield, and H. T. Ueda.
Journal of Glaciology, Vol. 17, No. 75, p 29-34, 1976. 5 fig, 4 ref.

Descriptors: *Drill holes, *Ice, *Surveys, *Antarctic, On-site investigations, On-site tests, Movement, Instrumentation, Measurement, Slopes, Analysis.
Identifiers: *Byrd Station, Inclinometer, Azimuth.

The drill hole at 'Byrd' station, which was completed in January 1968 to a vertical depth of 7063 ft (1253 m) below the top of the hole casing, was resurveyed in January 1975 to a vertical depth of 4835 ft (1474 m). Inclination and azimuth measurements were made with a Parsons multiple shot inclinometer and were compared with the earlier measurements made during drilling. The results indicated a progressively increasing displacement with depth to a value of 51.2 ft (15.6 m) or about 7.3 ft/year (2.23 m/year) at the 4835 ft (1474 m) level. The direction of movement relative to the surface varies from southwest at 300 ft (91.5 m) to northeast at 1100 ft (335 m) to east at 3368 ft (1027 m) to northeast at 4835 ft (1474 m), indicative of a complex twisting motion. An increase in accessible depth along the hole axis of 18 ft(5.49 m) beyond the 1969 depth was noted. No attempt was made to measure hole diameter or vertical strain. It was recommended that the hole be resurveyed in 3-5 years if it is still logistically feasible, using a more updated inclinometer. (Humphreys-ISWS)
W77-08227

A FURTHER COMPARISON OF GLACIER VELOCITIES MEASURED BY RADIO-ECHO AND SURVEY METHODS,
British Antarctic Survey, Cambridge (England).
C. S. M. Doake, M. Gorman, and W. S. B. Paterson.

Journal of Glaciology, Vol. 17, No. 75, p 35-38, 1976. 1 fig, 7 ref.

Descriptors: *Ice, *Surveys, *Glaciology, *On-site tests, *Arctic, On-site investigations, Velocity, Glaciers, Measurement, Instrumentation, Radar, Remote sensing, Drill holes, Evaluation, Sounding.
Identifiers: *Devon Island Ice Cap(Canada), Ice cap, Radio-echo survey.

A comparison was made between ice velocities that were measured by the radio-echo technique and ice velocities measured by a survey method on the Devon Island ice cap, Arctic Canada. Results were 2.58 + or - 0.11 m/a by radar and 2.17 + or - 0.20 m/a by survey. The discrepancy between the two measurements is within the limits of statistical significance, and the methods were considered to give comparable results. (Humphreys-ISWS)
W77-08228

RADIO-ECHO SOUNDING OF TEMPERATE GLACIERS: ICE PROPERTIES AND SOUNDER DESIGN CRITERIA,
Geological Survey, Denver, Colo.
R. D. Watts, and A. W. England.
Journal of Glaciology, Vol. 17, no. 75, p 39-48, 1976. 5 fig, 5 ref.

Descriptors: *Glaciers, *Sounding, *Electromagnetic waves, Glaciology, Design criteria, Instrumentation, Theoretical analysis, Mathematical studies, Remote sensing, Radio waves.
Identifiers: *Radio-echo sounding, Temperate glaciers, Scattering theory, Back-scattering.

This is the first paper in a two-part series which describes the design, operation, and testing of a successful 5 MHz radio-echo sounder for temperate glaciers. The first part dealt with the electromagnetic characteristics of temperate glaciers at radio frequencies. Earlier workers' problems in sounding through temperate ice were explained in terms of electromagnetic scattering by water-filled voids. The frequency dependence of the scattering indicates that returns from scatterers diminish rapidly at frequencies below about 10 MHz. A system with the following characteristics was recommended: a transmitted pulse with a center frequency of about 5 MHz, duration of about 1 cycle, and a receiver which is untuned and which measures field intensity rather than power. Spectral methods for studying the size distribution of scatterers were presented. (Humphreys-ISWS)
W77-08229

RADIO-ECHO SOUNDING: REFLECTIONS FROM INTERNAL LAYERS IN ICE SHEETS,
Wisconsin Univ. Middleton. Geophysical and Polar Research Center.
J. W. Clough.
Journal of Glaciology, Vol. 18, No. 78, p 3-14, 1977. 4 fig, 19 ref. NSF OPP72-05802.

Descriptors: *Glaciers, *Remote sensing, *Radio waves, *Antarctic, Reflectance, Ice, Snow, Cores, Physical properties, Polar regions, Cold regions, Glaciology.
Identifiers: *Ice sheets, *Byrd Station, *Radio-echo sounding, Radio-echo reflections, Internal layers, Internal reflections, Permittivity, Layers.

The origin and nature of radio-echo internal reflections were the subjects of much debate. Calculations of single- and multiple-layer reflection coefficients for dielectric changes in the ice sheet indicated that the observed relection strength may result from reflections many thin layers, but the zone of thin layers may best be approximated by replacing the zone with a single thicker layer with average dielectric properties. Calculation of reflections from density changes, dust and dirt bands, and anisotropy of permittivity indicated density variations as the most likely cause of the internal layering in the uppermost kilometer of ice sheets. Comparison of the depth of internal reflections at 'Byrd' station, Antarctica, with the physical properties of the ice measured in a deep core hole at that location supported the conclusion. (Sims - ISWS)
W77-08230

A NEW CLIMATIC MODEL FOR GLACIER BEHAVIOR OF THE AUSTRIAN ALPS,
Rider Coll., Trenton, N.J. Dept. of Geosciences.
H. W. Posamentier.
Journal of Glaciology, Vol. 18, No. 78, p 57-65, 1977. 3 fig, 1 tab, 18 ref.

Descriptors: *Glaciers, *Climatic data, *Model studies, Mathematical models, Ablation, Temperature, Air temperature, Precipitation(Atmospheric), Regression analysis, Correlation analysis, Mountains, Ice, Weather, Weather data, Meteorological data, Glaciology, Meteorology, Foreign countries.
Identifiers: *Austria.

Two climatic models were proposed for the fluctuation of Austrian Alpine glacier termini. The glacier record, based on annual observations by the Osterreichische Alpenverein, is related to climatological data from the high-elevation Sonnblick-Observatorium. The variables used in this analysis were monthly mean temperature and total precipitation during the ablation season for the concurrent plus preceding eleven years. The preferred model, mean temperature for June, July, and August for the concurrent plus preceding seven years, is inversely related to glacier advance. This model was derived by combining those variables with the highest correlation coefficient relative to the glacier record. Mean lag time between climate and glacier termini response seems to be seven years. The second and less preferred model was derived by multiple regression analysis and includes seven variables of temperature and precipitation. Variation in the glacier behavior record accounted for by the two models is 71% and 67%, respectively. (Sims-ISWS)
W77-08235

STRESS IN AN ELASTIC BEDROCK HUMP DUE TO GLACIER FLOW,
University of East Anglia, Norwich (England). School of Mathematics and Physics.
L. W. Morland, and E. M. Morris.
Journal of Glaciology, Vol. 18, No. 78, p 67-75, 1977. 10 fig, 6 ref.

Descriptors: *Glaciers, *Bedrock, *Stress, Flow, Ice, Loads(Forces), Strain, Model studies, Mathematical models, Failures, Rocks, Glaciology.
Identifiers: *Bedrock humps, Glacial flow.

The stress field is an isotropic elastic hump representing a typical bedrock feature was obtained for plane strain conditions. Gravity effects were included, and the applied load is a normal pressure distribution deduced from an idealized model of glacier flow. A Coulomb failure criterion was applied, including (1) the effective stress change due to pore water pressure, and (2) stresses on the predicted failure planes determined for different pressure amplitudes and relative gravity contributions. The latter make little difference to the maximum 'failure stress', but they influence the regions where such stress levels occur. Levels of cohesive stress required to inhibit Coulomb failure were obtained and in general, were low, implying that coherent rock in the adopted hump profile, subject to the model pressure, would not fail. This profile is stable unless jointing introduces an easier failure mechanism. (Sims-ISWS)
W77-08236

IMPURITY CONCENTRATIONS IN SEA ICE,
McGill Univ., Montreal (Quebec). Dept. of Physics.
J. R. Addison.
Journal of Glaciology, Vol. 18, No. 78, p 117-127, 1977. 6 fig, 1 tab, 26 ref.

Descriptors: *Sea ice, *Chemical analysis, *Laboratory tests, *Testing, Analysis, Analytical techniques, Ions, Profiles, Distribution patterns, Saline water, Melt water, Sampling, Ice, Chemicals, Chlorides, Sulphates, Sodium, Potassium, Magnesium, Calcium.
Identifiers: Ion concentrations.

Three different types of saline ice were cut into sections a few millimeters thick along planes parallel to the surface. The resulting melts were analyzed quantitatively for chloride, sulphate, sodium, potassium, magnesium, and calcium. Two of the specimens were artificial sea ice, grown in the laboratory at ambient temperatures of -30 C and -15 C, respectively. A portion of the latter exhibited a clear, glassy, fresh-ice structure. The third specimen was natural sea ice. The resulting ion concentration profiles and ion ratios were presented. For sections of widely varying salinity, the various ion ratios assumed values fairly close to those in natural seawater. (Humphreys-ISWS)
W77-08237

MEASUREMENT OF ICE MOVEMENT IN SUB-GLACIAL CAVITIES: A NEW CAVITOMETER BENEATH THE GLACIER D'ARGENTIERE (MT BLANC, FRANCE),
Grenoble-1 Univ. (France). Institut de Geographie Alpine.
G. Bocquet, and J. C. Ricq.
Journal of Glaciology, Vol. 18, No. 78, p 137-142, 1977. 4 fig, 3 ref.

Descriptors: *Glaciers, *Movement, *Instrumentation, Equipment, Mechanical equipment, Electrical equipment, Measurement, Surveys, Ice, Foreign countries, Foreign research, Engineering, Glaciology.
Identifiers: *Cavitometers, *France, *Glacier d'Argentiere(France), Glacial flow, Subglacial cavities.

The study of subglacial movements taking place in regions of cavitation beneath the Glacier d'Argentiere demonstrated the necessity for using several cavitometers. The very unusual conditions in which such apparatus is installed to measure simultaneously the velocity and the position of the ice vault led to the design and production of a prototype of a portable cavitometer which records the data on magnetic tape (cassettes). (Sims-ISWS)
W77-08238

ON DEPTH HOAR AND THE STRENGTH OF SNOW,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
C. C. Bradley, R. L. Brown, and T. Williams.
Journal of Glaciology, Vol. 18, No. 78, p 145-147, 1977. 6 ref. AROD DA-ARO-D-31-124-71-G59, NSF FA-3943.

Descriptors: *Snow, *Snowpacks, *Frost, Strength, Mechanical properties, Bearing strength, On-site investigations, Temperature, Thermal conductivity, Snow cover, Crystals.
Identifiers: *Depth hoar, Snow strength, Metamorphism, Recrystallization, Geothermal heat.

It has long been known that a temperature gradient in the snowpack, when temperatures are less than O C, can metamorphose the snow to produce a fragile euhedral crystalline end product called 'depth hoar' which is considered to be responsible for snowpack collapse and climax avalanches. The wave of metamorphism advancing through anhedral snow converts it first to subhedral, and finally to euhedral, depth hoar. Field observations, which are at the moment supported by laboratory

evidence, revealed that the zone of minimum snow strength in the gradient metamorphic layer is associated with the intermediate subhedral phase rather than with the euhedral end product. (Sims-ISWS)
W77-08239

RELOCATION OF BURIED MARKERS,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
W. H. Mathews.
Journal of Glaciology, Vol. 18, No. 78, p 150-151, 1977. 2 ref.

Descriptors: *Stations, *Relocation, *Remote sensing, *Glaciers, Instrumentation, Sites, Glaciology, Electronic equipment, On-site Investigations.
Identifiers: *Buried markers, Electromagnetic detector.

Success was achieved in relocating wire netting which had been covered by a year's net accumulation of snow on Berendon Glacier. A signal produced by a wire loop tuned to respond to a 15 kHz electromagnetic output was detected readily by a hand-held, battery-powered electromagnetic detector. Sextant readings on fixed landmarks around the glacier aided in locating the search area. (Humphreys-ISWS)
W77-08240

THE FLOODING OF RIVERS IN THE USSR AND THE MEASURES TAKEN TO CONTROL ICE JAMS (LES INONDATIONS FLUVIALES EN URSS ET LA LUTTE CONTRE LES CRUES CAUSEES PAR LES EMBACLES),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
K. S. Lubomirova.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 110-113, 1974. 5 ref.

Descriptors: *Floods, *Ice jams, *Rivers, *Reservoirs, Ice, Flooding, Reservoir operation, Hydroelectric plants, Frazil ice, Ice breakup, Foreign countries, Foreign research.
Identifiers: *USSR.

The flooding of streams and rivers of different regions of the USSR is classified according to the cause of the flood. The time lag involved in the breaking up of ice in rivers and reservoirs often causes ice jams and frazil ice in upstream reaches of the reservoirs, which results in high stages. Similar situations are found on rivers which have constrictions, tight bends, etc. However, in the described case, the places where ice jams are most likely to occur are known and so preventive measures can be taken. In order to control the ice regime downstream from reservoirs which are linked to large rivers, it was recommended that large amounts of warm water should be injected. It was proposed that at the time of constructing the cascades of hydrological power plants situated on rivers subjected to ice jams, the outflows should be made to open in succession upstream and downstream. Therefore, it would be possible to control the ice regime over a large river reach as power plants need only be constructed on every other cascade. (See also W77-01933) (Humphreys-ISWS)
W77-08246

DELINEATION OF THE BOUNDARIES OF A BURIED PRE-GLACIAL VALLEY WITH LANDSAT-1 DATA,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 2G.
W77-08415

COMBINED ICE AND WATER BALANCES OF MACLURE GLACIER, CALIFORNIA, SOUTH CASCADE GLACIER, WASHINGTON, AND WOLVERINE AND GULKANA GLACIERS, ALASKA, 1967 HYDROLOGIC YEAR,
Geological Survey, Anchorage, Alaska. Water Resources Div.
W. V. Tangborn, L. R. Mayo, D. R. Scully, and R. M. Krimmel.
Available from Supt. of Documents, GPO, Washington, D.C., 20402, price $3.90. Professional Paper 715-B, 1977. 20 p, 9 fig, 4 plates, 8 tab, 14 ref.

Descriptors: *Glaciers, *Ice, *Water balance, *Snowmelt, *International Hydrological Decade, *California, *Washington, *Alaska, Snowpacks, Snow cover, Abltation, Runoff, Melt water, Hydrologic cycle, Climatology, Cold regions, Mountains.
Identifiers: *Maclure Glacier(Calif), *South Cascade Glacier(Wash), *Wolverine and Gulkana Glaciers(Alaska).

Combined ice and water balances were measured in the 1967 hydrologic year (October 1-September 30) on four glaciers in western North America ranging in latitude from 37 degrees to 63 degrees N. This hydrologic year was characterized by heavier than normal winter precipitation in California and Washington and abnormally dry winter conditions in coastal Alaska. In summer the western conterminous states were abnormally dry and central and southern Alaska experienced very wet conditions. Maclure Glacier (lat 37 deg 45 min N., 3,650-m (meters) mean equilibrium line altitude) had an above normal winter balance of 3.46 m and a positive annual balance of 1.05 m (meters of water equivalent). South Cascade Glacier (lat 48 deg 22 min N., 1,900-m mean equilibrium line altitude) had a winter balance of 3.28 m, slightly above average. Above normal summer ablation resulted in a final annual balance of -0.58 m, slightly more negative than has been the case for the past decade. Wolverine Glacier's (lat 60 deg 24 min N., 1,200-m mean equilibrium line altitude) winter balance was 1.17 m, considerably below normal; the annual balance was -2.04 m. Gulkana Glacier (lat 63 deg 15 min N., 1,700-m mean equilibrium line altitude) had a winter balance of 1.05 m, approximately normal for this glacier; the final annual balance was -0.3-0 m. (Woodard-USGS)
W77-08473

2D. Evaporation and Transpiration

ESTIMATING EVAPOTRANSPIRATION IN THE NORTH PLATTE BASIN OF WYOMING,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
R. W. Van Klaveren.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 623, Price codes: A03 in paper copy, A01 in microfiche. M.S. Thesis, June 1975. 60 p, 8 tab, 32 fig, 22 ref. OWRT A-014-WYO(1), 14-31-0001-5051.

Descriptors: *Evapotranspiration, *Phreatophytes, Methodology, *Consumptive use, *Wyoming, River basins, Estimating, Water utilization.
Identifiers: *Potential evapotranspiration, *North Platte River Basin(Wyo).

Methods of calculating potential evapotranspiration were compared and estimates of phreatophyte water use were made for the North Platte River Basin of Wyoming. Three methods of estimating potential evapotranspiration, the Jensen-Haise, Thornthwaite, and Blaney-Criddle, were evaluated and compared to adjusted pan evaporation. By a simple modification of the Thornthwaite equation, the most favorable correlation of potential evapotranspiration with pan data was acquired. Average annual phreatophyte evapotranspiration was estimated using the Blaney-Criddle method. The estimated total long-term annual evapotranspiration for phreatophytes was 8,121 hectare-meters for the four major rivers consisting of the North Platte, Laramie, Medicine Bow, and Sweetwater.
W77-08505

2E. Streamflow and Runoff

MEASUREMENT OF FLASH FLOODS IN THE UNITED STATES--STATE OF THE ART,
Geological Survey, Reston, Va. Water Resources Div.
H. H. Barnes, Jr.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No 112, p 48-51, 1974. 10 ref.

Descriptors: *Floods, *Measurement, *Analytical techniques, *Reviews, Stream gages, Instrumentation, Crest-stage gages, Current meters, Culverts, Indirect flood measurement, Hydrographs, Discharge(Water), Flow rates, Mannings equation, Computer programs, United States.

During the past two decades the US Geological Survey has devoted a significant part of its total water resources appraisal effots to the measurement of floods in small basins. On the most important considerations in the development of all the State programs is the difficulty in measuring flood discharges. Most of the floods which occur at station sites over a large part of the country are produced by severe thunderstorm activity of limited areal extent. The inability to forecast the time and place of occuurrence of storms in advance, and the short time of concentration and storm duration, limits the probability of obtaining conventional current-meter measurements. As a consequence the changes in philosophy, instrumentation, equipment, and operational procedures during this period have been significant. This paper reviews the changes which have occurred during the past 20 years, and describes current practices employed in the measurement of floods. (See also W77-01933) (Woodard-USGS)
W77-08161

SIMULATION OF STREAMFLOW OF FLAMBEAU RIVER AT PARK FALLS, WISCONSIN TO DEFINE LOW-FLOW CHARACTERISTICS,
Geological Survey, Madison, Wis. Water Resources Div.
W. R. Krug.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 353/AS, Price codes: A02 in paper copy, A01 in microfiche. Water-Resources Investigations 76-116, December 1976. 14 p, 7 fig, 2 tab, 4 ref.

Descriptors: *Streamflow forecasting, *Routing, *Low flow, *Simulation analysis, *Flow characteristics, Computer models, Open channel flow, Analytical techniques, Evaluation, *Wisconsin.
Identifiers: *Flambeau River(Wis), Park Falls(Wis).

Daily streamflows of the Flambeau River at Park Falls, Wisconsin, were simulated for a 31-year period. Streamflow was simulated using a streamflow-routing model. These simulated daily flows were analyzed for summer (June 1-October 31) low-flow frequency. The resultant 7-day, 10-year summer low flow is 260 cubic feet per second. The standard error of estimate for this 10-year-frequency low flow is equivalent to the standard error of estimate for 16 years of gaging-station records. (Woodard-USGS)
W77-08172

HYDROLOGIC EFFECTS OF THE TAMPA BYPASS CANAL SYSTEM,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-08182

THE INFLUENCE OF PRECIPITATION ON BIOCHEMICAL OXYGEN DEMAND ON NINE STREAMS IN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geography.
For primary bibliographic entry see Field 5B.
W77-08203

EFFECTS OF MEANDERING IN ALLUVIAL STREAMS,
Battelle-Pacific Northwest Labs. Richland, Wash.
Y. Onishi, S. C. Jain, and J. F. Kennedy.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY7, Proceedings Paper 12248, p 899-917, July 1976. 6 fig, 3 tab, 19 ref, 3 append. OWRT A-029-IA(5), USDA-ARS 12-14-100-104(38).

Descriptors: *Meanders, *Alluvial channels, *Sedimentation, *Beds, Channels, Curves, Erosion, Friction, Open channel flow, Rivers, Equations, Sediment transport.
Identifiers: *Alluvial streams, *Bed forms, Bends(Hydraulic), Friction factor, Secondary flow, Sediment deposits, Meandering channel, Sediment transfer.

For a given mean depth and velocity of flow, the sediment discharge per unit width in the full-width meandering channel was found to be greater than that in the straight flume, which in turn was greater than that of the half-width meandering channel. The bend-loss coefficient, defined as the head loss (plus or minus) due only to channel curvature normalized by the mean-velocity head, increased with Froude number, the ratio of bed hydraulic radius to median sand diameter, and the ratio of width to center line radius of curvature. At the smaller depths investigated, the friction factors of the sinuous channel flows were less than those of the straight channel flows. These effects apparently resulted primarily from the large changes produced in the bed configurations by the secondary flows. (Roberts-ISWS)
W77-08216

APPLICATION OF THREE DAILY-RAINFALL RUNOFF MODELS TO FOUR AUSTRALIAN CATCHMENTS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-08218

LOW FLOW ANALYSES OF STREAMS: DETAILS OF COMPUTATIONAL PROCEDURES AND ANNOTATED BIBLIOGRAPHY,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
T. A. McMahon.
Research Report No. 5/1976, November 1976. 60 p, 9 fig, 1 tab, 31 ref, append. (148 ref).

Descriptors: *Reviews, *Low flow, *Streamflow, *Regional analysis, Forecasting, Low-flow frequency, Bibliographies, Watersheds(Basins), Statistical methods, Discharge(Water), Hydrology, Analytical techniques, Analysis, Water storage, Water yield, Frequency curves, Hydrologic data, Recession curves, Streamflow forecasting.

The several aspects of low stream flow reviewed included: (1) data, data extension, estimation of historical flows, adjustments of flow characteristics, and discharge measurements at an ungauged site; (2) frequency distribution and parameter specification, measures of central tendency, varibility and skewness, and persistnce; (3) analysis of low flow characteristics, flow duration analysis, uses of flow duration curves, low flow frequncy curves, annual frequency series, partial frequency series, transition probability matrix of low flows, uses of low flow frequency curves, recession analysis, uses of recession analysis, and flow interval approach; (4) storage-yield analysis; Gould's storage yield procedure, and use of storage-yield relationships; (5) low flow forecasting, and (6) regionalization, regional analysis, and use of regional analysis. The appendix, and annotated bibliography of papers and reports dealing exclusively or in part with low flow analysis, contained 148 entries. (Humphreys-ISWS)
W77-08219

FLASH FLOODS IN THE WESTERN MEDITERRANEAN (LES CRUES CATASTROPHIQUES SUR LA MEDITERRANEE OCCIDENTALE),
Servicio Meteorologico Nacional, Madrid (Spain).
J. Miro-Granada y Gelabert.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 119-132, 1974. 11 fig, 9 ref.

Descriptors: *Flash floods, *Weather patterns, *Meteorology, *Rainfall disposition, Historic floods, Precipitation(Atmospheric), Precipitation excess, Rainfall, Runoff, Orography, Isohyets, Analysis, Analytical techniques, Synoptic analysis, Foreign research, Foreign countries.
Identifiers: *Spain.

Along the Spanish Mediterranean coast, the rivers have short, steep gradients and, due to the semiarid climate, are often dried up or have only low discharges. Flash floods occur in this area principally in the autumn because during autumn, extensive storm nuclei build up, resulting in extremely heavy rainfall. The storm nuclei form because the Mediterranean is a source of heat energy and water vapor and because well-developed convective cells prevail, together with some other characteristic meteorological conditions. The flood of October 1973 on the southeast coast of Spain was studied. The genesis of the phenomenon is considered to be the coincidence of several factors: the maximum temperature of the shallow coastal seawater; a zone of air flow forked into two branches, one crossing the western Mediterranean from the southwest; and the orographical characteristics of the basin. The result was a divergence at 500 mb with a southwest flow and convergence at surface level where there were easterly winds. A vortex with a horizontal axis was set up. Comparisons were made between the storm rainfall and the average annual precipitation. It was shown that both the rain gauge and synoptic networks were inadequate to detect such nuclei so that flood warnings can be issued and possible damage minimized. The use of radar station sites was discussed. (See also W77-01933) (Humphreys-ISWS)
W77-08245

THE FLOODING OF RIVERS IN THE USSR AND THE MEASURES TAKEN TO CONTROL ICE JAMS (LES INONDATIONS FLUVIALES EN URSS ET LA LUTTE CONTRE LES CRUES CAUSEES PAR LES EMBACLES),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2C.
W77-08246

FLASH FLOODS IN SPAIN (LES CRUES BRUTALES EN ESPAGNE),
Consejo Superior di Investigaciones Cientificas, Madrid (Spain). Instituto de Hidrologia.
R. Heras.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 93-99, 1974. 5 fig, 1 tab, 4 ref.

Descriptors: *Flash floods, *Flood discharge, *Watersheds(Basins), *Analytical techniques, Analysis, Rainfall excess, Precipitation(Atmospheric), Meteorology, Statistical methods, Rainfall disposition, Runoff, Foreign countries, Foreign research.
Identifiers: *Spain.

Because of the immense irregularity of Spanish rivers, there is a large contrast between critically small low flows and maximum flood discharges as great as, and even greater than, the greatest floods recorded in Europe. The River Duero flood in 1909 may be one of the best known in western Europe for basins exceeding 1000 sq. km. The flood of small basins in the Mediterranean region and the Canary Isles are of the same magnitude as the most severe ones in the world. In view of the complexity of the maximum flood phenomenon, in particular the sudden, severe, catastrophic ones that occur in small basins, it is difficult to estimate the distribution of maximum precipitation and flood discharges using hydrological-statistical methods. The difficulty exists because the phenomena happen at irregular intervals in vast zones both on the Spanish mainland and on the Islands of Spain. However, using all existing information, including historical data, which in some cases have been recorded for more than 300 years, the distribution laws were obtained by using direct, empirical, statistical and hydrometric methods. (See also W77-01933) (Humphreys-ISWS)
W77-08247

THE OPERATION OF A FLOOD WARNING NETWORK: ITS USE FOR STUDYING FLASH FLOODS (EXPLOITATION D'UN RESEAU D'ALERTE: SON UTILISATION POUR L'ETUDE DES CRUES BRUTALES),
Division des Resources en Eau, Tunis (Tunisia).
H. Zebidi, and R. Kallel.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 57-61, 1974. 1 fig.

Descriptors: *Warning systems, *Flash floods, *Networks, *Africa, Forecasting, Hydrologic data, Watersheds(Basins), Flood forecasting, Communication, Radio communication, Foreign countries.
Identifiers: *Tunisia, Wadis, *Flood warning networks.

The dry climate which is found in most of Tunisia takes the form of particularly irregular flow patterns on the hydrographic network. The flow patterns are characterized by very low water levels and by sudden and violent floods. In addition to the difficulties of measuring the flood, devastating effects also result on the coastal plains and in the low zones which are crossed by the different wadis. Therefore, it was necessary to create a flood warning network, parallel to the hydrometric network, so that the different gauging stations can be reached in the time, and so that the civil authorities might be warned in time to avoid flood damage and loss of life. Of course, the flood warning network is always in direct contact with the Dam Control Service. The flood warning network operates by means of two-way radio contact as well as through a telephone link between the Central Bureau of Tunis (which is always open) and regional bureaus, which assemble the data from different basins and hydrometric stations set up at the nerve centers of the different wadis of the country. (See also W77-01933) (Humphreys-ISWS)
W77-08248

A METHODOLOGY FOR MEASURING FLASH FLOODS (METHODOLOGIE POUR LA MESURE DES CRUES BRUTALES),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
J. Cruette.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 34-43, 1974. 2 fig, 1 append.

Descriptors: *Flash floods, *Measurement, *Methodology, Organizations, Gaging stations, Sites, Flood discharge, Discharge(Water), Topography, Watersheds(Basins), Analytical techniques, Foreign countries, Foreign research.
Identifiers: *France, Flow charts.

Measuring flash floods is a very difficult operation, particularly when the greatest discharges are considered. With the aid of his own experience in this field, the author has tried to build a specific methodology. The methodology consists of a perpetual research into the best possible organization. All the operations retained for every elementary task are reconsidered systematically as soon as a new event brings supplementary information. The described approach was illustrated by two flow charts. Experience has shown also that all the measuring techniques used in the case of the most regular regimes have to be revised. In order to show the significance of the methodology, it was essential to mention some especially important points of the procedure. (See also W77-01933) (Humphreys-ISWS)
W77-08249

RECENT FLASH FLOODS OF THE DISON BROOK (CRUES BRUTALES RECENTES DU 'RUISSEAU' DE DISON (BELGIQUE): OBSERVATIONS ET PREVISIONS),
Liege Univ. (Belgium), Faculte des Sciences Appliquees.
For primary bibliographic entry see Field 4A.
W77-08250

EFFECT OF LATERAL INFLOW ON STEADY OPEN CHANNEL FLOWS,
Connecticut Univ., Storrs.
H. K. Soong.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 925, Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1976. 104 p, 8 tab, 29 fig, 28 ref. OWRT A-051-CONN(2), 14-31-0001-3507.

Descriptors: *Open channel flow, *Flow characteristics, *Momentum equation, *Energy equation, *Nonuniform flow, *Energy loss, Design.
Identifiers: *Lateral inflow, *Streamwise variation, Mixing loss, Design methods.

By a critical examination of one-dimensional open channel flow analysis, it can be shown that a single momentum or energy equation as widely used in the past is not sufficient to explain certain anomalies in the nonuniform flow region. Additional equations are necessary for evaluating energy and mixing losses. In this study these equations are developed and shown to be satisfactory in matching exprimental results. Furthermore, the streamwise variation of momentum and energy correction factors determined from the following two methods: (1) a direct numerical integration of momentum and energy flux across a section of open channel, obtained from the measured velocity distributions, and (2) a numerical solution of the momentum and energy equations for the correction factors, utilizing the flow variable derived from experimental data, is shown to be a pertinent parameter for the nonuniform flow field. The results should further the understanding of the flow behavior in the mixing region and provide a scheme of open channel flow analysis to improve design methods. (de Lara-Connecticut)
W77-08290

REGIONAL SIMULATION OF STREAMFLOW DATA,
North Carolina Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W77-08298

FLOODS OF NOVEMBER 12, 1974, IN THE CHARLOTTE AMALIE AREA, ST. THOMAS, U.S. VIRGIN ISLANDS,
Geological Survey, Miami, Fla. Water Resources Div.; and Geological Survey, San Juan (Puerto Rico). Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08470

HYDROLOGIC UNIT MAP--1974, STATE OF TEXAS.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08474

HYDROLOGIC UNIT MAP--1974, STATE OF OKLAHOMA.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08475

HYDROLOGIC UNIT MAP--1974, STATE OF SOUTH DAKOTA.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08476

HYDROLOGIC UNIT MAP--1974, STATE OF KANSAS.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08477

SMALL-STREAM FLOOD INVESTIGATIONS IN MINNESOTA, OCTOBER 1958 TO SEPTEMBER 1975,
Geological Survey, St. Paul, Minn. Water Resources Div.
L. C. Guetzkow, and K. T. Gunard.
Open-file report 77-39, December 1976. 161 p, 8 fig, 1 tab.

Descriptors: *Flood data, *Small watersheds, *Minnesota, *Peak discharge, Design criteria, Drainage systems, Road construction, Hydrologic data, Gaging stations, Streamflow, Flow characteristics, Stage-discharge relations.
Identifiers: *Basin characteristics.

An investigation of flood flows from small drainage basins in Minnesota was initiated to aid in the design of bridges, culverts and other highway drainage structures. The program provides peak flow data on streams having drainage areas generally less than 50 square miles, placing particular emphasis on those less than 10 square miles. Basin parameters being investigated are drainage area, length of main stream, slope of main channel, basin altitude, forest cover, and storage area. Each of the 138 gaging stations are equipped with crest-stage gages, and 10 stations have continuous recorded records of stage and precipitation. The relative magnitude of flood flows for different hydrologic regions are shown in graphs which relate maximum discharge to drainage area. Each station record contains location, drainage area, records available, type of gage, on-site structure elevations, bankfill stage, and annual maximum stage and discharge data. (Woodard-USGS)
W77-08481

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1976,
Geological Survey, Helena, Mont. Water Resources Div.
M. V. Johnson, R. J. Omang, and J. A. Hull.
Open-file report 77-172, March 1977. 204 p, 2 fig.

Descriptors: *Annual peak discharge, *Small watersheds, *Floods, *Montana, Crest-stage gages, Streamflow, Surface runoff, Design criteria, Highways, Hydrologic data.

Annual peak discharge from small drainage areas is tabulated for 336 sites in Montana. The 1976 additions included data collected at 206 sites. The program which investigates the magnitude and frequency of floods from small drainage areas in Montana, was begun July 1, 1955. Originally 45 crest-stage gaging stations were established. The purpose of the program is to collect sufficient peak-flow data, which through analysis could provide methods for estimating the magnitude and frequency of floods at any point in Montana. The ultimate objective is to provide methods for estimating the 100-year flood with the reliability needed for road design. (Woodard-USGS)
W77-08482

2F. Groundwater

SELECTED WATER-LEVEL RECORDS FOR WESTERN OKLAHOMA, 1950-1975,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08163

GROUND-WATER DATA FOR 1974-75 IN JOSHUA TREE NATIONAL MONUMENT, CALIFORNIA,
Geological Survey, Menlo Park, calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08164

WATER RESOURCES OF THE MYAKKA RIVER BASIN AREA, SOUTHWEST FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08167

GROUND-WATER RESOURCES OF VANDERBURGH COUNTY, INDIANA,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08170

GROUND WATER IN THE SAN JUAN METROPOLITAN AREA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08173

GEOHYDROLOGY OF THE ENGLISHTOWN FORMATION IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,
Geological Survey, Trenton, N.J. Water Resources Div.
W. D. Nichols.
Water Resources Investigations 76-123 (Open-File Report), February 1977. 62 p, 21 fig, 9 tab, 33 ref.

Descriptors: *Aquifer characteristics, *Hydrogeology, *Hydrologic properties, *New Jersey, *Atlantic Coastal Plain, Well data, Water levels, Pumping, Drawdown, Specific capacity,

Hydraulic conductivity, Transmissivity, Groundwater recharge, Specific gravity.
Identifiers: *Englishtown formation(NJ), Specific storage.

The geohydrologic data in this report are the basic requirements needed in the development of a computer simulation model of the most developed part of the Englishtown aquifer in the northern Coastal Plain of New Jersey. The Englishtown aquifer, which has an average thickness of about 100 feet throughout Monmouth and northern Ocean Counties, is sandwiched between overlying and underlying confining beds that have an average thickness of 40 ft and 200 ft respectively. The transmissivity of the aquifer is relatively low, ranging from 2,400 sq ft/d to 650 sq ft/d; the hydraulic conductivity averages about 15 ft/d. The average rate of withdrawal study increased from 5.5 mgd in 1959 to about 9.5 mgd in 1970. The effect of this withdrawal rate was a decline in head as of 1970 at a rate of 8 to 12 ft per year over large areas. As a consequence of this change in head, large quantities of water have apparently leaked from and through the confining layers into the Englishtown aquifer. The quantity of leakage and the effects of future stresses on the aquifer can best be estimated by simulation modeling. (Woodard-USGS)
W77-08175

GEOHYDROLOGY OF THE ALBIN AND LA GRANGE AREAS, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08176

EFFECT OF DIP ON THE SUBSURFACE STORAGE OR DISPOSAL OF FLUID IN SALINE AQUIFERS,
Louisiana Water Resources Research Inst., Baton Rouge.
For primary bibliographic entry see Field 4B.
W77-08204

EFFECT OF VISCOSITY RATIO ON THE RECOVERY OF FRESH WATER STORED IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 4B.
W77-08205

DIAGENESIS OF MIDDLE AND UPPER EOCENE CARBONATE SHORELINE SEQUENCES, CENTRAL FLORIDA.
Florida Univ., Gainesville. Dept. of Geology.
A. F. Randazzo, G. C. Stone, and H. C. Saroop.
Reprint from The American Association of Petroleum Geologists Bulletin, Vol. 61, No. 4, p 492-503, April, 1977. 14 fig, 2 tab, 41 ref. OWRT B-032-FLA(1), 14-34-0001-7148.

Descriptors: *Groundwater movement, *Porosity, *Permeability, *Groundwater resources, *Aquifer management, *Limestones, *Petrography, *Water management(Applied), *Aquifers, *Facies, *Diagenesis.

Petrographic analysis of 14 cores penetrating the Inglis and Avon Park Formations (Floridan aquifer) reveals several distinct lithofacies representing multiple regressive-transgressive cycles, aerial exposure, and diagenesis. Evolution of pore space varies with the lithofacies and is a function of primary deposition and diagenetic history. The general tendency has been toward obliteration of primary voids by compaction and calcite and dolomite infilling, but several zones show dissolution enlargement. There is evidence for penecontemporaneous dolomitization in a supratidal environment, as well as post-depositional dolomitization by Mg-rich ground-water flushing. Various dolomite textures can be used to predict the environment of dolomitization. These textures are (1) replacement dolomitization of the total sediment so that original fabrics are preserved; (2) dolomitization by aggrading nemorphic processes; and (3) replacement dolomitization of fossils and pellets only. Other diagenetic processes which have affected the lithofacies include dissolution, recrystallization and inversion, and several phases of calcite cementation. The hydrologic regime and the original texture of the carbonate rock controlled the types of cement present. Scalenohedral crystals have been precipitated from marine waters along the test walls of internal chambers of fossils. Small, equant, blocky crystals have precipitated from meniscus fluid in the vadose zone of ground water as coatings along internal chamber walls of fossils and at the contacts between grains.
W77-08208

APPLICATIONS OF SURFACE RESISTIVITY METHODS,
Alberta Univ., Edmonton. Dept. of Geology.
F. W. Schwartz, and G. L. McClymont.
Ground Water, Vol. 15, No. 3, p 197-202, May-June 1977. 5 fig, 10 ref.

Descriptors: *Groundwater, *Surveys, *Resistivity, *Canada, Geology, Geophysics, Rock properties, Conductivity, Electrical resistance, Borehole geophysics, Sandstones, Glacial drift, Aquifers, Groundwater potential, Groundwater resources, Hydrogeology.
Identifiers: *Alberta(Canada).

Generally, the geology of the Breton area of Alberta consists of a 5- to 125-ft veneer of glacial till overlying sandstone and sandy shale units of the Paskapoo Formation. These sandstone units are locally important aquifers. Glacial drift in the Hastings Lake area varies in thickness from 100 to 200 ft and overlies the Horseshoe Canyon Formation, which consists of bentonitic shale, siltstone, and coal units with minor sandstone units. Groundwater yields from drift and bedrock in this area are generally less than 30 gpm (113.6 l/m). Resistivity sounding were completed at 68 and 65 stations in the Breton and Hastings Lake areas, respectively. Profile maps from the Breton area are characterized by broad areas with apparent resistivity values greater than 100 ohm-ft. Qualitative evaluation of the resistivity soundings and existing borehole data indicated that the high resistivity values resulted from a thick resistive sandstone aquifer less than 25 ft from ground surface. A reasonably well-defined resistivity pattern was evident on the profile maps of the Hastings Lake area, with the highest resistivity values coming from stations located in the hummocky moraine south of the lake. In addition to providing useful information on the geology of an area, surface resistivity methods provide a rapid and relatively inexpensive tool to aid in planning more detailed groundwater studies because of their ability to detect inhomogeneities in the subsurface environment. (Sims-ISWS)
W77-08244

EFFECT OF DIP ON THE STORAGE OF FRESH WATER (OR THE DISPOSAL OF WASTE) IN A SALINE AQUIFER,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-08288

WATER-LEVEL DECLINE AND PUMPAGE IN DEEP WELLS IN THE CHICAGO REGION, 1971-1975,
Illinois State Water Survey, Urbana.
R. T. Sasman, C. R. Benson, J. S. Mende, N. F. Gangler, and V. M. Colvin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 911, Price codes: A03 in paper copy, A01 in microfiche. Circular 125, 1977. 35 p, 8 fig , 4 tab, 12 ref, 1 append.

Descriptors: *On-site data collections, *Illinois, *Groundwater, *Water wells, *Deep wells, Water levels, Well data, Water sources, Groundwater mining, Water yield, Discharge(Water), Aquifers, Geology, Hydrology, Water supply, Potentiometric level.
Identifiers: Cook County(Ill), Du Page County(Ill), Kane County(Ill), Will County(Ill), McHenry County(Ill), Grundy County(Ill), *Chicago region(Ill).

Pumpage from deep wells in the Chicago region increased from 200,000 gallons per day (gpd) in 1864 to 150.7 million gallons per day (mgd) in 1971. As a result, artesian pressure in the Cambrian-ordovician aquifer in Chicago has declined more than 850 feet. Pumpage from deep wells in the Chicago region is concentrated in northwestern and western Cook County, eastern Du Page and eastern Kane Counties, and around Joliet in Will County. Heavy pumpage from deep wells outside the Chicago region occurs at Rockford, Belvidere, De Kalb-Sycamore, Rochelle, and Ottawa-Peru. From October 1971 through November 1975, pumpage from deep wells in the Chicago region increased to 165.7 mgd, an increase of 15.0 mgd or 10% more than the 1971 pumpage. For the Chicago region, average annual water-level declines during the 4-year period ranged from 6 feet in McHenry County to 16 feet in Grundy County and averaged about 12 feet. Water levels in 6 selected observation wells outside the Chicago region declined an average of 1.7 feet per year during the same period. Withdrawals since 1971 within the Chicago region exceeded the practical sustained yield of the Cambrian-Ordovician aquifer, as they have each year since 1958, with the result that groundwater users continue to mine water. By the end of 1975, more than half of the upper units of the aquifer already had been dewatered in many areas. If the distribution of pumpage remains the same and pumpage continues to increase as indicated by recent trends, the principal water-yeilding units of the aquifer will be partially dewatered in many areas much sooner than previously anticipated. Only a few pumping levels exceeded 1000 feet in 1971. In 1975, at least 17 municipal and industrial wells had pumps set at 1000 feet or deeper. Water levels for 664 wells were tabulated in an appendix. (See also W73-10993 and W75-04727) (Humphreys-ISWS)
W77-08302

AQUIFER MODELING HELPS FARMERS.
Water Research in Action, Vol. 1, No. 12, p 1-2, April, 1977.

Descriptors: *Mathematical models, *Computer models, *Aquifers, Planning, Irrigation water, Model studies.
Identifiers: *Snake River Plain Aquifer(Idaho).

A team of University of Idaho researchers and students are in the process of refining a computerized mathematical model of the Snake River Plain Aquifer, one of the most economically important water resources in Idaho. It is estimated that 4.5 million acre-feet of water flow through the 9,000 square mile aquifer each year. Among the values plugged into the model formulas are net amount of water applied by irrigation, the quantity of water used by vegetation, and precipitation/evaporation/snowmelt in the recharge areas. The net effect is a very usable predicting device that provides key information at selected points and indicates where more data needs to be collected. The model is now being used by Idaho Department of Water officials for water resource projections and planning studies. (Eberle-NWWA)
W77-08317

GROUND WATER RECHARGE IN EASTERN CONNECTICUT BASED ON SIMULATION MODELING,
Connecticut Univ., Storrs.
R. E. Cady.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 045, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 67 p, 9 tab, 19 fig, 2 append, 30 ref. OWRT A-052-CONN(10).

Descriptors: *Groundwater recharge, *Flow system, *Hydraulic models, *Hydraulic conductivity, *Hydraulic gradient, *Hydrogeology, Till, Glacial sediments, Streamflow, Permeability, *Connecticut, Bedrock, Simulation analysis.
Identifiers: *Fractured bedrock.

The flow system within fractured bedrock and till of Eastern Connecticut is approximated by a numerical simulation model of small ground water basins. Ground water recharge is calculated as that amount of water necessary to maintain the flow system since recharge is the only input to a natural undeveloped ground water basin. The model is based upon a steady-state solution to ground water flow equations for a series of representative cross sections through each basin. Hydraulic conductivities are adjusted to correlate the model with existing stream flow data. Resultant values for recharge and hydraulic conductivity are well within one order of magnitude of values determined through independent techniques (maximum discrepancy of 19 percent). Regional hydraulic gradient and localized flow systems exhibit a substantial contribution to control of amounts of ground water recharge beyond the limits imposed merely by glacially deposited overburden. (de Lara-Conn)
W77-08344

GROUNDWATER RESOURCES OF GUAM: OCCURRENCE AND DEVELOPMENT,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W77-08448

THE EUTAW-MCSHAN AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08466

HISTORIC WATER-LEVEL CHANGES AND PUMPAGE FROM THE PRINCIPAL AQUIFERS OF THE MEMPHIS AREA, TENNESSEE: 1886-1975,
Geological Survey, Memphis, Tenn. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08469

MAPS SHOWING GROUND-WATER CONDITIONS IN THE PUERCO-ZUNI AREA, APACHE AND NAVAJO COUNTIES, ARIZONA--1975,
Geological Survey, Flagstaff, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08471

DIGITAL-COMPUTER MODEL OF THE SANDSTONE AQUIFER IN SOUTHEASTERN WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
H. L. Young.
Southeastern Wisconsin Regional Planning Commission, Waukesha, Technical Report No 16, April 1976. 42 p, 11 fig, 20 maps, 2 tab, 3 append. $5.00.

Descriptors: *Model studies, *Drawdown, *Artesian aquifers, *Wisconsin, *Illinois, Digital computers, Computer programs, Aquifer characteristics, Sandstones, Analytical techniques, Projections, Withdrawal, Pumping, Water supply, Hydrogeology.
Identifiers: Southeastern Wisconsin, Northeastern Illinois.

The sandstone aquifer in southeastern Wisconsin and northeastern Illinois is modeled as being a confined aquifer underlain by an impermeable bed (Precambrian basement rock) and overlain by a leaky confining bed (Maquoketa Shale). The model is a digital-computer program that computes changes in head caused by pumping from the aquifer. The program solves finite-difference equations that approximate the partial-differential equation of two-dimensional, nonsteady groundwater flow. Basic input to the program consists of the hydrologic properties of the aquifer and pumpage from the aquifer. The model was calibrated by operating the program several times for the period 1880-1973, adjusting values of hydrologic properties until the computed drawdown approximated the known drawdown for that period. Using the calibrated model and estimated pumpage to 2000, drawdowns were predicted from 1974 through 1980, 1990, and 2000. Maximum drawdown is centered on New Berlin and is more than 300 feet from 1974 through 1990 and 450 feet from 1974 through 2000. (Woodard-USGS)
W77-08478

DIGITAL-MODEL ANALYSIS OF THE EFFECTS OF WATER-USE ALTERNATIVES ON SPRING DISCHARGES, GOODING AND JEROME COUNTIES, IDAHO,
Geological Survey, Boise, Idaho. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08484

2G. Water In Soils

FULVIC ACID-METAL ION INTERACTIONS IN WATER,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-08102

DELINEATION OF DECIDUOUS WETLAND FORESTS IN NORTHEASTERN CONNECTICUT,
Connecticut Univ., Storrs. Inst. of Water Resources.
P. H. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 662, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1977. 123 p, 19 fig, 15 tab, 7 append, 86 ref. OWRT A-058-CONN(1), 14-31-0001-4007.

Descriptors: *Wetlands, *Freshwater, *Boundaries, *Soil types, *Soil water, *Remote sensing, *On-site investigations, Plant populations, Topography, *Connecticut, *Forests.
Identifiers: *Inland wetland identification, *Delineation methodology, *False color infrared imagery, *Biological-physical gradients, *Wetland-upland transition, Zones, Deciduous wetland forests, Index of abundance, Ground truth, Soil pH, Crown cover.

Inland wetlands in Connecticut, presently defined by soil type, are delineated according to the National Cooperative Soils Survey of the U.S.D.A. Soil Conservation Service, a method which can produce many discrepancies in the location of inland wetland boundaries. This study examining alternate delineation methods, was designed to (1) investigate vegetation distribution and selected physical and chemical properties of wetland soils and bordering uplands and the interface between the two, and (2) provide the ground truth necessary for the identification and delineation of deciduous wetland forests using false color infrared (FCIR) imagery. In study sites located within the Town of Mansfield, Connecticut, line transects were laid out across wetland to upland transition zones, with plant species and layers identified, their positions recorded, and crown cover determined. Discriminant analysis applied to abundance data showed which members of plant species best separate wetlands from uplands and which were representative of natural plant associations. Results from the soil studies reveal that the wetland soil to upland soil gradient changes significantly in soil pH and in soil water content. Soil water and topographic position govern plant distribution along these gradients, accounting for the distinct separation of wetland and upland plant associations. Of the criteria studied, vegetation distribution and crown cover, soil water content, and relief are the most useful for delineating deciduous wetland forests and are valuable in using remote sensing imagery. (de Lara-Connecticut)
W77-08194

SPRAY IRRIGATION OF TREATED MUNICIPAL SEWAGE EFFLUENT AND ITS EFFECT ON CHEMICAL PROPERTIES OF FOREST SOIL,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W77-08202

RAINFALL INFILTRATION CHARACTERISTICS FOR A SEMI-ARID WATERSHED SOIL,
Arizona Water Resources Research Center, Tucson.
J. G. Morse.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 723, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1976. 77 p, 10 fig, 4 tab, 41 ref. OWRT A-027-ARIZ(1), 14-31-0001-3503.

Descriptors: *Infiltration, *Gamma rays, *Compaction, *Rainfall simulators, Soil compaction, Arid lands, *Arizona, Model studies, Simulation analysis, Mathematical models.
Identifiers: Watershed soils, *Rainfall infiltration, Semi-arid soils.

Rainfall infiltration characteristics for a semi-arid watershed soil were studied. The soil examined was obtained from Page Ranch, 25 miles north of Tucson, AZ. Laboratory infiltration tests were conducted on reconstructed soil profiles similar to those on the watershed. A mathematical model of infiltration, developed by Dr. Roger Smith, was used to simulate the infiltration process. Results from infiltration tests conducted on site at the watershed during a previous research study were also simulated using the infiltration model. Laboratory and field infiltration tests were conducted using a realistic rotating disk rainfall simulator. Single- and dual-source gamma ray attenuation techniques were used to obtain soil moisture measurements within the laboratory soil profiles. Direct measurement of surface crusting effects in the laboratory using the dual-source technique was attempted but was determined to be unworkable due to resolution and boundary effect problems. Using the measured saturated hydraulic conductivity values of the laboratory and field soils, and the unsaturated soil properties as measured for the field soil, the mathematical model of infiltration as developed by Roger Smith simulated the infiltration rates of bare test plots. By changing the saturated conductivity of the upper soil layer, it was also possible to simulate the infiltration process on a grass-covered field plot.
W77-08206

ROOT GROWTH, STRENGTH, AND CHEMICAL PROPERTIES OF A HOBSON FRAGIPAN,
Missouri Univ., Columbia. Dept. of Agronomy.
C. R. Edmonds.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 908, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis, May 1976. 132 p, 23 fig, 16 tab, 86 ref, append. OWRT A-087-MO(2), 14-34-0001-6026.

Descriptors: Effluents, *Hydraulic conductivity, *Root growth, Soil strength, *Soil water movement, Waste water disposal, *Soil profiles, Soil properties, *Acidity, Acidic soils, *Missouri, *Soil horizons, *Soil chemical properties, Ion exchange, Soil-water-plant relationships.
Identifiers: *Fragipan horizon(Soils).

A large percentage of Ozark soils in Missouri possess a fragipan horizon. The fragipan restricts water movement and root growth in the profile. This study was conducted to evaluate the effect of changes in acidity and bulk density on the Hobson fragipan with respect to root growth and hydraulic conductivity. Chemical and physical tests associated with basic soil properties were determined. Ion exchange relationships of six ion pairs, along with ion products of Fe, Al, and Mn hydroxides were examined. Hydraulic conductivity, probe penetration, and root growth experiments were conducted on reformed and natural samples of B2 and fragipan horizons. The rate of probe penetration had no effect on point resistance in reformed cores. Both acidity and high bulk density restrict root growth in the Hobson B2 and fragipan horizons. Data suggest low pH could induce Al toxicity in unlimed samples of both the B2 and fragipan soil. In reformed cores root growth was restricted at strengths between 10 and 20 bars, and greater strengths effectively stopped root growth. Strength of undisturbed B2 and fraigpan cores was 20 to 25 bars and greater than 100 bars, respectively, at 0.33 bar moisture tension. No roots penetrated either core. The hydraulic conductivity of reformed cores was only slightly increased due to calcium oxide addition. Indications are the fragipan would remain stable with respect to roots and water movement unless it was physically modified. Profile modification would need to be suplemented with lime to effectively increase root distribution in the Hobson profile. (Blanchar-Missouri)
W77-08285

A QUANTITATIVE STUDY OF ORGANIC CARBON DECOMPOSITION AND NITROGEN TRANSFORMATIONS IN SEWAGE SLUDGE-SOIL SYSTEMS,
Rutger - The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 5B.
W77-08291

A WATER MANAGEMENT MODEL FOR HIGH WATER TABLE SOILS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-08301

A SIMULATION OF AN IRRIGATION SCHEDULING MODEL WHICH INCORPORATES RAINFALL PREDICTIONS,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-08343

LANDSAT-1 DATA, ITS USE IN A SOIL SURVEY PROGRAM,
South Dakota State Univ., Brookings. Dept. of Plant Science; and South Dakota State Univ., Brookings. Remote Sensing Inst.
F. C. Westin, and C. J. Frazee.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 67-95, September 1975. 16 fig, 2 tab, 6 ref. NASA 5-21774, NASA 42-003-007.

Descriptors: *Soil surveys, *South Dakota, *Mapping, *Remote sensing, Soils, Maps, Surveys, Soil relief, Soil texture, Land use, Data processing, Satellites(Artificial), Analysis, Analytical techniques, Synoptic analysis, Distribution patterns, Soil types.
Identifiers: LANDSAT, Thematic soil maps.

The three objectives for this study were: (1) to investigate the unique characteristics of LANDSAT imagery as they aid in recognizing soil survey boundaries; (2) to explore the use of LANDSAT imagery for low intensity soil surveys; and (3) to investigate LANDSAT imagery as a base map for publishing thematic soil maps. Using many of the characteristics of LANDSAT imagery, a low intensity soil survey of Pennington County, South Dakota, was completed in 1974. LANDSAT-1 color composite transparencies, single band transparencies, and enlargement prints were interpreted to produce a soilscape map for 400,000 hectares. Areas of similar photographic characteristics were delineated on mylar over a color composite using a light table and a three-power magnifying glass. The field checking was done by a resource team of soil, geology, and range science specialists. The color composite transparency was adequate for locating most of the boundaries between soilscape areas. The soilscape map was interpreted to give general guidelines for land evaluation. It was concluded that a LANDSAT photographic background for soil-related information greatly enhances its use since much can be deduced about hydrology and land use. (See also W77-08408) (Humphreys-ISWS)
W77-08414

DELINEATION OF THE BOUNDARIES OF A BURIED PRE-GLACIAL VALLEY WITH LANDSAT-1 DATA,
Purdue Univ., Lafayette, Ind.
J. B. Peterson, F. E. Goodrick, and W. N. Melhorn.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 97-103, September 1975. 4 fig, 6 ref. NASA NAS 9-14016, NASA NGL 15-005-186.

Descriptors: *Soil surveys, *Indiana, *Remote sensing, *Glaciation, Pleistocene epoch, Soil classification, Land use, Soil types, Prairie soils, Glacial drift, Aquifers, Geomorphology, Satellites(Artificial).
Identifiers: LANDSAT, Udoll soils, Udalfs, Timber soils.

The continuity of a narrow meandering strip of Udoll (prairie) soils running east and west for approximately 40 miles across north central Indiana in an area predominantly of Udalfs (timber soils) was apparent in LANDSAT-1 (ERTS-1) data. The dark Udoll soils ocur in predominantly flat topography, contrasting sharply in satellite imagery from surrounding light colored Udalf soils in the characteristically rolling, undeveloped landscape of the late Wisconsin till plains. This dark stretch of prairie soil is believed to have formed in the heavy textured, poorly drained glacial debris which filled a major pre-glacial tributary of the Teays River system. This valley was apparently re-occupied and partly re-excavated by surface drainage during interglalcial times, following retreat of the Kansan and Illinoisan age ice invasions. Final filling of the valley occurred during retreat of the East White sublobe of the Wisconsin stage ice. The origin and the continuity of this meandering stretch of prairie was not recognized by soil scientists who, over a 60 year period, mapped the three counties which encompass it. Furthermore, geologists who had been searching for the exact location of this buried valley had been unsuccessful until the LANDSAT data provided an adequate synoptic view. Ready identification and location of the valley has significance to soil survey and land classifiction people as a guide to soil classification and land use and to geologists as a guide to location of a potentially economically significant aquifer. (See also W77-08408) (Humphreys-ISWS)
W77-08415

DRAINABLE POROSITY EVALUATION AND ITS RELATIONSHIP TO HYDRAULIC CONDUCTIVITY AND EXCHANGEABLE CATIONS UNDER DIFFERENT BULK DENSITIES,
Alexandria Univ. (Egypt). Dept. of Soil and Water Sciences.
For primary bibliographic entry see Field 4A.
W77-08461

CHEMICAL AND VEGETATIVE STABILIZATION OF SOILS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8D.
W77-08512

PERSISTENCE OF MYCOBACTERIUM BOVIS BCG IN SOIL AND ON VEGETABLES SPRAY-IRRIGATED WITH SEWAGE EFFLUENT AND SLUDGE,
Public Health Service, Cincinnati, Ohio. Div. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-08525

2H. Lakes

THE UTILITY OF PALEOLIMNOLOGICAL ANALYSES OF LAKE SEDIMENTS FOR EVALUATING ACID PRECIPITATION EFFECTS ON DILUTE LAKES,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 5A.
W77-08103

TRANSIENT THREE-DIMENSIONAL CIRCULATION OF LAKES,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. T. Cheng.
ASCE Proc, Journal of the Engineering Mechanics Division, Vol 103, No EM1, Paper 12721, p 17-34, February 1977. 8 fig, 25 ref.

Descriptors: *Water circulation, *Lakes, *Model studies, *Numerical analysis, Analytical techniques, Finite element analysis, Mathematical models, Reservoirs, Turbulent flow, Gravity waves, Mixing.

A mixed analytical and numerical model to study the wind-driven, transient, three-dimensional circulation in lakes is presented. Emphasis is placed on the formulation and development of the model, which consists of a formal analytical solution together with a system of depth-averaged conservation equations. After solving the depth-averaged system numerically by the finite element technique, the three-dimensional velocity profiles are calculted from the formal solution. Simulation of an idealized lake shows good agreement on the general circulation pattern and wave characteristics with the work of others. The limitation of this model is examined, and a solution is proposed to accommodate it. (Woodard-USGS)
W77-08181

A STATISTICAL ANALYSIS OF THE MERCURY CONCENTRATIONS IN FISH FROM LAKE JOCASSEE, SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5A.
W77-08190

ARSENIC IN WATER AND FISH FROM LAKES HARTWELL, KEOWEE, AND JOCASSEE, SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5A.
W77-08191

A SURVEY OF CADMIUM OCCURRENCE AND CONCENTRATION IN FISH FROM ELEVEN MAJOR RESERVOIRS IN SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5A.
W77-08192

DELINEATION OF DECIDUOUS WETLAND FORESTS IN NORTHEASTERN CONNECTICUT,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2G.
W77-08194

PLUVIAL LAKES OF NEVADA AND ESTIMATED FULL PLUVIAL CLIMATES,
Nevada Univ. System, Reno. Water Resources Center.
M. D. Mifflin, and M. Wheat.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 721, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Center, Completion Report, May 1977. 77 p, 5 fig, 9 tab, 67 ref, 1 plate. OWRT A-007-NEV(2). A-021-NEV(1). 14-01-0001-798 and 1396.

Descriptors: Rain, *Lake shores, *Paleohydrology, Paleoclimatology, Lake morphology, Lake beds, *Climates, *Nevada, Great Basin, Lakes, Evaporation, Lake basins.
Identifiers: *Lake Lahontan(Nev), *Pluvial climates, *Pluvial lakes, Lake evaporation.

Study for shoreline evidence in more than 81 basins of Nevada has yielded recognition of 53 pluvial lakes of Lahontan (Wisconsinan) age, probable shoreline evidence of three pre-Lahontan Lakes in three basins, and absence of shoreline features in many basins previously thought to have contained pluvial lakes. Basin areas, basin floor altitudes, lake areas, lake altitudes, over-flow relations and other data have been developed to aid in quantitative analysis of full pluvial climates of Lahontan age in Nevada. Using modern aspects of Great Basin climates and associates hydrology, the observed pluvial lake paleohydrology could have been maintained by mean annual temperatures approximately 5 deg F lower than modern mean annual temperatures, corresponding pluvial mean annual precipitation averaging 68 percent over modern precipitation, and mean annual pluvial lake evaporation averaging 10 percent less than mean annual modern lake evaporation. The analyses indicate modern climates of the coolest and moistest parts of Nevada (extreme northwest Nevada and some parts of northeastern Nevada) were likely similar to the full pluvial climates in parts of southcentral Nevada and northwestern Nevada. (Fallon-Nevada)
W77-08199

RELATIVE REFLECTANCE AND COMPLEX REFRACTIVE INDEX IN THE INFRARED FOR SALINE ENVIRONMENTAL WATERS,
Missouri Univ.-Kansas City. Dept. of Physics.
For primary bibliographic entry see Field 2L.
W77-08215

MINERAL CYCLING IN RESERVOIRS,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-08217

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; THE WIND-DRIVEN CURRENTS AND CONTAMINANT DISPERSION IN THE NEAR-SHORE OF LARGE LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W77-08220

A PREDICTIVE MODEL FOR TRANSIENT TEMPERATURE DISTRIBUTIONS IN UNSTEADY FLOWS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 5B.
W77-08221

PUMPED-STORAGE IN THE PACIFIC NORTHWEST, AN INVENTORY.
Corps of Engineers, Portland, Oreg. North Pacific Div.
Report 26, January 1976. 151 p, 30 fig, 8 tab, 1 append.

Descriptors: *Pumped storage, *Pacific Northwest US, *Hydroelectric power, Powerplants, Lakes, Reservoirs, Peak power, Electric power production, Underground powerplants, Economics, Reservoir operation, Reservoir sites, Electric power demand.
Identifiers: *Pumped storage inventories, Weekly cycle pumped storage sites.

This report was prepared in response to a 1975 Congressional request that the Corps of Engineers compile an inventory of the potential pumped-storage projects in the Pacific Northwest and to identify those sites which have the most potential for inclusion in the basin development plan. The inventory covered the entire States of Oregon, Washington, and Idaho, and those portions of western Montana, Wyoming, Utah, and Nevada falling within the Columbia River Basin. The report consisted of a discussion of criteria used in selecting and evaluating sites, a listing of potential sites, together with preliminary estimates of plant size, reservoir characteristics, annual costs, and an evaluation of some of the more promising sites. Both daily/weekly and seasonal pumped-storage sites were included in the inventory. (Sims-ISWS)
W77-08224

NITROGEN AND PHOSPHORUS ANALYSES OF RAINFALL AT ROTORUA, NEW ZEALAND,
Marine Dept., Rotorua (New Zealand). Fisheries Research Div.
For primary bibliographic entry see Field 5A.
W77-08242

THE FALLOUT OF NITROGEN AND PHOSPHORUS COMPOUNDS FROM THE ATMOSPHERE AT NGAPUNA, NEAR ROTORUA, NEW ZEALAND,
Marine Dept., Rotorua (New Zealand). Fisheries Research Div.
For primary bibliographic entry see Field 5A.
W77-08243

THE ACCUMULATION AND DISTRIBUTION OF ORGANOCHLORINES AND SOME HEAVY METALS IN AMERICAN FALLS RESERVOIR FISHES, WATER AND SEDIMENT,
Idaho State Univ., Pocatello. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W77-08287

BENTHIC MICROBIAL COMMUNITY RESPIRATION OF A SOFT-WATER LAKE,
Connecticut Univ., Storrs. Inst. of Water Resources.
S. G. Hornor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 917, Price codes: A05 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1977. 90 p, 19 fig, 4 tab, 73 ref. OWRT A-054-CONN(3), 14-31-0001-4007.

Descriptors: *Lake sediments, *Sediment-water interfaces, *Microbial degradation, *Chemical oxygen demand, *Oxygen, *Productivity, *Water analysis, *Aerobic bacteria, *Anaerobic bacteria, Temperature, Light intensity, Connecticut.
Identifiers: *Benthic microbial community respiration, *Soft-water bog lake, *Gas exchange, *Dissolved organic carbon, *Alternate terminal electron acceptors, *Dehydrogenase activity, Optical density, Dunham Pond(Conn).

Over a three year period, microbial community respiration of the sediment-water interface and the upper 9 cm of the surface sediments of Dunham Pond, a small (4.7 ha surface area), shallow (maximum depth 4.5 m), stratifying, soft-water bog lake in eastern Connecticut, was estimated. Relative rates of gas exchange were estimated and seasonal changes in dissolved organic carbon and optical density were analyzed for the overlying water, while light intensity and temperature were measured at the sediment surface. These variables indicate that the concentration of oxygen in the overlying water is the single most important factor influencing rates of gas exchange at the sediment-water interface. Community respiration of the surface sediments was estimated by two independent means: The accumulation of chemical oxygen demand and the relative rates of electron transport as measured by dehydrogenase activity. Respiration was found to decrease with increasing sediment depth. Colony forming units of aerobic and anaerobic bacteria in the sediment horizons were estimated over several annual cycles. Sediments data indicate that respiration within the sediment column is limited by the availability of alternate terminal electron acceptors. The results of experiments with intact cores and sediment horizons indicate that Dunham Pond is a relatively productive lake, with the majority of productivity based on the benthic microbial community.
W77-08296

CHARACTERISTICS OF THE BIOTIC CYCLE OF LAKE BAIKAL, (IN RUSSIAN),
Limnologicheskii Institut, Irkutsk (USSR).
K. K. Votintsev, and G. I. Popovskaya.
Dokl Akad Nauk SSSR Ser Biol. 216(3), p 666-669, 1974.

Descriptors: Lakes, *Primary productivity, *Food chains, *Nitrogen, *Phosphorus, Energy, Water pollution, Nutrients.
Identifiers: *Lake Baikal(USSR), *Biotic cycle.

The size and depth of Lake Baikal (USSR), the high primary production/1 m2 of surface area (127 g organic C/yr on the average), the antiquity of the lake and the stability of the environment, the balance of inorganic and organic N and P compounds and the creation of highly specialized ecological groups which provide a high percentage of energy utilization in the food chain were studied.--Copyright 1975, Biological Abstracts, Inc.
W77-08321

THE PRODUCTIVITY OF FOULING ORGANISM ASSOCIATIONS IN LAKE ZELENETSKOE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 5C.
W77-08323

LAKE NAIVASHA AND LAKE NAKURU: AN ECOLOGICAL COMPARISON BETWEEN TWO BIRD LAKES IN EAST AFRICA, (IN SWEDISH),
Uppsala Univ. (Sweden). Inst. of Zoology.
A. Lundberg, and B. Tallmark.
Fauna Flora (Stockh). 68(1), p 1-15, 1973.

Descriptors: *Africa, *Lakes, *Ecology, Vegetation, *Aquatic algae, Invertebrates, *Birds, Water pollution, *Aquatic plants.
Identifiers: *Lake Naivasha(East Africa), *Lake Nakuru(East Africa), Alkaline lakes.

The Rift Valley lakes are of great biological interest because of their extremely rich bird fauna. Lake Naivasha is a fresh-water lake; Lake Nakuru is alkaline. Due to this, there is a great difference of vegetation. The water vegetation of Lake Naivasha is highly developed, e.g., sedge, papyrus, water-lilies and submersed species, while plankton is of less importance. The algae of Lake Nakuru form almost the whole vegetation. The number of invertebrate species is also much greater in Lake Naivasha than in Lake Nakuru. The bird fauna is more differentiated in the fresh-water lake, but because of the enormous supply of food avaiable for primary consumers of birds, the number of the latter is greater in the alkaline lake. Due to the position of the lakes in a relatively densely populated district and the lack of outfall of Lake Nakuru, the risk of pollution is great. Investigations have indicated very low toxic proportions in animals. The rapid increase of (human) population in Africa may quickly change the situation for the worse.--Copyright 1975, Biological Abstracts, Inc.
W77-08324

LAMINATED SEDIMENTS IN HOLOMICTIC BERKSHIRE LAKES,
Massachusetts Univ., Amherst. Dept. of Zoology.
For primary bibliographic entry see Field 2J.
W77-08341

HYPOPHTHALMICHTHYS MOLITRIX (VAL.)) FOR INCREASING FISH PRODUCTIVITY AND DECREASING THE LEVEL OF EUTROPHICATION OF DNIEPER RESERVOIRS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W77-08364

THE LANDSAT-1 MULTISPECTRAL SCANNER AS A TOOL IN THE CLASSIFICATION OF INLAND LAKES,
National Eutrophication Survey, Corvallis, Oreg.
For primary bibliographic entry see Field 5A.
W77-08433

TROPHIC STATUS OF INLAND LAKES FROM LANDSAT,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5A.
W77-08434

THE USE OF LANDSAT-1 IMAGERY FOR WATER QUALITY STUDIES IN SOUTHERN SCANDINAVIA,
Lund Univ., (Sweden). Dept. of Physical Geography.
For primary bibliographic entry see Field 5A.
W77-08435

BEACH PROFILE CHANGES: EAST COAST OF LAKE MICHIGAN, 1970-72,
Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 2J.
W77-08440

FOX CHAIN OF LAKES INVESTIGATION AND WATER QUALITY MANAGEMENT PLAN,
Illinois State Water Survey, Urbana.
V. Kothandaraman, R. L. Evans, N. G. Stall, and D. L. Gross.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 125, Price codes: A10 in paper copy, A01 in microfiche. Cooperative Resources Report 5, Illinois State Water Survey, Illinois State Geological Survey, 1977. 200 p, 106 fig, 59 tab, 126 ref.

Descriptors: *Lakes, *Water quality, *On-site investigations, *On-site data collections, *Illinois, *Data collections, *Hydrologic data, Hydrologic aspects, Hydraulics, Water levels, Water temperature, Limnology, Sediments, Trace elements, Water balance, Water circulation, Nutrients, Eutrophication, Biological properties, Chemical properties, Physical properties, Water pollution sources, Algae, Benthos, Glacial soils, Geology.
Identifiers: *Fox Chain of Lakes(Ill).

The results of an extensive technical program conducted jointly by the Illinois State Water Survey and the Geological Survey on the Fox Chain of Lakes were presented. This effort was directed toward ascertaining the causes of lake eutrophication and the means by which the causes may be halted, reversed, or at least minimized. Geographic, geologic, hydrological, physical, chemical, and biological characteristics of the lakes were employed in identifying the causes of eutrophic conditions of the lakes. The trophic condition of the lakes was discusses as related to their limnological characteristics and nutrient budget. The nutrients responsible for the accelerated aging of the lakes were identified, and the sources of the nutrients and proportional contribution of each source were assessed. Only about 27% of the lakes drainage area as measured at Jognburg lie within Illinois. The Chain's water surface area is approximately 6850 acres, and the lakes have a mean depth of about 5.7 feet at the normal pool elevation 736.5 feet above msl. Artificial destratification and the chemical controls proposed are designed to offer some immediate relief from the consequences of eutrophication. The ultimate success in reversing the eutrophic trends in the Fox Chain of Lakes will depend on the drastic reduction of the nutrient loading to the lake system both from without and within the lake area. (Humphreys-ISWS)
W77-08442

A STUDY OF COOLING INITIALLY UNIFORM AND THERMALLY STRATIFIED LAYERS OF WATER,
Purdue Univ. Lafayette, Ind. School of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W77-08444

POPULATION DYNAMICS AND SPECIES DIVERSITY OF ICHTHYO-PARASITOFAUNA OF THE BUFFALO NATIONAL RIVER,
Arkansas Univ., Fayetteville. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-08446

SELECTIVE WITHDRAWAL AND HEATED WATER DISCHARGE: INFLUENCE ON THE WATER QUALITY OF LAKES AND RESERVOIRS PART I - SELECTIVE WITHDRAWAL,
Wisconsin Univ. -Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5G.
W77-08447

REPRODUCTION RATE AND PRODUCTIVITY OF BACTERIA IN THE PONDS OF THE KARAMET-NIYAZ FISHERY FARM, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W77-08462

COMPUTER PROGRAM FOR RESERVOIR-WATER BUDGETS,
Agricultural Research Service, Chickasha Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 4A.
W77-08464

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1974-75 WATER YEARS,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-08483

A PREDICTIVE PHOSPHORUS MODEL FOR LAKES - SENSITIVITY ANALYSIS AND APPLICATIONS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W77-08499

THE LIMNOLOGY OF A NORTH CAROLINA MILLPOND WITH SPECIAL REFERENCE TO HISTORICAL CHANGES AS EVIDENCED BY SEDIMENT CORE ANALYSIS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W77-08507

2I. Water In Plants

ROOT GROWTH, STRENGTH, AND CHEMICAL PROPERTIES OF A HOBSON FRAGIPAN,
Missouri Univ., Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-08285

27TH NORTHWEST FISH CULTURE CONFERENCE.
Conference held at Twin Falls, Idaho, December 1-2, 1976. 73 p.

Descriptors: Rainbow trout, Salmon, Sockeye salmon, *Fish hatcheries, Chinook salmon, Bass, *Columbia River, *Pacific Northwest U.S., Canada, *Aquiculture, *Fish, *Conferences.
Identifiers: Columbia River Basin, *Snake River, Chambers Creek Basin, Dworshak National Fish Hatchery, Alberta, Dorion fish hatchery, *Fish culture.

Northwest Fish Culture Conferences are informal meetings for exchange of information and ideas concerning all areas of fish culture. Current progress reports of management practices and problems, new developments, and research studies are presented. The Proceedings contain unedited briefs or oral reports presented at the conference. Much of the material concerns progress of incompleted studies or projects. (Klontz-Idaho)
W77-08309

THE USE OF SKYLAB DATA TO STUDY THE EARLY DETECTION OF INSECT INFESTA-

TIONS AND DENSITY AND DISTRIBUTION OF HOST PLANTS,
Agricultural Research Service, Weslaco, Tex. Southern Region Citrus Insects Research.
For primary bibliographic entry see Field 7C.
W77-08422

GROWTH OF TROPICAL AND TEMPERATE GRASSES AT PALMERSTON NORTH I. WARM-SEASON YIELDS WITH AND WITHOUT IRRIGATION,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiology Div.
For primary bibliographic entry see Field 3F.
W77-08457

POTENTIAL OF NEW SUMMER GRASSES IN NORTHLAND: I. WARM-SEASON YIELDS UNDER DRYLAND AND IRRIGATION,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiology Div.
For primary bibliographic entry see Field 3F.
W77-08458

THE INFLUENCES OF SIMULATED MOISTURE STRESS CONDITIONS AND OSMOTIC SUBSTRATES ON GERMINATION AND GROWTH OF CULTIVATED AND WILD SAFFLOWERS,
Pahlavi Univ., Shiraz (Iran). Coll. of Agriculture.
A. Bassiri, M. Khosh-Khui, and I. Rouhani.
Journal of Agricultural Sciences, Vol. 88, No. 1, p. 95-100, February, 1977. 2 fig, 2 tab, 16 ref.

Descriptors: *Plant growth, *Moisture stress, *Moisture deficit, *Osmotic pressure, Germination, Droughts, Water supply, Salinity tolerance, Arid lands, Crop growth, Crop response, Moisture uptake, Stress, Moisture availability, Ecotypes.
Identifiers: *Osmotic potential.

Comparisons were made between cultivated safflower varieties (Carthmus tinctorius L.) and six wild ecotypes (C. oxyacantha Bieb.) for their tolerance to simulated drought conditions. Experiments were made to compare different osmotic substances and the relative tolerance of wild ecotypes and cultivated varieties of safflower. These experiments may be valuable in finding the strain most resistant to drought. Plant characteristics of the wild strains were noted and soil samples from their collection sites were analyzed for the electrical conductivity of the saturated extract. Polyethylene glycol, mannitol, and sodium chloride were used as osmotic substrates. The influences of treatments were studied on seed germination, shoot length, and fresh and dry weight of shoots and roots of seedlings. The results are presented. Increased osmotic potentials progressively delayed and reduced seed germination, shoot length and fresh and dry weights of seedlings. Shoots were, however, more adversely affected than roots. Wild ecotypes were apparently more sensitive to high osmotic potentials than the cultivated varieties. (Jamail-Arizona).
W77-08460

2J. Erosion and Sedimentation

THE UTILITY OF PALEOLIMNOLOGICAL ANALYSES OF LAKE SEDIMENTS FOR EVALUATING ACID PRECIPITATION EFFECTS ON DILUTE LAKES,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 5A.
W77-08103

AMERICAN SEDIMENTATION LAW AND PHYSICAL PROCESSES,
For primary bibliographic entry see Field 6E.
W77-08130

SEDIMENT YIELD AND LAND USE IN SOUTHWEST UNITED STATES,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 4D.
W77-08178

DATA FOR CALIBRATING UNSTEADY-FLOW SEDIMENT-TRANSPORT MODELS, EAST FORK RIVER, WYOMING, 1975,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08180

EFFECTS OF MEANDERING IN ALLUVIAL STREAMS,
Battelle-Pacific Northwest Labs. Richland, Wash.
For primary bibliographic entry see Field 2E.
W77-08216

ALTERNATIVE MEASURES OF RIVER CHANNEL SHAPE AND THEIR SIGNIFICANCE,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 8B.
W77-08241

BENTHIC MICROBIAL COMMUNITY RESPIRATION OF A SOFT-WATER LAKE,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2H.
W77-08296

PYRO- AND TRIPOLY-PHOSPHATE CONTENTS OF SEDIMENTS,
Missouri Univ.-Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W77-08306

STATISTICAL CHARACTERIZATION OF DILUTE PARTICULATE SUSPENSIONS IN TURBULENT FLUID FIELDS,
Illinois Univ. at Urbana-Champaign. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5B.
W77-08330

LAMINATED SEDIMENTS IN HOLOMICTIC BERKSHIRE LAKES,
Massachusetts Univ., Amherst. Dept. of Zoology.
S. D. Ludlum.
Limnology and Oceanography, Vol. 21, September 1976, p. 743-746. 1 tab, 12 ref. OWRT A-077-MASS(1), 14-34-0001-7045.

Descriptors: Sedimentation, *Massachusetts, Sedimentation rates, Lakes, Lake beds, *Lake sediments, Limnology, Sampling, Profundal zone.
Identifiers: *Berkshire Hills(Mass), *Laminated sediments, Sediment sampling techniques.

Laminated sediments are common in the profundal sediments of the deeper holomictic lakes in the Berkshire Hills of Massachusetts. The laminae are best developed in lakes subject to prolonged seasonal hypolimnetic anoxia and in one lake are limited to water depths in which seasonal anoxia occurs. Samples were taken from the deepest area of all lakes using Ekman dredges, dried, sliced into vertical sections, scraped or cleaned, oven-dried and then examined for sediment laminae. (Lefferts-Massachusetts)
W77-08341

BEACH PROFILE CHANGES: EAST COAST OF LAKE MICHIGAN, 1970-72,
Western Michigan Univ., Kalamazoo.
R. A. Davis, W. G. Fingleton, and P. C. Pritchett.
Available from the National Technical Information Service, Springfield, VA 22161 as AD A018891, Price codes: A05 in paper copy, A01 in microfiche. Army Corps of Engineers, Coastal Engineering Research Center Miscellaneous Paper No. 10-75, October 1975. 97 p, 28 fig, 6 tab, 28 ref, 1 append. Army DACW72-70-C-0037.

Descriptors: *Beach erosion, *Shores, *Lake Michigan, *Great Lakes, Surveys, Measurement, Lakes, Water levels, Coasts, Beaches, Erosion, Sedimentation, Sediments, Geomorphology.
Identifiers: *Bluff erosion, *Beach profiles.

This field study of beach changes on the eastern shore of Lake Michigan concerned the movement of the bluff or the edge of the terrace marking the landward boundary of the beach. Data collected every 4 weeks from August 1970 to August 1972 indicated recession or no change at each of 17 profile sites on a 250-mile segment of the east coast of Lake Michigan. During this period, lake levels were rising from a mean of 578.9 ft above mean water level (MWL) in 1970 to 579.7 ft MWL in 1972. The maximum bluff erosion at any one site between monthly surveys was 20 ft at profile 4 in June 1972. Variables affecting the rate of movement of the bluff include lake level, composition of the bluff or terrace, orientation and straightness of shoreline, wave climate, manmade structures, and possibly longshore bars. There was a lack of correlation between bluff erosion at nearby stations, but each site varied seasonally, with maximum erosion occurring in late fall when storm occurrence is also high. Shore ice protected the beaches in winter; erosion resumed in spring at a reduced level. Beach width from the base of the bluff to the water level at the time of the survey also varied seasonally, with beaches narrow in early summer when lake level is at a maximum and wider in late fall when lake level is at a lower level. The study beaches were mostly well-sorted sand (mean grain size between 0.330 to 0.189 mm or 1.60 and 2.40 phi units), with some gravel and heavy mineral concentrations.(Sims - ISWS)
W77-08440

THE LIMNOLOGY OF A NORTH CAROLINA MILLPOND WITH SPECIAL REFERENCE TO HISTORICAL CHANGES AS EVIDENCED BY SEDIMENT CORE ANALYSIS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W77-08507

2K. Chemical Processes

FULVIC ACID-METAL ION INTERACTIONS IN WATER,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-08102

CONTINUOUS AUTOMATED MONITORING OF CHEMICAL AND PHYSICAL CHARACTERISTICS OF THE RED CEDAR RIVER,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5A.
W77-08110

U S GEOLOGICAL SURVEY, WATER RESOURCES DIVISION, RADIOCARBON MEASUREMENTS I,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08169

INVESTIGATION OF DETECTION LIMITS FOR SOLUTES IN WATER MEASURED BY LASER RAMAN SPECTROMETRY,
Smithsonian Institution, Washington, D.C.; and Geological Survey, Lakewood, Colo. Water Resources Div.
K. M. Cunningham, M. C. Goldberg, and E. R. Weiner.
Analytical Chemistry, Vol 49, No 1, p 70-75, January 1977. 3 fig, 2 tab, 23 ref.

Descriptors: *Water analysis, *Chemical analysis, *Spectroscopy, *Dissolved solids, Analytical techniques, Solutes, Ions, Remote sensing.
Identifiers: *Laser raman spectrometry.

The influence of experimental parameters on detection sensitivity was determined for lasar Raman analysis of dissolved solutes in water. Individual solutions of nitrate, sulfate, carbonate, bicarbonate, monohydrogen phosphate, dihydrogen phosphate, acetate ion, and acetic acid were measured. An equation is derived which expresses the signal-to-noise ratio in terms of solute concentration, measurement time, spectral silt width, laser power fluctuations, and solvent background intensity. Laser beam intensity fluctuations at the sample and solvent background intensity are the most important limiting factors. (Woodard-USGS)
W77-08171

RELATIVE REFLECTANCE AND COMPLEX REFRACTIVE INDEX IN THE INFRARED FOR SALINE ENVIRONMENTAL WATERS,
Missouri Univ.-Kansas City. Dept. of Physics.
For primary bibliographic entry see Field 2L.
W77-08215

IMPURITY CONCENTRATIONS IN SEA ICE,
McGill Univ., Montreal (Quebec). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W77-08237

MEASUREMENT OF THE ATTENUATION OF ELECTROMAGNETIC RADIATION BY WATER IN THE VISIBLE REGION OF THE SPECTRUM,
Missouri Univ., Kansas City. Dept. of Physics.
For primary bibliographic entry see Field 1A.
W77-08293

GROUNDWATER RESOURCES OF GUAM: OCCURRENCE AND DEVELOPMENT,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W77-08448

SPECTROANALYTICAL PARAMETERS OF FUNGAL METABOLITES: OOSPOREIN AND DESMETHOXYVIRIDIOL,
Auburn Univ., Ala. Dept. of Chemistry.
R. J. Clarkson, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 245, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, December 11, 1974, 46 p, 17 fig, 23 ref. OWRT A-035-ALA(6).

Descriptors: Fungi, Metabolism, *Fluorescence, *Analytical techniques, *Spectroscopy, Chemical analysis, Pollutant identification, Molecular structure, Luminescence, Instrumentation.
Identifiers: Spectroanalytical parameters, *Fungal metabolites, *Oosporein, *Desmethoxyviridiol, *Phosphorescence, Spectral anomalies.

The spectroanalytical parameters of oosporein were investigated, and the fluorescence spectra were reported, a possible explanation of anomalies which occurred in the course of the research, is discussed. Molecular weight studies were carried out on oosporein in an effort to explain the spectral anomalies either in terms of decomposition of oosporein or in terms of dimerization. Also, some related research in terms of EPR data and visible spectra was performed. The spectroanalytical parameters of desmethoxyviridiol were investigated, and U.V., flurorescence, and Phosphorescence spectra were reported, as well as extinction coefficients and fluorescence and phosphorescence lifetimes. Some discussion was presented in terms of irregularities in the Beer's plot as well as in the dilution-fluorescence intensity plot, and a possible explanation was offered. Quenching experiments were performed in order to ascertain whether the low-temperature luminescence of desmethoxyviridiol was due to phosphorescence or delayed fluorescence.
W77-08449

DISSOLVED SOLIDS, HARDNESS, AND ORTHOPHOSPHATE OF SURFACE-WATER RUNOFF IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08467

FRACTIONATION AND CONTROL OF IRON IN CHANNELIZED AND SWAMP DRAINAGE STREAMS IN NORTH CAROLINA,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W77-08510

2L. Estuaries

WATER RESOURCE POLICIES AND AUTHORITIES, COASTAL ZONE MANAGEMENT PROGRAM IMPLEMENTATION,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-08114

BOUNDARIES OF THE COASTAL ZONE: A SURVEY OF STATE LAWS,
Louisiana State Univ., Baton Rouge. Sea Grant Legal Program.
For primary bibliographic entry see Field 6E.
W77-08132

EFFECT OF METALS ON PHOTOSYNTHESIS OF MARINE PHYTOPLANKTON, (IN RUSSIAN),
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
For primary bibliographic entry see Field 5C.
W77-08160

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR NEW ORLEANS, LOUISIANA (LAKE PONTCHARTRAIN, LOUISIANA, AND VICINITY HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 8D.
W77-08165

COASTAL ZONE LEGISLATION: LOUISIANA LANDMARKS, LABYRINTHS AND LOGROLLING,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 6E.
W77-08186

DRIFT VELOCITIES OF SURFACE FILMS OVER WAVES,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W77-08193

METHODOLOGY FOR APPLYING THE FINITE ELEMENT METHOD TO PARTIALLY STRATIFIED ESTUARIES,
Clemson Univ., S.C. Dept. of Civil Engineering.
J. E. McCoy, and B. L. Edge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 719, Price codes: A04 in paper copy, A01 in microfiche. Clemson University Water Resources Research Institute, Report No. 66, January, 1977. 45 p, 3 fig, 27 ref, 3 append. S-052-SC.

Descriptors: *Estuaries, *Mathematical models, *Stratification, Hydrodynamics, *Finite element analysis, Model studies, Equations, Methodology, *Stratified flow, Numerical analysis.
Identifiers: Galerkin method.

A two-dimensional model which predicts constituent transport in stratified estuarine flow systems would enable planners and engineers to determine consequences of proposed modifications to stratified bodies of water. This study attempts to ascertain whether the finite element method can be formulated for a stratified system and then determines a nonlinear numerical analysis based on the finite element approach for an estuarine system. A finite element model of two-dimensional constituent transport is developed and applied to stratified flow systems. The results indicate that the finite element method can be successfully developed to model stratified flow systems. The finite element method is applied to the equations of motion, continuity, constituent transport, and density variation with salinity. Assumptions consistent with application to estuarine systems are defined. The parameters are approximated by a polynomial variation over each element in the system representation. The Galerkin method is used to determine the values of the parameters at element nodes, by solution of a system of simultaneous equations. With the nodal values of the parameters obtainable, a finite difference technique is used to extend the calculations through time. In addition to showing the applicability ot the finite element method to stratified flow systems, a formulation of the governing equations of estuarine flow is presented in algorithmic form according to the finite element solution technique. This formulation is a prerequisite to the construction of a computer algorithm to execute the numerous repetitive calculations and to subsequently model estuarine stratified flow successfully.
W77-08198

RELATIVE REFLECTANCE AND COMPLEX REFRACTIVE INDEX IN THE INFRARED FOR SALINE ENVIRONMENTAL WATERS,
Missouri Univ.-Kansas City. Dept. of Physics.
M. R. Querry, W. E. Holland, R. C. Waring, L. M. Earls, and M. D. Querry.
Journal of Geophysical Research, Vol. 82, No. 9, p 1425-1433, March 20, 1977. 8 fig, 3 tab, 14 ref. OWRT A-091-MO(2), USGS 14-08-0001-12636.

Descriptors: *Saline water, *Reflectance, *Refractivity, *Infrared radiation, *Great Salt Lake, *Pacific Ocean, *Atlantic Ocean, Optical properties, Sea water, Aqueous solutions, Laboratory tests, Salinity, Salts, Lakes, Oceans, Phosphates, Mine water, Effluents, Remote sensing, Chemical analysis, Data processing, Analytical techniques.
Identifiers: *Dead Sea(Israel), *San Francisco Bay(Calif).

By using distilled water as the standard reflector, relative specular reflectance spectra in the 2- to 20-

micrometer wavelength region of the infrared were measured for surface water samples collected from the San Francisco Bay, the Pacific Ocean, the Atlantic Ocean, the Great Salt Lake (Utah), the Dead Sea (Israel), and an effluent pit of a phosphate mine in central Florida. Phase difference spectra and spectral values of the complex refractive index were computed for each water sample by applying a Kramers-Kronig analysis to the relative reflectance spectra. Spectral values for the complex refractive index suitable for Mie scattering calculations were tabulated for each water sample. The reflectance spectra of the natural saline waters bore great similarity to spectra for individual aqueous solutions containing NACl, K2S04, NH4H2P04, NaNo3, and NaHC03. Chemical analyses of the water samples also were presented in tabular form. (Sims-ISWS)
W77-08215

A PREDICTIVE MODEL FOR TRANSIENT TEMPERATURE DISTRIBUTIONS IN UNSTEADY FLOWS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 5B.
W77-08221

EFFECTS OF 40-FOOT CHARLESTON HARBOR PROJECT ON TIDES, CURRENTS, AND SALINITIES; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
H. A. Benson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024 524, Price codes: A09 in paper copy, A01 in microfiche. Miscellaneous Paper H-76-9, May 1976. 188 p, 92 fig, 70 tab.

Descriptors: *Model studies, *Harbors, *Estuaries, *South Carolina, *Hydraulic models, Rivers, Tides, Currents(Water), *Salinity, Channels, Navigation, Flow, Saline water intrusion, Channel improvement, Shoals, Coastal engineering.
Identifiers: *Charleston Harbor(SC).

The Charleston Harbor Model reproduced the Ashley, Cooper, and Wando Rivers and a portion of the Atlantic Ocean. The model was of fixed-bed construction and was equipped with all the necessary appurtenances for accurate reproduction and measurement of tides, tidal cuurrents, salinity intrusion, and other significant phenomena of the prototype. The plan tested consisted of deepening the existing 35-ft-deep Cooper River navigation channel to 40 ft from the ocean to approximately river mile 20.6 and Shipyard Creek to 38 ft. In addition, the proposed Wando River Terminal channel was installed in the model at a depth of 35 ft. Hydraulic and salinity tests were made with the deepened project for two Pinopolis release conditions. The first condition involved the existing weekly average freshwater discharge at the Pinopolis power generating station of 15,600 cfs. The second flow condition reproduced a weekly average flow at Pinopolis of 3500 cfs. The results of these tests were reported. (Sims-ISWS)
W77-08222

THERMAL SENSOR FOR MEASUREMENT OF OCEAN CURRENT DIRECTION,
Office of the Secretary (Navy), Washington, D.C.
G. A. Edgerton.
U.S. Patent No. 3,995,480, 4 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 66, December 7, 1976.

Descriptors: *Patents, *Currents(Water), *Ocean currents, Instrumentation, Measurement, Flow measurement, Water circulation, Turbulence, Velocity.
Identifiers: Current direction, Sensors, Thermal sensors.

The measurement of direction of ocean current using a thermal sensor can be accomplished by using simple convective heat transfer theory. If a body (cylinder or sphere) is immersed in a moving fluid a boundary layer develops from the leading edge, or rather the stagnation point. In this boundary layer, the fluid velocity increases from zero at the surface of the body to the value of the velocity of the inviscid flow around the body. The flow in the boundary layer in the vicinity of the stagnation point is always laminar, but transition to turbulent flow may occur at some point downstream of the stagnation point. The changes in both the laminar to turbulent flow and the velocity gradient around the body cause a temperature gradient around the body. This invention uses a sensor having a spherical configuration for the measurement of ocean currents. A hollow spherical housing made from material that has good heat transfer characteristics has its inside lined with a multitude of temperature sensing elements which are used to determine the two stagnation points on the sphere when immersed in a moving fluid. The stagnation points always align themselves with the direction of fluid flow. (Sinha-OEIS)
W77-08257

THE INFLUENCE OF BRACKISH-WATER INTRUSION ON MACROINVERTEBRATE ASSOCIATIONS OF THE LOWER TCHEFUNCTE RIVER, LOUISIANA,
New Orleans Univ., La. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W77-08292

COASTAL ENERGY IMPACT PROGRAM.
National Oceanic and Atmospheric Administrations, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-08358

REPORT ON WATER RESOURCES PROBLEMS OF WESTERN COLLIER COUNTY, FLORIDA AS AFFECTED BY THE GAC CORPORATION'S CANAL SYSTEM IN ITS GOLDEN GATE DEVELOPMENT PROJECT,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-08380

A CONTROLLABLE AUTOMATED ENVIRONMENTAL DATA ACQUISITION AND MONITORING SYSTEM,
Brookhaven National Lab., Upton, N. Y.
For primary bibliographic entry see Field 7C.
W77-08441

SUSPENDED-PARTICLE TRANSPORT AND CIRCULATION IN SAN FRANCISCO BAY: AN OVERVIEW,
Geological Survey, Menlo Park, Calif. Water Resources Div.
T. J. Conomos, and D. H. Peterson.
In: Estuarine Processes, Vol II; Circulation, Sediments, and Transfer of Material in the Estuary, 1977: Academic Press, Inc., New York, p 82-97, 1977. 6 fig, 1 tab, 41 ref.

Descriptors: *Sediment transport, *Particle size, *Water circulation, *Bays, *California, Sediment distribution, Suspension, Deposition(Sediments), Estuaries, Sediment load.
Identifiers: *San Francisco Bay, Sediment resuspension.

Differences in the relative magnitude and timing of wind stress and river inflow in the northern and southern reaches of San Francisco Bay create different sedimentary conditions. The northern reach is a partially to well mixed estuary receiving most of the total annual fresh-water input (840 cubic meter/sec) and suspended sediment input (4 million metric tons) into the bay; more than 80% of the sediment is received during winter. Density-driven nontidal estuarine circulation (about 5 cm/sec) maintains a turbidity maximum which changes seasonally in particle concentration (40 to 80 mg/liter). Strong tidal currents (< or = 225 cm/sec) and wind-generated waves resuspend sediment from the shallow bay floor: some of the riverborne sediment deposited during winter is resuspended during summer and transported landward to the turbidity maximum. Long-term sediment data (extrapolated from bathymetric charts) indicate that the northern reach is an effective sediment trap. In contrast, long-term sediment data suggest that the southern reach is experiencing net erosion. The southern reach receives little river inflow or riverborne suspended sediment, and the average nontidal circulation is weak (< or = 2 cm/sec). The principal source of suspended sediment (25 mg/liter) in the southern reach is the shallow bay floor (average depth 6 m). (Woodard-USGS)
W77-08486

LONGITUDINAL DISTRIBUTION OF SELECTED MICRONUTRIENTS IN NORTHERN SAN FRANCISCO BAY DURING 1973,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5C.
W77-08487

PHYTOPLANKTON PRODUCTION AND ENUMERATION IN NORTHERN SAN FRANCISCO BAY DURING 1972,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5C.
W77-08488

IMPLICATIONS OF SEASONAL CHEMICAL AND PHYSICAL FACTORS ON THE PRODUCTION OF PHYTOPLANKTON IN NORTHERN SAN FRANCISCO BAY,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5C.
W77-08489

PHOSPHORUS EXCHANGE AT THE SEDIMENT-WATER INTERFACE OF SELECTED NARRAGANSETT BAY SEDIMENTS,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W77-08502

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

STATUS OF REVERSE OSMOSIS DESALINATION TECHNOLOGY,
Office of Water Research and Technology, Washington, D.C. Membrane Processes Div.
K. C. Channabasappa.
Desalination, Vol 17, p 31-67, 1975. 31 fig, 12 tab, 14 ref.

Descriptors: *Reverse osmosis, *Desalination apparatus, *Costs, *Reviews, Water treatment, Brackish water, Saline water, Sea water, Desalination, Membrane processes, Technology, Unit costs, Operating costs, Methodology, Thin films.
Identifiers: Plugging index.

Reverse osmosis (RO), a relatively new technology, gradually is becoming as established and economical method for demineralization of saline waters. Over 50 commercial plants ranging in size from 50,000 gpd to 2 million gpd (2 mgd) are producing fresh quality water for municipal and industrial uses from brackish water sources. Congress has authorized construction of a 100 mgd plant in Yuma, Arizona, to demineralize otherwise unusable high salinity irrigation return flows as part of the Colorado River Salinity Control. Engineering design and operation details, plant, were presented. A review of the plant operation data indicate that it is imperative for the plant owners and equipment suppliers to place due emphasis on providing adequate feed water pretreatment facilities and trained plant operation personnel to ensure trouble-free operation and to achieve further economy in desalting costs. Significant advances have been made in the development of RO process for seawater desalination. Soaring energy costs are providing incentive for plant owners to prefer RO plants (up to 100,000 gpd) over vapor compression distillation hardware. Results of the Federal Government Desalting R and D Programs clearly indicate that RO desalting costs will be at least 20-30% lower than distillation. (Humphreys-ISWS)
W77-08225

TRANSFERENCE: A COMPREHENSIVE PARAMETER GOVERNING PERMEATION OF SOLUTES THROUGH MEMBRANES,
Alza Corp., Palo Alto, Calif.
F. Theeuwes, R. M. Gale, and R. W. Baker.
Journal of Membrane Science, Vol. 1, No. 1, p 3-16, March 1976. 9 fig, 10 ref.

Descriptors: *Membrane processes, *Permeability, *Laboratory tests, *Mathematical models, Diffusion, Membranes, Transfer, Analysis, Analytical techniques, Testing procedures, Sorption, Solutes, Measurement, Saturation.
Identifiers: Ficks law, *Transference(Membrane processes).

Experimental studies of the diffusion of moderate molecular weight drugs through synethetic polymeric membranes has led to the definition of a new parameter to characterize solute permeation. The accepted parameter which describes transmembrane flux is permeability, P, defined as the product of the flux times the membrane thickness divided by the concentration difference across the membrane in the external solution. The new parameter described is called transference, T, and is defined as the mass of solute transferred from a saturated solution, under perfect sink conditions, across the membrane per unit time and area, multiplied by the thickness of the membrane. Regardless of whether there is solvent-membrane interaction or not, the permeability coefficient, P, for given solute and membrane differs from one solvent to another. In contrast, transference is independent of solvent, unless there is solvent-membrane interaction, in which case the inconsistency of transference for a particular solvent signifies that the membrane is modified by the presence of that solvent or solvent-solute combination. Therefore, transference is a more comprehensive parameter than permeability and is basic at the same time to solute-membrane permeation. When transference is introduced into Fick's law, it is obvious immediately that the flux of solute through the membrane, at equal fraction of saturation in any donor solvent, is equal and independent of the donor solvent in the absence of solvent-membrane interaction, when the solute has a constant solvent-membrane partition coefficient. Two examples of the use of the transference parameter were provided. (Humphreys-ISWS)
W77-08231

PRODUCTION OF ENERGY FROM CONCENTRATED BRINES BY PRESSURE-RETARDED OSMOSIS, 1. PRELIMINARY TECHNICAL AND ECONOMIC CORRELATIONS,
Ben Gurion Univ. of the Negev, Beersheba (Israel). Research and Development Authority.
S. Loeb.
Journal of Membrane Science, Vol. 1, No. 1, p 49-63, March 1976. 5 fig.

Descriptors: *Osmosis, *Electric power production, *Economics, *Membrane processes, Theoretical analysis, Foreign research, Brines, Saline water, Energy, Unit costs, Membranes, Electric power, Power plants.
Identifiers: *Israel, Pressure retarded osmosis.

Preliminary technical and economic correlations were made on the production of energy from concentrated brines by Pressure-Retarded Osmosis (PRO). In PRO, the hydraulic pressure is less than the osmotic pressure, so that water flux is against the hydraulic pressure gradient, this fact being the basis for energy production. It is visualized that a PRO power plant, operating continuously, would pump a concentrated brine such as Dead Sea brine on the outside of the fibers in hollow fiber modules at a high hydraulic pressure. Simultaneously, Jordan River water or brackish springs would be pumped through the inside of the fibers and would permeate through the fiber wall into the pressurized brine. The permeate-enhanced brine would be depressurized through a hydroturbine, delivering net power equal to the high hydraulic pressure x the permeate rate, in the idealized case. A transport analysis indicated that an asymmetric membrane, with the brine on the skin side, is as desirable in PRO as it is in reverse osmosis from the standpoint of high water permeation flux. The mechanical efficiency of a PRO power was examined. The efficiency is very sensitive to the ratio of concentration brine rate to permeate rate, a low value of this ratio (Less than 2) being desirable. A preliminary analysis was made of the unit cost of energy production from a PRO plant. The results were expressed as a function of the ratio of concentrated brine to permeate rate, the water flux, and the hydraulic pressure used. The analysis indicated the desired course of experimentation to obtain data for calculation of the minimum unit energy costs. (Humphreys-ISWS)
W77-08233

COMPUTER PREDICTION OF STATIONARY STATES OF MEMBRANES FROM DIFFERENTIAL PERMEABILITIES,
Aberdeen Univ. (Scotland). Dept. of Chemistry.
C. McCallum, and P. Meares.
Journal of Membrane Science, Vol. 1, No. 1, p 65-98, March 1976. 19 fig, 4 tab, 27 ref.

Descriptors: *Membranes, *Mathematical models, *Membrane processes, *Theoretical analysis, Zeta potential, Permeability, Computer models, Ion exchange, Cation exchange, Electrodialysis, Osmosis, Computer programs, Foreign research, Diffusion, Evaluation.
Identifiers: Computer flow diagrams.

It is desirable to be able to predict from data on the concentration-dependent permeabilities how a macroscopic membrane of known dimensions would perform under a given set of external constraints, e.g., when a predetermined current is passed through the membrane placed between particular external solutions as in electrodialysis. A computational procedure was developed which enables the final steady-state under given constraints to be evaluated by an iterative procedure. The membrane is regarded as a hypothetical series array of slices of equal thickness. The number of slices has to be chosen sufficiently large that the difference in composition across any single slice is small enough for its behaviour to be described by the local coefficients appropriate to the mean composition of the slice. The computation then adjusts the profiles across the whole membrane until each slice is in interfacial equilibrium with its neighbours and the imposed constraints are satisfied. The required fluxes and forces are then evaluated without difficulty. Useful and informative by-products from the computations are the steady profiles of the intensive variables in the membrane. The profiles are not accessible to direct measurement. The procedure was tested by calculating the osmotic and salt diffusion fluxes and the membrane potentials when the membrane separates different solutions at zero current and pressure difference. Although the computation requires the inversion of a 60 x 60 square matrix in most cases, the results were found to agree satisfactorily with those obtained experimentally. The procedure has been used to generate fluxes when an electric current is passed between different solutions as in electrodialysis. The data show how the membrane properties in electrodialysis depend on the current density, external concentrations and membrane thickness in a more precise way than has been available hitherto. The membrane profiles were found to exhibit a very pronounced dependence on the current density. (Humphreys-ISWS)
W77-08234

THERMOCOMPRESSION-TYPE APPARATUS FOR DESALTING SALINE WATER,
Societa Italiana Resine S.p.A., Milan (Italy).
D. Barba, F. Concari, and G. Spizzichino.
U.S. Patent No. 3,997,408, 10 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 953, no 2, p 710, December 14, 1976.

Descriptors: *Patents, *Desalination, *Saline water, *Demineralization, *Waste water treatment, *Water purification, Separation techniques, Water softening, Equipment.
Identifiers: Steam compression.

A desalting apparatus operates on the principle of thermocompressione, otherwise known as steam-compression. In such apparatus the saline water is caused to flow on a heat-exchange surface; the temperature of the stream produced in this manner is increased by means of a compressor and the compressed stream is used to heat the heat-exchange surface by yielding its condensation heat. The condensate is recovered and provides soft water. The purity of the produced soft water depends upon the efficiency with which the steam is separated from its entrained microscopic droplets of the saline water. A specific object is to provide a thermocompression desalter in which fluted tubes may be utilized in the evaporator without a substantial risk of incrustations. The apparatus comprises: an evaporator section including a heating chamber and a bundle of evaporator tubes crossing the chamber; means for circulating saline water throught the tubes of the bundle including a separating chamber in which the steam produced in the evaporator section is separated from the non-evaporated saline water. A compressor delivers steam at an increased pressure to the heating chamber and condensate is recovered from the heating chamber. (Sinha-OEIS)
W77-08252

FORWARD OSMOSIS EXTRACTORS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
C. D. Moody, and J. O. Kessler.
Desalination, Vol 18, p. 283-295, 1976. 1 fig, 14 ref.
OWRT B-053-ARIZ(2), 14-34-0001-7137.

Descriptors: *Water reuse, Kinetics, Design, Sea water, *Osmosis, *Desalination, *Waste water treatment, Model studies, Mathematical models, *Permselective membranes, *Separation techniques, Membrane processes.
Identifiers: *Forward osmosis.

Osmosis occurs when two solutions of differing osmolar concentrations are separated by a membrane permeable to the solvent but not (or nearly not) to the solutes. Derived is the relationship between the kinetics and design for the purpose of

applying this process to problems such as agricultural water reclamation, dehydration of solutions and the production of potable nutrient solutions from sea water. Three mathematical models that include increasingly complex fundamental process assumptions are presented. In all cases the fundamental mechanical device is assumed to be a continuous flow extractor that incorporates a semipermeable membrane.
W77-08340

3B. Water Yield Improvement

ASPHALT-RUBBER MIXTURES FOR SEEPAGE CONTROL,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 4A.
W77-08195

100 MESH SAND IMPROVES HYDRAULIC FRAC RESULTS.
For primary bibliographic entry see Field 4B.
W77-08312

3C. Use Of Water Of Impaired Quality

WATER ALLOCATION AND PRICING FOR CONTROL OF IRRIGATION-RELATED SALINITY IN A RIVER BASIN,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 5G.
W77-08213

YEAR ROUND COOLING WATER FROM THE COLD WEATHER OF WINTER,
For primary bibliographic entry see Field 5D.
W77-08251

ROOT GROWTH, STRENGTH, AND CHEMICAL PROPERTIES OF A HOBSON FRAGIPAN,
Missouri Univ., Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-08285

DIFFUSE AGRICULTURAL POLLUTION: THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS,
Wisconsin Univ. Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W77-08329

ECONOMIC IMPACTS OF CONTROLLING WATER QUALITY IN AN IRRIGATED RIVER BASIN,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-08332

RECLAMATION AND USE OF DISTURBED LAND IN THE SOUTHWEST.
For primary bibliographic entry see Field 5G.
W77-08452

DRAINABLE POROSITY EVALUATION AND ITS RELATIONSHIP TO HYDRAULIC CONDUCTIVITY AND EXCHANGEABLE CATIONS UNDER DIFFERENT BULK DENSITIES,
Alexandria Univ. (Egypt). Dept. of Soil and Water Sciences.
For primary bibliographic entry see Field 4A.
W77-08461

RESPONSE OF OAT AND SPINACH TO SEWAGE SLUDGE APPLICATION IN SOIL,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 5C.
W77-08495

3D. Conservation In Domestic and Municipal Use

WHAT WE CAN DO BEFORE THE WELL RUNS DRY--A SUMMARY OF WRC REPORT NO. 35 --RESIDENTIAL WATER CONSERVATION-MILNE,
California Univ., Berkeley. Water Resources Center.
S. Mitchell, R. L. Crowell, and J. H. Snyder.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 590, Price codes: A02 in paper copy, A01 in microfiche. Special Summary Report, April 1977. 14 p, (California Water Resources Center Project UCAL-WRC-W-424). OWRT-A-048-CAL (2).

Descriptors: *Water conservation, *Water supply, *Domestic water, Water consumption.
Identifiers: *Residential water conservation.

This pamphlet is a summary of Report No. 35, 'Residential Water Conservation' by Professor Murray Milne of the School of Architecture and Urban Planning, Los Angeles Campus of the University of California. It is intended to be a non-technical report for homeowners, builders, developers, architects, planners, utility company managers, plumbingware manufacturers, and lawmakers who are seeking ways to reduce residential water consumption. (See also W76-08103).
W77-08101

NETWORK EVALUATION OF WASTEWATER COLLECTION ECONOMICS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-08331

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS: ECONOMIC, LEGAL, AND FINANCIAL ASPECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W77-08345

OIL-FLUSHED TOILETS GAIN,
Compost Science, Vol. 18, No. 1, p 25, January-February, 1977.

Descriptors: *Domestic wastes, *Sanitary engineering, Oils, Odor, Bacteria, Viruses, Water utilization, Water conservation, Costs, Waste disposal.
Identifiers: *Oil-flushed toilets.

An oil-flushed toilet has been developed which uses no water for the disposal of body wastes. A colorless, low-viscosity mineral oil replaces water as the flushing medium. The oil and wastes are carried to a holding tank where oil floats to the top and water-saturated wastes sink. The oil is recycled to toilet tanks after filtration. There is no odor, and no bacterial or viral presence in this system. Domestic water savings have been estimated at 30-40% of the water piped into a home when this system is used. The system was installed at restrooms in the Rocky Mountain National Park, Colorado, when facilities were expanded. It was found to be less expensive than regular systems and more environmentally acceptable. It has reduced water pumping in the park buildings from a daily pumping to one pumping every 7 to 10 days. There has been no need to close comfort stations because of water shortages. Operation during early and late seasons can be attributed to the fact that oil does not freeze. Sewage production has been reduced from 14,000 gallons daily to 1,800 gallons per week. Costs have been reduced from 20 cents per flush with water to 2 per flush with the oil system. The ultimate disposal of wastes from the system can still be a problem. The wastes are usually trucked to a municipal treatment plant or to farmland for agricultural use, but a plan for producing methane gas from them is being studied. A system for marine applications is being adapted for use in high-rise buildings. Water from sink, basins, bathtub, and washing machines could be disposed to a smaller septic tank and drain field after filtration when this method is installed in domestic applications. (Collin
W77-08583

3E. Conservation In Industry

KRAFT MILL RECOVERY SYSTEM,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y. (Assignee).
For primary bibliographic entry see Field 5D.
W77-08258

WASTE IMPOUNDMENT EFFICIENCY AT SUGAR MILL,
For primary bibliographic entry see Field 5D.
W77-08268

CLOSED-LOOP SYSTEM SEPARATES OIL FROM PREWASH OVERFLOW,
Miller Brewing Co., Milwaukee, Wis.
For primary bibliographic entry see Field 5D.
W77-08271

CHARACTERIZATION AND TREATMENT OF TEXTILE DYEING WASTEWATERS,
Crompton and Knowles Corp., Reading, Pa.
For primary bibliographic entry see Field 5D.
W77-08278

EFFECT OF ACCLIMATION TO LIME-SULFIDE EFFLUENT FROM UNHAIRING CATTLEHIDES ON THE COMPOSITION OF ACTIVATED SLUDGE,
Agricultural Research Service, Philadelphia, Pa. Eastern Regional Research Center.
For primary bibliographic entry see Field 5D.
W77-08279

SPLIT-STREAM CHEMICAL TREATMENT (A PATENTED PROCESS BY CHEMLAN COMPANY, INC.) OF TANNING INDUSTRY WASTE WATER,
For primary bibliographic entry see Field 5D.
W77-08280

BACTERIAL GROWTH KINETICS IN THE COMPLETELY MIXED ACTIVATED SLUDGE TREATMENT OF FELLMONGERY EFFLUENT,
Rhodes Univ., Grahamstown (South Africa). Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W77-08281

TAKING ACRES OUT OF POLLUTION-CONTROL PLANS,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W77-08283

AN INVESTIGATION OF THE TECHNICAL AND ECONOMIC FEASIBILITY OF USING

LOW TEMPERATURE GEOTHERMAL SOURCES IN COLORADO,
Environmental Consulting Services, Inc., Boulder, Colo.
For primary bibliographic entry see Field 4B.
W77-08310

THE ERDA GEOTHERMAL PROGRAM,
Energy Research and Development Administration, Washington, D.C.
For primary bibliographic entry see Field 4B.
W77-08314

A PRELIMINARY ANALYSIS OF THE ENERGY AND WATER REQUIREMENTS FOR DEVELOPING GEOTHERMAL ENERGY IN ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 4B.
W77-08351

LEGAL CONTROL OF CONSUMPTIVE WATER USE IN PENNSYLVANIA POWER PLANTS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Office of Enforcement.
R. T. Weston, and J. R. Gray.
Dickinson Law Review, Vol 80, p 353-409 (Spring 1976). 351 ref.

Descriptors: *Power plants, *Thermal pollution, *Regulation, *Remedies, *Pennsylvania, Energy loss, Energy conversion, Dispersion, Ohio, Electric power, Federal government, State governments, River basin commissions, Electric powerplants, Water pollution sources, Heated water, *Consumptive use, Legal aspects, Interstate commissions.

The North Atlantic and Ohio regions have been identified as areas of potential water shortage for energy purposes, a problem which may exceed the ability of existing allocation doctrines and institutional schemes. The article identifies existing legal means of resolving conflicts between power plant water consumption and other uses; it considers the adequacy of available remedies, and covers regulatory programs art all levels of government which address these conflicts. The need for disposal of waste heat from power facilities poses a major challenge to our water resource laws which has not yet been effectively addresses. Antiquated state law necessitates protracted litigation. Sporadic legislative efforts which are anomlous and incomplete hamper effective Pennsylvania state regulation. Federal law leaves most facilities unregulated. Interstate river basin commission have attempted to tie power plant water use to comprehensive plans, however, much remains to be done. The ultimate solution lies in conservation of energy. The use of waste heat from power plants may be technologically impossible at this time; but in the future it will be imperative. In the interim we must use available laws to protect our water resources. (Molloy-Florida)
W77-08368

PROGRESS IN MHI'S INTEGRATED TECHNIQUES FOR ENVIRONMENTAL PROTECTION,
Mitsubishi Heavy-Industries Ltd., Tokyo (Japan). Environmental Technology Dept.
For primary bibliographic entry see Field 5D.
W77-08533

REMOVING SOLUBLE METALS FROM WASTE WATER,
For primary bibliographic entry see Field 5D.
W77-08591

3F. Conservation In Agriculture

AN ANALYSIS OF AGRICULTURAL WATER REQUIREMENTS IN THE TAR-NEUSE RIVER BASIN OF NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. S. Sowell, R. E. Sneed, and L. H. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 674, Price codes: A02 in paper copy, A01 in microfiche. Paper presented at ASAE 1976 Winter Meeting, Palmer House, Chicago, Ill., December 14-17, 1976. 18 p, 5 fig, 5 tab, 8 ref, Paper No 76-2529. OWRT B-068-NC(5). 14-31-0001-4114.

Descriptors: *Agricultural water, *Water demand, *Irrigation water, *Water requirements, Irrigation computer models, Irrigation efficiency, *North Carolina, *Water utilization.
Identifiers: *Agricultural water demand, Water use model, Irrigation policy, *Tar-Neuse River Basin(NC), Wake County(NC).

Agricultural water use has been increasing for several decades, with most of the increase being for irrigation. Computer models are available to quantify the effects of water availability and to study changes in various parameters and decisions on economic return. Two models were developed in this study with objectives as follows: (1) to determine total water requirements for a given level of agricultural activity in an area, and (2) to determine, for a limited quantity of water available to agriculture in an area, the optimum level of agricultural activity. These models are referred to as IRRI and the LP models respectively. One application of the IRRI model has been to determine the water requirements for irrigation of crops currently grown in a large region in Eastern N.C. The region is the Tar-Neuse River Basin and adjacent counties and includes a total of 35 counties. (Kiger-NC State)
W77-08106

IRRIGATED AGRICULTURE: NONPOINT AND POINT SOURCE WATER POLLUTION,
For primary bibliographic entry see Field 5G.
W77-08116

CAN A STATE EMBARGO THE EXPORT OF WATER BY TRANSBASIN DIVERSIONS,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W77-08129

UNITED STATES V TULARE LAKE CANAL COMPANY (RECLAMATION LAWS CONCERNING SALE OF LAND IN EXCESS OF 160 ACRES).
For primary bibliographic entry see Field 6E.
W77-08151

YEAR ROUND COOLING WATER FROM THE COLD WEATHER OF WINTER,
For primary bibliographic entry see Field 5D.
W77-08251

AGRICULTURAL WATER DEMAND IN WAKE COUNTY, NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 6D.
W77-08297

A WATER MANAGEMENT MODEL FOR HIGH WATER TABLE SOILS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 961, Price codes: A03 in paper copy, A01 in microfiche. Paper presented at 1975 Winter Meeting ASCE, Chicago, Illinois, December 15-18, 1975. No. 75-2524, 27 p, 9 fig, 1 tab, 20 ref. OWRT A-086-NC(1), 14-34-0001-6034.

Descriptors: *Subsurface irrigation, *Model studies, *Subsurface drainage, *Computer models, *Water management(Applied), *Drainage systems, Land management, Irrigation practices, Irrigation effects, Soil management, Irrigation systems, High water table, *Soil water movement, *North Carolina, Coastal plains, Alternative water use.
Identifiers: Field experiments, *High water table soils.

A water management computer model is being developed to simulate the soil water regime for high water table soils. The model is based on a water balance in the soil profile. Approximate methods are used to evaluate infiltration, subsurface drainage, ET, subirrigation, and the soil water distribution within the profile. Inputs to the model are soil properties, parameters of the surface and subsurface drainage systems, and meteorological data. The model provides the capacity of predicting the response of the water table and the soil water regime above the water table to rainfall, ET, given degrees of surface and subsurface drainage, and the use of water table control or subirrigation practices. When finally tested and completed the model can be employed to evaluate alternative water management systems and operational procedures by simulating their performance over several years of record. Results of a field experiment to test the validity of the model are presented. Examples of the use of the model for water management system design and evaluation are given. (Stewart-NC State)
W77-08301

AQUIFER MODELING HELPS FARMERS.
For primary bibliographic entry see Field 2F.
W77-08317

A SIMULATION OF AN IRRIGATION SCHEDULING MODEL WHICH INCORPORATES RAINFALL PREDICTIONS,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
G. D. Stephens.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 092, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, August 1975, 107 p, 27 fig, 5 tab, 35 ref, 4 append. OWRT A-025-ALA(4).

Descriptors: *Irrigation, *Forecasting, Evapotranspiration, *Soil moisture, Moisture stress, Evaporation, Rainfall, *Simulation analysis, Model studies, Cotton, Moisture tension, *Alabama.
Identifiers: Scheduling-with-forecasts, Scheduling-without-forecasts, *Irrigation scheduling models, Auburn(Ala).

A scheduling-with-forecasts model and a scheduling-without-forecasts model were developed and a sensitivity analysis was performed on the scheduling-with-forecasts model to test the effects of changes in the model inputs on model parameters and results. Weather and forecast data for the 1971-1973 growing seasons at Auburn were used in the models and daily values for the resulting available soil moisture, amount of irrigation applied, amount of excesses above the total available soil moisture capacity and amount of deficits below the critical available soil moisture level were determined for both the scheduling-with-forecasts and the scheduling-without-forecasts models. An analysis of these results showed that the scheduling-with-forecasts model using acceptance level of 0.50 significantly increased the

amounts of deficits over that obtained by the scheduling-withoutgforecasts model but did not significantly decrease the amounts of applied irrigation or excesses below that of the scheduling-without-forecasts model. A further study was made to determine the effects on model performance of changing the acceptance level in the scheduling-with-forecasts model. The optimum value for acceptance level was 0.80. The scheduling-with-forecasts model using acceptance level of 0.80 resulted in significant decreases in amounts of applied irrigation and excesses without significant increases in amounts of deficits over those resulting from the scheduling-without-forecasts model.
W77-08343

FROM GOOD HUSBANDRY TO REASONABLE USE: ILLINOIS SURFACE WATER DRAINAGE LAW EVOLVES IN SUBDIVISION CASE,
For primary bibliographic entry see Field 4A.
W77-08353

WATER FOR FOOD - OR FOR MORE IMPORTANT PURPOSES. (REALLOCATION OF IRRIGATION WATER TO CITIES AND INDUSTRIES),
Wyoming Univ., Laramie. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-08377

IRRIGATION AND IRRIGATION DISTRICTS.
For primary bibliographic entry see Field 6E.
W77-08396

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, VOLUME I-A, TECHNICAL SESSION PRESENTATIONS, AGRICULTURE-ENVIRONMENT.
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W77-08408

AGRICULTURAL INVENTORY CAPABILITIES OF MACHINE PROCESSED LANDSAT DIGITAL DATA,
General Electric Co., Beltsville, Md. Space Systems Organization.
D. L. Dietrich, R. E. Fries, and D. D. Egbert.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 221-232, September 1975. 8 fig, 2 tab, 3 ref.

Descriptors: *Vegetation, *Remote sensing, *Classification, *North Dakota, *Canada, Monitoring, Standing crops, Agriculture, Census, Crops, Grains(Crops), Surveys, Spatial distribution, Satellites(Artificial), Mapping, Areal, Evaluation, Measurement, Data processing, Analytical techniques.
Identifiers: *Saskatchewan(Canada), LANDSAT.

Agricultural crops identification and acreage determination analysis of LANDSAT digital data were performed in Williams County, North Dakota, and Melfort, Saskatchewan, Canada. A multispectral image processing and analysis system was utilized to perform the man-machine interactive analysis. The developed techniques yielded crop acreage estimate results with accuracy greater than 90% and as high as 99%. These results are encouraging evidence of agricultural inventory capabilities of machine-processed LANDSAT digital data. (See also W77-08408) (Humphreys-ISWS)
W77-08423

AGRICULTURAL APPLICATIONS OF REMOTE SENSING--A TRUE LIFE ADVENTURE,
General Electric Co., Beltsville, Md.
E. S. Schaller.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 233-238, September 1975.

Descriptors: *Remote sensing, *Agriculture, *Mapping, *California, Crops, Spatial distribution, Classification, Census, Vegetation, Farm management, Cotton, Aerial photography, Satellites(Artificial).
Identifiers: *San Joaquin Valley(Calif), LANDSAT.

In mid-1973, General Electric undertook a study of agricultural applications of remote sensing with a major agricultural firm. The study continued for eighteen months and covered the areas of crop monitoring and management as well as large-scale crop inventories. Pilot programs in the application of aircraft remote sensing and LANDSAT data were conducted. An operational aircraft survey program for ranch management has subsequently been implemented by the agricultural firm. LANDSAT data were successfully used to produce a 97% accurate inventory of cotton over 4.8 million acres of California's San Joaquin Valley. (See also W77-08408) (Humphreys-ISWS)
W77-08424

PRACTICAL APPLICATION OF REMOTE SENSING IN AGRICULTURE,
Anderson, Clayton and Co., Houston, Tex.
R. A. Phelps.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 239-242, September 1975. 10 ref.

Descriptors: *Remote sensing, *Agriculture, *Mapping, *Crops, *Arizona, Cotton, Aerial photography, Farm management, Vegetation, Spatial distribution, Molds, Satellites(Artificial).
Identifiers: LANDSAT.

During the past few years, Anderson, Clayton and Company has utilized in their remote sensing program imagery from several types of platforms from light aircraft to the LANDSAT (ERTS) satellites. Inexpensive imagery was preferred over expensive magnetic tapes. Emphasis was on practical application of remote sensing data to increase crop yield by decreasing plant stress, disease, weeds, and undesirable insects, and by improving irrigation. Imagery obtained from low altitudes via aircraft provided the necessary resolution and complements but did not replace data from high altitude aircraft, Gemini and Apollo spacecraft, Skylab space station, and LANDSAT satellites. Federal government centers are now able to supply imagery within about thirty days from date of order and deserve to be commended. Nevertheless, if the full potential of space imagery in practical agricultural operations is to be realized, the time span from date of imaging to user application needs to be shortened from the current several months to not more than two weeks. (See also W77-08408) (Humphreys-ISWS)
W77-08425

AN OVERVIEW OF THE DEVELOPMENT OF REMOTE SENSING TECHNIQUES FOR THE SCREWWORM ERADICATION PROGRAM,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
C. M. Barnes, and F. C. Forsberg.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 263-287, September 1975. 16 fig, 8 ref.

Descriptors: *Insect control, *Remote sensing, *Environment, *Texas, *Mexico, Land use, Satellites(Artificial), Climatic data, Weather data, Analytical techniques, Environmental effects, Entomology, Air temperature.
Identifiers: Screwworm, *Screwworm eradication.

The paper reported the current status of remote sensing techniques developed for the screwworm eradication program of the Mexican-American Screwworm Eradication Commission. A review of the type of data and equipment used in the program was presented. Future applications of remote sensing techniques were considered. (See also W77-08408) (Humphreys-ISWS)
W77-08427

RELATIONSHIP BETWEEN CORN YIELD, EXPRESSED AS A PERCENTAGE OF MAXIMUM, AND THE N PERCENTAGE IN THE GRAIN. I. VARIOUS N-RATE EXPERIMENTS,
Iowa Agricultural and Home Economics Experiment Station, Ames.
W. H. Pierre, L. Dumenil, V. D. Jolley, J. R. Webb, and W. D. Shrader.
Agronomy Journal, Vol. 69, p 215-220, March-April 1977. 1 fig, 3 tab, 23 ref.

Descriptors: *Corn(Field), *Crop production, *Nitrogen, *Geographical methods, *Regression analysis, *Iowa, Model studies, Economic impact, Moisture stress, Productivity.
Identifiers: *Nitrogen percentage, Nitrogen sufficiency, Relative yield, Maximum yield.

A graphical method and a regression method were developed to relate corn (Zea mays L.) yield, expressed as a percentage of maximum, and the grain's N percentage. Data used came from 13 site-years of 6 N-rate experiments in Iowa and from previous literature. There was good agreement between the two methods for determining maximum yields and N percentages at various proportions of maximum yield. Average critical N percentages (those at maximum yield) were 1.52% for the graphical and 1.54% for the regression method in Iowa experiments. Data calculated from reported experiments were in general agreement with the Iowa results. Some variability in compared experimental results may have been attributable to differences among the 23 hybrids represented. There was little or no demonstrable effect on the relative yield-percent N relationship due to moisture stress, plant density or adequacy of other nutrients. That relationship offers a basis for estimating N sufficiency and the N requirement for maximum yield or an economic optimum yield. (Jahns-Arizona)
W77-08456

GROWTH OF TROPICAL AND TEMPERATE GRASSES AT PALMERSTON NORTH I. WARM-SEASON YIELDS WITH AND WITHOUT IRRIGATION,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiology Div.
B. J. Forde, C. R. Slack, P. G. Roughan, and H. C. M. Whitehead.
New Zealand Journal of Agricultural Research, Vol. 19, No. 2, p 135-142, 1976. 5 tab, 16 ref.

Descriptors: *Grasses, *Crop production, *Photosynthesis, *Soil moisture, Irrigation, Tropical regions, Plant physiology, Leaves, Moisture tension, Field capacity, Fertilizers, Soil water, Irrigation effects, Water shortage, Bermudagrass, Flowering, Range management, Grazing, Temperate.
Identifiers: Paspalum, Kikuyu, *New Zealand.

Experiments were conducted on several species of grasses in New Zealand to determine the most suitable for highest yield of summer growth. Summer production of temperate grasses is limited by inadequate water supply, supra-optimal day temperatures and dormancy after spring flowering. In the warmer areas of New Zealand, the summer growing tropical grasses paspalum and kikuyu contribute significantly to annual pasture yields. Both, however, are difficult to manage. There are other tropical grasses which could possibly be cultivated in New Zealand. These grasses possess Carbon 4 photosynthesis pathways, whereas the temperate grasses fix carbon by the Carbon 3 pathway. Studies suggest that Carbon 4 pathway grasses may result in more economical use of available soil moisture. Warm season yields of 14 Carbon 4 photosynthetic pathway tropical grasses were compared with yields of 6 Carbon 3 pathway temperate grasses, and observations were made on the extent of flowering and on frost sensitivity and the results reported. Results show that tropical grasses can give a substantially higher yield over the summer than the temperate pasture grasses in current use. However, a more accurate assessment of the role of selected tropical grasses in New Zealand as perennial, summer-producing forage species must await further study. (Jamail-Arizona)
W77-08457

POTENTIAL OF NEW SUMMER GRASSES IN NORTHLAND: I. WARM-SEASON YIELDS UNDER DRYLAND AND IRRIGATION,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiology Div.
A. O. Taylor, J. A. Rowley, and B. J. Hunt.
New Zealand Journal of Agricultural Research, Vol. 19, No. 2, p 127-133, 1976. 1 fig, 5 tab, 9 ref.

Descriptors: *Irrigation effects, *Range management, *Crop production, *Grasses, Pastures, Irrigation, Soil types, Irrigation efficiency, Droughts, Rainfall, Grazing, Tropical regions, Photosynthesis, Feeds, Plant growth, Evapotranspiration, Leaching.
Identifiers: Paspalum, Kikuyu.

The warm-season yield of a range of Carbon 4 photosynthetic pathway summer-growing tropical grasses was measured by mechanical harvesting over three seasons in small plot trials in New Zealand under high levels of nutrition and pest control. Several of the grasses produced higher yields than the naturalized summer grasses paspalum and kikuyu. Irrigation sufficient to replace evaporative water loss substantially increased the early summer production of all grasses but usually decreased their early autumn production. Leaching of soil nutrients may have been partially responsible for the poor autumn production under irrigation. The grasses varied widely in their relative yield response to irrigation. Production of all grasses persisted reasonably well under the five week harvest interval and 5 or 10 centimeter cutting height, although those with some degree of stoloniferous habit were generally better than bunch types. The experiments provide preliminary data on the yield potential of a range of Carbon 4 grasses in New Zealand and demonstrate that several types can maintain acceptable yields for at least three years in a coastal environment under lax cutting conditions. (Jamail-Arizona)
W77-08458

IMPROVING FOOD CROP PRODUCTION IN THE SUDAN SAVANNA ZONE OF NORTHERN NIGERIA,
Institute for Agricultural Research, Zaria (Nigeria).
A. H. Kassam, M. Dagg, J. M. Kowal, and F. H. Khadr.
Outlook on Agriculture, Vol. 8, No. 6, p 341-347, 1976. 2 fig, 1 tab, 45 ref.

Descriptors: *Crop production, *Water requirements, *Foods, *Rainfall, Africa, Crops, Precipitation(Atmospheric), Soil erosion, Agriculture, Droughts, Climates, Evaporation, Evapotranspiration, Soil moisture, Sorghum, Fertilizers, Farm management, Crop response.
Identifiers: *Nigeria(Sudan Savanna zone).

The potential for increasing food production in the Sudan Savanna of Northern Nigeria is discussed. This area has generally been considered marginal for crop production because of lack of available water, among other factors. However, studies have shown that the area has potential for food crop production. One of the main features of the Sudan agricultural zone is its low crop productivity per unit of land, which has not increased over the past thirty years or more. Economic and social pressures are making greater demands on soil resources of the area. There seems little doubt that the application of simple, but improved, technology can result in increased levels of production. The effects of improved crop science, mechanization, and climate on the area are discussed. The water requirements are outlined. The major crops grown, sorghum, millet, cowpea, and groundnuts, as well as diseases to which these crops are susceptible, are discussed. The conclusions presented suggest that better organization and more efficient methods should be applied to the problems faced by the region. (Jamail-Arizona)
W77-08459

THE INFLUENCES OF SIMULATED MOISTURE STRESS CONDITIONS AND OSMOTIC SUBSTRATES ON GERMINATION AND GROWTH OF CULTIVATED AND WILD SAFFLOWERS,
Pahlavi Univ., Shiraz (Iran). Coll. of Agriculture.
For primary bibliographic entry see Field 2I.
W77-08460

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

CITIZEN PARTICIPATION IN COMPREHENSIVE WATER RESOURCES PLANNING,
Massachusetts Univ., Amherst. Inst. for Man and Environment.
For primary bibliographic entry see Field 6B.
W77-08105

INVENTORY OF COLORADO'S FRONT RANGE MOUNTAIN RESERVOIRS,
Colorado State Univ., Fort Collins. Dept. of Recreation Resources.
For primary bibliographic entry see Field 6B.
W77-08107

FEDERAL STATUTORY MODIFICATION OF PRIVATE WATER RIGHTS IN SOUTH FLORIDA,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-08112

CAN A STATE EMBARGO THE EXPORT OF WATER BY TRANSBASIN DIVERSIONS,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W77-08129

WELLS, PUMPING PLANTS, CONDUITS AND STREAMS,
For primary bibliographic entry see Field 6E.
W77-08154

BEAR RIVER COMPACT,
For primary bibliographic entry see Field 6E.
W77-08155

MEASUREMENT OF FLASH FLOODS IN THE UNITED STATES--STATE OF THE ART,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08161

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1975,
Geological Survey, Indianapolis, Ind. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08162

ON THE RELATIONSHIP BETWEEN THE FINITE ELEMENT AND FINITE DIFFERENCE METHODS,
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 7A.
W77-08168

SIMULATION OF STREAMFLOW OF FLAMBEAU RIVER AT PARK FALLS, WISCONSIN TO DEFINE LOW-FLOW CHARACTERISTICS,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08172

HYDROLOGIC EFFECTS OF THE TAMPA BYPASS CANAL SYSTEM,
Geological Survey, Tallahassee, Fla. Water Resources Div.
L. H. Motz.
Florida Bureau of Geology, Tallahassee, Report of Investigations No 82, 1975. 42 p, 22 fig, 4 tab, 19 ref.

Descriptors: *Flood control, *Canals, *Diversion, *Florida, *Surface-groundwater relationships, Water levels, Aquifers, Hydrologic aspects, Hydrogeology, Model studies.
Identifiers: *Tampa Bypass Canal(Fla).

Flood water of the Hillsborough River will be diverted at a point upstream from areas of floodplain encroachment in the cities of Tampa and Temple Terrace into nearby McKay Bay by means of the Tampa Bypass Canal System, which is being built through an area east of Tampa. The canal system will breach the underying artesian Floridan aquifer in places where the potentiometric surface is at or near land surface, causing drawdowns over a wide area and diverting flow from other parts of the hydrologic system. A water-control structure would maintain the pool level in the Eureka Springs and Harney Flats areas at a significantly higher level than without the structure, reducing drawdowns in and discharge from the Floridan aquifer in these areas. The canal system, as presently designed, will lower water levels in the Floridan aquifer by 1.0 foot or more over a 50 to 90 square mile area and will result in a discharge from the aquifer into the canal system of about 13 to 22 mg. This discharge will be equal to a decrease in the discharge from other parts of the hydrologic system. By adding an additional control structure near Buffalo Avenue, the affected area could be reduced 45 to 50 percent, and the discharge could be reduced 40 to 45 percent. (Woodard-USGS)
W77-08182

SELECTED HYDROLOGIC DATA, UINTA BASIN AREA, UTAH AND COLORADO,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08183

WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1975,
Geological Survey, Champaign, Ill. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08184

WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1975,
Geological Survey, Carson City. Nev. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08185

ASPHALT-RUBBER MIXTURES FOR SEEPAGE CONTROL,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
R. M. Kalash.
M.S. Thesis, 1977. 81 p, 24 fig, 5 tab, 25 ref, 2 append. OWRT A-075-ARIZ(1). 14-34-0001-7006.

Descriptors: *Seepage control, Water harvesting, *Asphalt, *Rubber, Water conservation, Testing procedures, Physical properties, Permeability, Membrane, Adsorption, Viscosity, Tensile strength, Water yield improvement.
Identifiers: *Waterproof membranes.

A laboratory investigation was made of asphalt-rubber for use in water seepage control applications. Laboratory testing utilized for physical property determinations included viscosity, creep (tensile), ductility (ASTM D113-74), water vapor transmission (ASTM E96-72), Procedure Bw), water absorption (ASTM 570-72), and permeability. The results showed that the asphalt-rubber is relatively impermeable as a membrane. Physical properties of the base asphalt that are increased with the addition of rubber include water absorption and viscosity. The test that exhibited lower physical property values was ductility. Compared with plain asphalt, creep (tensile) test results showed that the rate of deformation of asphalt-rubber mixtures depends on the magnitude of the tensile load applied.
W77-08195

PUMPED STORAGE POTENTIAL OF THE HELLS CANYON AREA,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W77-08196

THE INFLUENCE OF PRECIPITATION ON BIOCHEMICAL OXYGEN DEMAND ON NINE STREAMS IN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geography.
For primary bibliographic entry see Field 5B.
W77-08203

IMPLEMENTATION OF AN OPTIMIZATION MODEL FOR OPERATION OF A METROPOLITAN RESERVOIR SYSTEM,
Southern Methodist Univ., Dallas, Tex. School of Engineering and Applied Science.
M. A. Collins.
Water Resources Bulletin, Vol. 13, No. 1, p 57-70, February 1977. 6 tab, 19 ref. OWRT C-3355(3739)(5).

Descriptors: *Reservoirs, *Operations, *Optimization, *Dynamic programming, *Economic efficiency, Water supply, Computer models, Reservoir releases, Equations, Operations research, Water distribution(Applied), Simulation analysis, *Texas.
Identifiers: *Dallas reservoir system(Tex), *Multiple reservoirs, *Optimal operation, Sectioning search, Water withdrawal, Cost minimization.

A deterministic dynamic programming optimization model with a refining sectioning search procedure is developed and implemented to derive minimum cost withdrawal and release patterns for water supply from a multiple reservoir system serving the Dallas metropolitan area. Applications are made to the four reservoir system operated by this city. A realistic cost structure, including non-linear power consumption, block rate unit power costs, and flow dependent power consumption for intracity water distribution, is utilized. Applications are made to find least cost operating patterns and, as well, by inclusion of a water loss penalty function supply patterns which will reduce evaporation water losses for the Dallas system. The model is viewed as an envolved tool which can be refined and improved as greater familiarity with it is gained by City personnel. (Bell-Cornell).
W77-08211

LOW FLOW ANALYSES OF STREAMS: DETAILS OF COMPUTATIONAL PROCEDURES AND ANNOTATED BIBLIOGRAPHY,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-08219

ALTERNATIVE MEASURES OF RIVER CHANNEL SHAPE AND THEIR SIGNIFICANCE,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 8B.
W77-08241

THE FLOODING OF RIVERS IN THE USSR AND THE MEASURES TAKEN TO CONTROL ICE JAMS (LES INONDATIONS FLUVIALES EN URSS ET LA LUTTE CONTRE LES CRUES CAUSEES PAR LES EMBACLES),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2C.
W77-08246

THE OPERATION OF A FLOOD WARNING NETWORK: ITS USE FOR STUDYING FLASH FLOODS (EXPLOITATION D'UN RESEAU D'ALERTE: SON UTILISATION POUR L'ETUDE DES CRUES BRUTALES),
Division des Resources en Eau, Tunis (Tunisia).
For primary bibliographic entry see Field 2E.
W77-08248

A METHODOLOGY FOR MEASURING FLASH FLOODS (METHODOLOGIE POUR LA MESURE DES CRUES BRUTALES),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
For primary bibliographic entry see Field 2E.
W77-08249

RECENT FLASH FLOODS OF THE DISON BROOK (CRUES BRUTALES RECENTES DU 'RUISSEAU' DE DISON (BELGIQUE): OBSERVATIONS ET PREVISIONS),
Liege Univ. (Belgium), Faculte des Sciences Appliquees.
R. Spronck.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 9-16, 1974. 4 fig, 5 tab, 11 ref.

Descriptors: *Flash floods, *Watersheds(Basins), *Rainfall, *Data collections, Precipitation(Atmospheric), Rainfall disposition, Rainfall intensity, Time, Duration curves, Frequency curves, Frequency, Foreign countries.
Identifiers: *Belgium, *Dison Brook(Belgium).

A large number of short but severe floods have occured in the watershed of the small brook of Dison. Therefore, the authorities have decided to undertake important flood control measures. Engineers affiliated with interested bodies have been enlisted to carry out preliminary studies and to forecast maximum discharges. Furthermore, the legal action brought by certain riverside residents has resulted in several investigations and surveys. Although rainfall measurements in the studied region have been sufficiently numerous, the same cannot be said for maximum discharges, which have been estimated indirectly. In this situation, it is necessary to synthesize the general data available. (See also W77-01933) (Humphreys-ISWS)
W77-08250

IMPROVING INSTITUTIONAL ARRANGEMENTS FOR WATER DEVELOPMENT IN THE STATE OF WASHINGTON: DEVELOPMENTAL AND ENVIRONMENTAL TRADE-OFFS AND CONSTRAINTS,
Washington Univ., Seattle. Inst. of Governmental Research.
For primary bibliographic entry see Field 6E.
W77-08284

REGIONAL SIMULATION OF STREAMFLOW DATA,
North Carolina Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W77-08298

A WATER MANAGEMENT MODEL FOR HIGH WATER TABLE SOILS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-08301

FLOOD MANAGEMENT: WHO BENEFITS AND WHO PAYS,
Massachusetts University, Amherst. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6F.
W77-08303

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS: ECONOMIC, LEGAL, AND FINANCIAL ASPECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W77-08345

INPUT-OUTPUT MODELING IN WATER RESOURCES SYSTEM PLANNING,
Colorado State Univ. Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-08346

CHANNELIZATION: ENVIRONMENTAL, GEOMORPHIC AND ENGINEERING ASPECTS,
North Carolina Univ. at Charlotte. Dept. of Geography and Earth Science.
For primary bibliographic entry see Field 8D.
W77-08352

FROM GOOD HUSBANDRY TO REASONABLE USE: ILLINOIS SURFACE WATER DRAINAGE LAW EVOLVES IN SUBDIVISION CASE,
J. Fry.
Chicago-Kent Law Review, Vol 52, No 1, p 169-83, 1975.

Descriptors: *Illinois, *Surface drainage, *Natural flow doctrine, *Reasonable use, *Diversion, Urban drainage, Relative rights, Agricultural ru-

noff, Urban runoff, Urban sociology, Legal aspects, Riparian rights, Water law, Water rights, Natural flow, Flow, Alteration of flow, Surface runoff, Central U.S.
Identifiers: *Absolute liability, *Common enemy rule, Good husbandry exception.

Until the recent Illinois Supreme Court decision of Templeton v. Huss, the natural flow rule governed the drainage of unwanted surface water. This civil law rule imposed strict liability for injury to another's land resulting from any interference with the natural flow of surface waters. However, since the rule impeded agricultural development the Illinois court declared a good husbandry exception. The exception allowed for an increase in drainage to improve and till higher lands, but strictly prohibited diversion from the natural course of drainage. Proof of diversion was essential to recovery unless the increased drainage flow totally destroyed the lower lands. Huss appears to modify the natural flow rule by implementing a policy of reasonable use, which negates the necessity for proof of diversion. This policy shifts the emphasis from one favoring agricultural development to one in which the interests of both the developer and those harmed by the development are balanced. However, the balancing test will not be applicable in all drainage situations since the holding only involved an urban subdivider's liability, and therefore cannot be extended to agricultural development. This article explores possible factual applications of the holding and interpretation of the test employed. (Anderson-Florida)
W77-08353

A NEW MEASURE OF DAMAGE FOR WRONGFULLY APPROPRIATED WATER,
R. R. Douglas.
Arizona State Law Journal, Vol 1975, p 565-84 (1975). 129 ref.

Descriptors: *Prior appropriation, *Preferences(Water rights), *Remedies, *Penalties(Legal), Legal aspects, Water law, Water rights, Diversion, Legislation, Judicial decisions, Priorities, Water resources development, Management, Alternative water use, Economics, Alternative costs, State governments, Regulation.
Identifiers: Taking(Legal), Presumptive damage rate.

The author examines traditional water law damage measures, and analyzes their strengths and shortcomings, and suggests possible alternatives. While public policy in the west has long approved the prior appropriator, judicially established and enforced damage measures for wrongful deprivations of water have often, at least tacitly, favored illegal takings. Damages for permanent deprivations have not been carried to their logical legal conclusion. The measures for temporary takings have tied water values to land values and have failed to recognize alternative uses of the water right. It is suggested that a water right be valued in its highest and best use and that strict liability should be imposed for the taking or destruction of a water right. Alternatively, a system for establishing a presumptive damage measure at the going rate for water in a given area is proposed. Finally, the equities and convenience of application of the proposed new measures are discussed and contrasted with present damage measures. A presumptive damage rate based on the established cost of water in the area would provide realistic relief for the deprivation of water rights protected by the state's constitution and statutes. (Rieck-Florida)
W77-08361

PUBLIC RIGHTS IN PENNSYLVANIA WATERS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Office of Enforcement.
For primary bibliographic entry see Field 6E.
W77-08362

FLOOD PLAINS FOR OPEN SPACE AND RECREATION.
Bureau of Outdoor Recreation, Washington, D. C.
For primary bibliographic entry see Field 6F.
W77-08374

RESTLESS RIVER: INTERNATIONAL LAW AND THE BEHAVIOR OF THE RIO GRANDE,
Texas Univ. at Austin. Dept. of Geography.
For primary bibliographic entry see Field 6E.
W77-08384

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, VOLUME I-A, TECHNICAL SESSION PRESENTATIONS, AGRICULTURE-ENVIRONMENT.
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W77-08408

ESTIMATING VEGETATIVE BIOMASS FROM LANDSAT-1 IMAGERY FOR RANGE MANAGEMENT,
Nebraska Univ., Lincoln. Conservation Survey Div.
P. M. Seevers, J. V. Drew, and M. P. Carlson.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 1-8, September 1975. 1 fig, 2 tab, 6 ref.

Descriptors: *Estimating, *Range management, *Nebraska, *Remote sensing, *Vegetation regrowth, Vegetation, Agriculture, Measurement, *Biomass, Management, Land use, Mapping, Vegetation establishment, Data processing, Ranges, Grasses, Range grasses, Satellites(Artificial).
Identifiers: *LANDSAT.

Evaluation of LANDSAT-1, band 5 data for use in estimation of vegetative biomass for range management decisions was carried out for five selected range sites in the Sandhills region of Nebraska. Analysis of sets of optical density-vegetative biomass data indicated that comparisons of biomass estimation could be made within one frame, but not between frames without correction factors. There was high correlation among sites within sets of radiance value-vegetative biomass data and also between sets, indicating that comparisons of biomass could be made within one frame, but not between frames without correction factors. There was high correlation among sites within sets of radiance value-vegetative biomass data and also between sets, indicating that comparisons of biomass estimation could be made within one frame, but not between frames without correction factors. There was high correlation among sites within sets of radiance value-vegetative biomass data and also between sets, indicating that comparisons of biomass could be made within and between frames. LANDSAT-1 data were shown to be a viable alternative to currently used methods of determining vegetative biomass production and stocking rate recommendations for Sandhills rangeland. To be of maximum benefit, however, LANDSAT data must be available to decision makers within seven to ten days after acquisition. (See also W77-08408) (Humphreys-ISWS)
W77-08409

DISCRIMINATING COASTAL RANGELAND PRODUCTION AND IMPROVEMENTS WITH COMPUTER AIDED TECHNIQUES,
Lockheed Electronics Co., Inc., Houston, Tex. Aerospace Systems Div.
C. A. Reeves, and D. P. Faulkner.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 9-17, September 1975. 4 fig, 4 ref.

Descriptors: *Range management, *Remote sensing, *Texas, *Coasts, Coastal marshes, Land use, Vegetation, Classification, Data processing, Satellites(Artificial), Ranges, Mapping, Measurement, Computers.
Identifiers: LANDSAT.

This study successfully demonstrated that broad rangeland types can be accurately separated to acceptable levels on LANDSAT bulk data with a computer aided classification procedure. Although this was a pilot study, the output classification could be used by land managers as an input to their rangeland inventory. It was also determined that this first step just 'scratched the surface' in extracting inventory information. A second step to further refine the classification is needed to differentiate improved pastures from the native rangelands. A third step would be to monitor changes as native rangelands are converted to improved pastures and as climatic or seasonal aspects influence these lands. These steps are necessary for the development of a dynamic model based on inputs from remotely sensed data and to predict variations in carrying capacity of rangelands as affected by seasonal variations and range improvement practices. This model could take advantage of the unique multispectral and repeat coverage characteristics of the LANDSAT type satellites. The product of this model have the potential of aiding the range manager to become a more efficient and more accurate decision maker at lower cost. (See also W77-08408) (Humphreys-ISWS)
W77-08410

USEFULNESS OF LANDSAT DATA FOR MONITORING PLANT DEVELOPMENT AND RANGE CONDITIONS IN CALIFORNIA'S ANNUAL GRASSLAND,
Geological Survey, Sioux Falls, S. Dak. EROS Data Center.
D. M. Carneggie, S. D. DeGloria, and R. N. Colwell.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 19-41, September 1975. 5 fig, 10 ref, 3 plate.

Descriptors: *Range management, *Grasslands, *Remote sensing, *California, Monitoring, Ranges, Land use, Vegetation, Growth rates, Growth stages, Mapping, Forages, Plant growth, Data processing, Satellites(Artificial).
Identifiers: LANDSAT.

LANDSAT imagery and magnetic tapes were analyzed to determine their utility for monitoring and assessing range condition within the annual grassland in California. LANDSAT data, forage samples at selected range sites, and ground spectral reflectance data were all examined in order to verify the usefulness of LANDSAT imagery (1) for determining range condition and growth stage, and (2) for assessing relative forage production. The results of ground spectral reflectance data compared with green forage production data showed a close correspondence between spectral reflectance ratios and green biomass. Changes in ground spectral reflectance data also correspond with observed changes in growth stage and condition of the forage species. Moreover, LANDSAT spectral reflectance data provides quantitative signals of significant growth stages in the development of annual forage species. Relative differences in forage production are also indicated by the LANDSAT spectral radiance data. Provided that cloud-free LANDSAT coverage is available during critical growth stages of the annual plants,

LANDSAT data can be used to: (1) assess differences in range condition on a regional basis; (2) compare differences in production between grazing regions for a given year; and (3) compare differences in condition and production for a given site between years. Moreover, the length of the green feed period can be determined; and this information, along with ground samples of forage production and climatic data, can provide the inputs to simple models for estimating forage production or for determining the remaining length of the green feed period beyond a definable threshold date late in the growth cycle of the annuals. (See also W77-08408) (Humphreys-ISWS)
W77-08411

MONITORING VEGETATION CONDITIONS FROM LANDSAT FOR USE IN RANGE MANAGEMENT,
Texas A and M Univ., College Station.
R. H. Haas, D. W. Deering, J. W. Rouse, Jr., and J. A. Schell.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 43-52, September 1975. 1 fig, 1 tab.

Descriptors: *Range management, *Remote sensing, *Vegetation, *Texas, *Great Plains, Monitoring, Growth stage, Forages, Plant growth, Analytical techniques, Mapping, Ranges, Satellites(Artificial), Statistics.
Identifiers: LANDSAT.

A summary of the LANDSAT Great Plains Corridor projects and the principal results were presented. Emphasis was given to the use of satellite acquired phenological data for range management and agri-business activities. A convenient method of reducing LANDSAT MSS data to provide quantitative estimates of green biomass on rangelands in the Great Plains was explained. A Transformed Vegetation Index (TVI6), which is useful for detection and quantitative assessment of green biomass differences, was developed. Detailed statistical analysis showed that the TVI6 parameter, along with limited weather data, is adequate to quantatively assess rangeland feed conditions. The ability to estimate green biomass in increments of 250 to 300 kg/ha with a 95% probability from TVI6 data and readily available weather data was indicated. (See also W77-08408) (Humphreys-ISWS)
W77-08412

UTILIZATION OF LANDSAT IMAGERY FOR MAPPING VEGETATION ON THE MILLIONTH SCALE,
Kansas Univ., Lawrence, Space Technology Labs.
For primary bibliographic entry see Field 7C.
W77-08413

ARE CLEAR-CUT AREAS ESTIMATED FROM LANDSAT IMAGERY RELIABLE,
Pacific Forest Research Centre, Victoria (British Columbia).
Y. J. Lee.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 105-114, September 1975. 7 fig, 1 tab, 3 ref.

Descriptors: *Clear-cutting, *Lumbering, *Canada, *Remote sensing, Forest management, Areal, Estimating, Data processing, Satellites(Artificial), Mapping, Surveys.
Identifiers: LANDSAT.

The reliability of LANDSAT imagery for estimation of clear-cut areas was evaluated by comparison with data obtained from high-altitude photos, logging historical maps, and from field inspections. A mature forest, owned by Pacific Logging Company, was selected as a test site because of its continuous clear-cut operation. The forest is about 50 km northwest of Victoria, British Columbia, Canada, and consists of 9092 ha. Ground truth was based on high-altitude photos and the Pacific Logging Company Logging History Map for 1973, with a scale of 1:63,360. LANDSAT imagery from band 5, recorded by multispectral scanner, was obtained on September 4, 1972 and on August 12, 1973. Areas clear-cut within the past year were overestimated by 12.9% (105 ha), those clear-cut 1-year or more by 2.2% (76 ha), whereas uncut mature timber was underestimated by 3.6% (176 ha). Three clear-cut areas were missed in the company map and two in the LANDSAT enhancement. The difference between area estimates was significant when all 26 areas were included, but not when 2 overestimated areas were excluded from the analysis. The ability to identify the status and to estimate the size of current and past clear-cutting activity has been definitely established. The acreages for clear-cut and uncut mature timber determined from LANDSAT imagery are reliable, and the LANDSAT color enhancement technique is a useful tool in up-dating clear-cut areas for long-term planning in forest management. (See also W77-08408) (Humphreys-ISWS)
W77-08416

OPERATIONAL CONSIDERATIONS FOR THE APPLICATION OF REMOTELY SENSED FOREST DATA FROM LANDSAT OR OTHER AIRBORNE PLATFORMS,
Saint Regis Paper Co., Jacksonville, Fla. Southern Timberlands Div.
For primary bibliographic entry see Field 7C.
W77-08417

TIMBER TYPE SEPARABILITY IN SOUTHEASTERN UNITED STATES ON LANDSAT-1 MSS DATA,
Lockheed Electronics Co., Inc. Houston, Tex.
E. P. Kan, and R. D. Dillman.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 135-157, September 1975. 7 fig, 3 tab, 19 ref. NASA NAS 9-12200.

Descriptors: *Forest management, *Pulp and paper industry, *Remote sensing, *Southeast U.S., *Texas, Mapping, Lumber, Lumbering, Softwood, Hardwood, Classification, Data processing, Analytical techniques, Photogrammetry, Forestry, Forests, Land use, Industrial crops, Satellites(Artificial), Vegetation regrowth.
Identifiers: LANDSAT.

A quantitative, computer-aided study was made on the spectral separability of timber types and condition classes in the Southeastern United States, using LANDSAT-1 multispectral scanner data. Conclusions were obtained on accuracies at different levels of mapping detail and the choice of parameters affecting mapping accuracies, such as spectral bands, number of bands, and seasons of data. It was concluded that LANDSAT-1 could be used effectively to discriminate the gross forest features of softwood, hardwood, and regeneration. The only significant detectable age difference would be between an established forest and a young (or denuded) forest, i.e., regeneration. The red or near infrared bands would be better for discrimination; phenological early and late spring data would be better than winter (summer and autumn data were not available for analysis). A temporal analysis would be superior to single-season analysis. Lastly, two spectral bands would be most cost effective for computer analysis. The study site, Sam Houston National Forest of East Texas, is a typical forest in the Flatwoods Zone, Southern Region, U.S. Forest Service. The widely accepted computer scheme of training-field, maximum likelihood classifier was employed, while cross-classification accuracies and divergence measures were computed to evaluate timber type separability. (See also W77-08408) (Humphreys-ISWS)
W77-08418

MAPPING OF THE WILDLAND FUEL CHARACTERISTICS OF THE SANTA MONICA MOUNTAINS OF SOUTHERN CALIFORNIA,
ESL, Inc., Sunnyvale, Calif. Earth Resources Technology Applications.
For primary bibliographic entry see Field 7C.
W77-08419

COMPUTER ANALYSIS AND MAPPING OF GYPSY MOTH DEFOLIATION LEVELS IN PENNSYLVANIA USING LANDSAT-1 DIGITAL DATA,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7C.
W77-08420

COMPUTER IMPLEMENTED CLASSIFICATION OF VEGETATION USING AIRCRAFT ACQUIRED MULTISPECTRAL SCANNER DATA,
National Aeronautics and Space Administration, Bay Saint Louis, Miss. Earth Resources Lab.
W. G. Cibula.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 183-201, September 1975. 11 fig, 3 tab, 8 ref.

Descriptors: *Forest management, *Remote sensing, *Mapping, *Mississippi, Aerial photography, Forests, Vegetation, Spatial distribution, Land use, Plant groupings, Classification, Trees, Canopy, Analytical techniques, Training.

The use of aircraft 24-channel multispectral scanner data in conjunction with computer processing techniques to obtain an automated classification of plant species associations was discussed. The classification of various plant species associations was related to information needed for specific applications. In addition, the necessity of multiple selection of training fields for a single class in situations where the study area consists of highly irregular terrain was detailed. It was mentioned that a single classification will be illuminated differently in different areas, resulting in the existence of multiple spectral signatures for a given class. These different signatures result because different qualities of radiation upwell to the detector from portions that have differing qualities of incident radiation. Techniques of training field selection were outlined, and a classification obtained from a natural area in Tishomingo State Park in north Mississippi was presented. (See also W77-08408) (Humphreys-ISWS)
W77-08421

WILDLIFE MANAGEMENT BY HABITAT UNITS--A PRELIMINARY PLAN OF ACTION,
C. D. Frentress, and R. G. Frye.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 245-262, September 1975. 4 fig, 34 ref, 2 append.

Descriptors: Wildlife habitats, *Remote sensing, *Texas, *Land use, Mapping, Vegetation, Trees, Classification, Management, Wildlife management, Environment, Maps, Spatial distribution, Oak trees, Juniper trees, Aerial photography, Satellites(Artificial), Analytical techniques.
Identifiers: *Travis County(Tex), LANDSAT.

The Texas Parks and Wildlife Department recognizes the need for managing populations of wildlife species by defined area units. A data stratification scheme is required to investigate species populations for the purpose of identifying unit boundaries. Vegetation type maps are commonly used to stratify data collection points and, subsequently to delineate boundaries of homogeneous populations. Procedures for yielding vegetation type maps were developed, using LANDSAT data and a computer assisted classification analysis (LARSYS) developed by Purdue University. Ground cover in Travis County, Texas, was classified on two occasions, using a modified version of the unsupervised approach to classification. The first classification produced a total of 17 classes. Examination revealed that further grouping was justified. A second analysis produced 10 classes which were displayed on printouts which were later colorcoded. The final classification was 82% accurate. While the classification map appeared to satisfactorily depict the existing vegetation, two classes were determined to contain significant error. A review of the procedures indicated that the major sources of error could have been eliminated by stratifying cluster sites more closely among previously mapped soil associations that are identified with particular plant associations. This could have served as a safeguard to prevent overlooking a vegetational class. (See also W77-08408) (Humphreys-ISWS)
W77-08426

THE RATIONALE FOR ATTEMPTING TO DEFINE SALT MARSH MOSQUITO-BREEDING AREAS IN GALVESTON COUNTY BY REMOTE SENSING THE ASSOCIATED VEGETATION.
Lockheed Electronics Co., Houston, Tex.
G. K. Arp.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 289-299, September 1975. 2 tab, 23 ref.

Descriptors: *Salt marshes, *Insect control, *Mosquitos, *Remote sensing, *Texas, Mapping, Environment, Grasses, Vegetation, Marsh plants, Aerial photography, Entomology, Surveys, Wetlands, Aquatic plants.
Identifiers: *Galveston County(Tex).

This paper concerned the rationale for attempting to define salt marsh mosquito breeding areas in Galveston County, Texas. It concluded a botanical survey of the marsh plant communities, their relationship to flooding, and their exposure to salt water. Particular emphasis was given to Distichilis spicata, a widespread marsh grass. Evidence suggests that breeding areas of Aedes sollicitans, salt marsh mosquitos, are associated with Distichlis, and that both species respond to similar ecological conditions in the salt marsh. Analysis of the Galveston salt marsh community revealed five major plant associations, ranging from sea level to 91 cm (3 ft) in elevation. The associations are Spartina alterniflora, Distichlis spicata, Spartina patens, salt flats, and Spartina spartinae. From aircraft overflights at various altitudes, characteristics that identify Distichlis spicata and Spartina patens were defined. These characteristics may be used in identifying the associated mosquito-breeding areas either visually or by remote sensing, (See also W77-08408) (Humphreys-ISWS)
W77-08428

A COMPARATIVE INTERREGIONAL ANALYSIS OF SELECTED DATA FROM LANDSAT-1 AND EREP FOR THE INVENTORY AND MONITORING OF NATURAL ECOSYSTEMS,
Earth Satellite Corp., Berkeley, Calif.
For primary bibliographic entry see Field 7C.
W77-08436

REMOTE SENSING APPLICATIONS IN KANSAS,
Kansas Univ., Lawrence. Space Technology Labs.
B. G. Barr, J. C. Coiner, and D. L. Williams.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agricultural-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 569-584, September 1975. 8 fig, 7 ref. NASA NGL 17-004-024.

Descriptors: *Resources development, *Remote sensing, *Kansas, *Land development, Irrigation, Aerial photography, Project planning, Land use, Reservoirs, Highways, Satellites(Artificial), Planning, City planning, Cities, Urban mapping.
Identifiers: LANDSAT.

The Satellite Applications Laboratory of the University of Kansas Space Technology Center has carried out since April 1972 a program designed to assist decision makers in local, state, and regional agencies in the application of remote sensing techniques to their activities. To date, twenty projects have been initiated in support of 29 separate municipal, county, regional, and state agencies or entities. Several data products have been prepared for the use of these agencies based on LANDSAT imagery: high altitude color, color infrared, and multispectral black and white photography; and imagery from a Hasselblad camera cluster flown in the University's aircraft. Projects organized in the six sequential phases of contact, project definition, project initiation, on-going project, project completion, and continuing support were designed to demonstrate the utility of remote sensing in the context of the user agency. After reviewing these phases, four projects were detailed to illustrate the methods and results of applications projects. Two of these projects have resulted in single user decisions during 1974 related to: (1) completion of an interstate highway and cancellation of construction plans for a large reservoir, and (2) zoning changes around a smaller reservoir. Two on-going projects were also discussed: (1) a multi-user project related to the expansion of irrigation in Kansas, and (2) a program of activities leading to incorporation of remote sensing into the data acquisition methods of Kansas City, Kansas. (See also W77-08408) (Humphreys-ISWS)
W77-08437

SELECTIVE WITHDRAWAL AND HEATED WATER DISCHARGE: INFLUENCE ON THE WATER QUALITY OF LAKES AND RESERVOIRS PART I - SELECTIVE WITHDRAWAL,
Wisconsin Univ. -Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5G.
W77-08447

A FINITE ELEMENT MODEL TO DETERMINE THE EFFECT OF LAND-USE CHANGES ON FLOOD HYDROGRAPHS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-08450

RECLAMATION AND USE OF DISTURBED LAND IN THE SOUTHWEST.
For primary bibliographic entry see Field 5G.
W77-08452

DETERMINATION OF WATER-RESOURCES POLICIES IN ARID LANDS,
For primary bibliographic entry see Field 6B.
W77-08453

DRAINABLE POROSITY EVALUATION AND ITS RELATIONSHIP TO HYDRAULIC CONDUCTIVITY AND EXCHANGEABLE CATIONS UNDER DIFFERENT BULK DENSITIES,
Alexandria Univ. (Egypt). Dept. of Soil and Water Sciences.
M. I. Fahmy, M. El-Said, and Y. Z. El-Shafei.
Alexandria Journal of Agricultural Research, Vol. 23, No. 1, p 183-197, April, 1975. 8 fig, 2 tab, 16 ref.

Descriptors: *Moisture tension, *Hydraulic conductivity, *Porosity, *Drainage, *Bulk density, Conductivity, Cations, Density, Physical properties, Soil types, Sands, Clays, Saline soils, Salinity, Clay loam.
Identifiers: *Drainage porosity, Egypt.

Drainage is an important practice for normal agriculture and for reclaiming saline soils. A study was conducted to find a feasible method for evaluating drainable porosity by implementing the moisture-tension curve of soil, and to investigate its relationship to hydraulic conductivity, bulk density and exchangeable cations of different soils of Egypt. A clay soil, a calcareous soil, and sandy soil from different regions in Egypt were planted in corn and cotton and measurements taken. The results are presented. The relationship between drainable porosity and hydraulic conductivity showed an exponential proportionality for the disturbed clay soils but a linear one for the disturbed calcareous and sandy soils. It has been found that drainage porosity should be maintained at higher than ten percent to yield high production. Compaction reduced both values of drainable porosity and hydraulic conductivity for either disturbed or undisturbed sample. (Jamail-Arizona).
W77-08461

COMPUTER PROGRAM FOR RESERVOIR-WATER BUDGETS,
Agricultural Research Service, Chickasha Okla. Southern Great Plains Watershed Research Center.
R. R. Schoof.
USDA Publication No. ARS-S-161, April 1977. 32 p, 6 fig, 3 tab, 8 append.

Descriptors: *Runoff, *Reservoirs, *Flow control, *Computer programs, Discharge(Water), Base flow, Evapotranspiration, Hydrology, Seepage, Spillways, Dam, Inflow, Water storage, *Hydrologic budget.
Identifiers: Floodwater-retarding reservoirs, Reservoir water budget, FORTRAN IV.

A computer program for computing reservoir-water budgets is presented. The program was designed for floodeater-retarding reservoirs, but the system is applicable to all water-storage reservoirs where there is a need for computation and tabulation of water input, output, and change in storage. Discussions of the computing procedure, input and output formats, and data-editing routine are included. Flow charts of the main program and two of the subroutines, complete FORTRAN listings, and symbol definitions are also included. (ARS).
W77-08464

WATER-RESOURCES INVESTIGATIONS IN SOUTH DAKOTA, 1976.
Geological Survey, Huron, S.D. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08468

FLOODS OF NOVEMBER 12, 1974, IN THE CHARLOTTE AMALIE AREA, ST. THOMAS, U.S. VIRGIN ISLANDS,
Geological Survey, Miami, Fla. Water Resources Div.; and Geological Survey, San Juan (Puerto Rico). Water Resources Div.
For primary bibliographic entry see Field 7C.

W77-08470

TIME OF TRAVEL OF SOLUTES IN THE EAST FORK TRINITY RIVER, NOVEMBER 1975; AND ELM FORK TRINITY RIVER, DECEMBER 1975; TRINITY RIVER BASIN, TEXAS,
Geological Survey, Fort Worth, Tex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08472

HYDROLOGIC UNIT MAP--1974, STATE OF TEXAS.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08474

HYDROLOGIC UNIT MAP--1974, STATE OF OKLAHOMA.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08475

HYDROLOGIC UNIT MAP--1974, STATE OF SOUTH DAKOTA.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08476

HYDROLOGIC UNIT MAP--1974, STATE OF KANSAS.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08477

ACTIVITIES OF THE WATER RESOURCES DIVISION IN CALIFORNIA.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08479

WATER RESOURCES DATA FOR CONNECTICUT, WATER YEAR 1975,
Geological Survey, Hartford, Conn. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08480

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1975.
Geological Survey, Albany, N.Y. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08485

PREDICTION MODELS OF REAERATION RATE FOR MOUNTAIN CREEKS,
Utah State Univ. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5G.
W77-08501

FOREST FERTILIZATION AND WATER QUALITY IN THE NORTH CAROLINA PIEDMONT,
North Carolina State Univ., Raleigh. School of Forest Resources.
For primary bibliographic entry see Field 5B.
W77-08508

FRACTIONATION AND CONTROL OF IRON IN CHANNELIZED AND SWAMP DRAINAGE STREAMS IN NORTH CAROLINA,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W77-08510

DESIGN AND OPERATION OF RAIN RETENTION BASINS (ENTWURF UND BETRIEB VON REGENRUCKHALTEBECKEN),
For primary bibliographic entry see Field 8A.
W77-08547

4B. Groundwater Management

DEEP WATER RESOURCES OF THE LIMESTONES OF FRANCHE-COMTE: PROBLEMS OF QUANTITY AND QUALITY, (IN FRENCH),
M. Dreyfuss.
Ann Sci Univ Besancon Geol. 18, p87-95, 1973.

Descriptors: Water quality, *Limestone, Groundwater, *Water pollution sources, *Groundwater resources, Water sources, Water supply, *Chemical compounds.
Identifiers: *France(Franche-Comte).

There are large reserves of deep water in the limestones of Franche-Domte, France, of the order of several billion m3 or a volume about equivalent to that yielded by the rivers yearly, but the exploitation of these reserves presents several difficulties. Bores placed haphazardly in a favorable zone but not reaching a subterraneous circulation yield a limited output. As to quality, the water contains many stable soluble chemical compounds which may at times be dangerous. The plateaux and mountains above these water sources are inhabited; there are agricultural enterprises, industry and tourism. The zones of access by possibly polluted water additions must be avoided, and the quality of the water for human consumption must be carefully studied.--Copyright 1975, Biological Abstracts, Inc.
W77-08122

WELLS, PUMPING PLANTS, CONDUITS AND STREAMS,
For primary bibliographic entry see Field 6E.
W77-08154

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1975,
Geological Survey, Indianapolis, Ind. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08162

SELECTED WATER-LEVEL RECORDS FOR WESTERN OKLAHOMA, 1950-1975,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08163

GROUND-WATER DATA FOR 1974-75 IN JOSHUA TREE NATIONAL MONUMENT, CALIFORNIA,
Geological Survey, Menlo Park, calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08164

SUBSURFACE-TEMPERATURE DATA FOR SOME WELLS IN WESTERN UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08166

WATER RESOURCES OF THE MYAKKA RIVER BASIN AREA, SOUTHWEST FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
B. F. Joyner, and H. Sutcliffe, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 768, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 76-58, December 1976. 87 p, 18 fig, 7 tab, 38 ref.

Descriptors: *Groundwater resources, *Surface waters, *Water quality, *Florida, Aquifer characteristics, Water table aquifers, Artesian aquifers, Water wells, Water yield, Water supply, Chemical analysis, Groundwater movement, Surface-groundwater relationships, Streamflow, Lakes.
Identifiers: *Myakka River basin(Fla).

Ground water in the Myakka River basin area of southwest Floria is obtained from a water-table aquifer and from five zones in an artesian aquifer. Wells in the water-table aquifer yield generally less than 50 gpm and dissolved solids concentration is less than 500 mg/liter except in coastal areas and the peninsula southwest of the Myakka River estuary. Wells in the Venice area that tap zone 1 usually yield less than 30 gmp. The quality of water is good except in the peninsula area. Zone 2 is the most highly developed aquifer in the heavily populated coastal areas. Wells yield as much as 200 gpm. In most areas, water is of acceptable quality. Wells that tap zone 3 yield as much as 500 gmp. Fluoride concentration ranges from 1 to 3.5 mg/liter. Zone 4 yields as much as 1,500 gpm to large diameter wells. Except in the extreme northeastern part of the area water from zone 4 usually contains high concentrations of fluoride and sulfate. Zone 5 is the most productive aquifer in the area, but dissolved solids concentrations usually are too high for public supply except in the extreme northeast. Surface water derived from natural drainage is of good quality except for occasional high color in summer. Most of the streams in the Myakka River basin area have small drainage basins, are of short channel length, and do not yield high volumes of flow. During the dry season, streamflow is maintained by groundwater discharge, and, as a result, chloride, sulfate, and dissolved solids concentrations and the hardness of the water are above drinking water standards for some streams. (Woodard-USGS)
W77-08167

U S GEOLOGICAL SURVEY, WATER RESOURCES DIVISION, RADIOCARBON MEASUREMENTS I,
Geological Survey, Reston, Va. Water Resources Div.
F. J. Pearson, Jr., and M. Bodden.
Radiocarbon, Vol 17, No 1, p 135-148, 1975. 5 tab, 31 ref.

Descriptors: *Radioactive dating, *Groundwater, *Carbon radioisotopes, Analytical techniques, Sampling, Washington, Nevada, California, Arkansas, Texas, Africa.
Identifiers: *Kenya.

Results of C-14 analyses of dissolved carbonate from 121 water samples are reported. Hydrologic systems from which results from 10 or more wells are given include, Pasco Basin, south-central Washington; Southern Great Basin, Nevada and California; Arkansas Hot Springs; Edwards Aquifer, Texas; and North Eastern Province, Kenya. (Woodard-USGS)
W77-08169

GROUND-WATER RESOURCES OF VANDERBURGH COUNTY, INDIANA,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, St. Paul, Minn. Water Resources Div.
L. W. Cable, and R. J. Wolf.

Indiana Department of Natural Resources, Indianapolis, Bulletin No 38 of the Division of Water, 1977. 37 p, 19 fig, 3 plates, 3 tab, 17 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Aquifer characteristics, *Water quality, *Indiana, Hydrologic data, Hydrogeology, Water yield, Transmissivity, Geophysics, Maps, Groundwater discharge, Water analysis, Chemical analysis.
Identifiers: Vanderburgh County(Ind).

Sandstone units of Middle and Late Pennsylvanian age and sand and gravel of Quaternary age are the source of fresh (1,000 parts per million of dissolved solids or less) ground water in Vanderburgh County, Indiana. Aquifers occur in older rocks, but, owing to their depth, the water is too highly mineralized to be useful for most purposes. Sand and gravel deposits of the Ohio River Valley are the best aquifer in Vanderburgh County. These deposits form a single hydrologic unit referred to as the Ohio River valley aquifer. This is the only aquifer in the county capable of accommodating high-yield wells. Properly constructed wells in this aquifer could easily yield 1,000 gallons per minute and more. Transmissibilities in the Ohio River valley aquifer range from 120,000 gallons per day per foot and less near the valley walls to more than 200,000 gallons per day per foot in the thickest parts of the aquifer. The water in the aquifer is predominately a very hard calcium bicarbonate type having a high iron content. (Woodard-USGS)
W77-08170

GROUND WATER IN THE SAN JUAN METROPOLITAN AREA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div.
H. R. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 414/AS, Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 41-75, July 1976. 34 p, 15 fig, 3 tab, 24 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *Puerto Rico, Water wells, Water supply, Water utilization, Surface-groundwater relationships.
Identifiers: *San Juan area(PR).

Ground water in the San Juan, Puerto Rico, area has played a declining role in water supply since the completion of the Lofza reservoir project in the early 1950's. Ground-water potential is limited because of the small size of the aquifers and susceptibility to seawater intrusion. Of the 30 million gallons per day about half is being used. Two water-bearing zones are present: an artesian aquifer, composed of the San Sebastian Formation and the lower Cibao Formation that yields an average of 244 gallons per minute to wells; and, a water-table aquifer composed of the upper Cibao Formation and the Aguada and Aymamon Limestones that yields an average of 515 gallons per minute to wells. Ground water is less mineralized inland and in the artesian aquifer. Mean concentrations of dissolved solids are 363 milligrams per liter for the artesian aquifer and 525 milligrams per liter for the water-table aquifer. (Woodard-USGS)
W77-08173

GEOHYDROLOGY OF THE ENGLISHTOWN FORMATION IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-08175

GEOHYDROLOGY OF THE ALBIN AND LA GRANGE AREAS, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
W. B. Borchert.
Water-Resources Investigations 76-118 (Open-File Report), November 1976. 72 p, 20 fig, 4 tab, 27 ref.

Descriptors: *Aquifer characteristics, *Water level fluctuations, *Irrigation wells, *Observation wells, *Pumping, Drawdown, Groundwater recharge, Hydrogeology, Well data, Borehole geophysics, Surface-groundwater relationships, Groundwater movement, Water quality, Chemical analysis, Subsurface mapping, *Wyoming.
Identifiers: Southeastern Wyoming.

The Albin and La Grange areas in southeastern Wyoming are two adjoining different hydrologic areas. Since ground water is the only source of water for irrigation in the Albin area, 34 irrigation wells have been drilled since 1968 and developed in conjunction mostly with center-pivot sprinkler systems that in 1974 irrigated about 6,980 acres. Most irrigation wells are developed in channel deposits of the Ogallala Formation of late Miocene. Water levels in parts of these channel deposits have declined about 4 to 7 feet since pumping began in 1968. In the La Grange area, lands are irrigated by surface water, ground water or a combination of both. The best producing wells are those completed in both the Brule Formation of Oligocene age and the alluvium. Secondary porosity was located and elevated in the Brule using caliper logs, an Acoustic Borehole Televiewer and geophysical logs. From the spring of 1970 to the spring of 1974, hydrographs of wells in parts of the La Grange area show water-level rises of about 5 feet resulting from the net effect of surface-water recharge and groundwater pumpage. Throughout the La Grange area no significant annual water-table declines have occurred. It is unlikely that irrigation wells pumping near Horse Creek have caused significant direct streamflow depletion. (Woodard-USGS)
W77-08176

GROUND-WATER BASIC DATA FOR RAMSEY COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08177

HYDROLOGIC EFFECTS OF THE TAMPA BYPASS CANAL SYSTEM,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-08182

SELECTED HYDROLOGIC DATA, UINTA BASIN AREA, UTAH AND COLORADO,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08183

WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1975,
Geological Survey, Champaign, Ill. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08184

WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1975,
Geological Survey, Carson City. Nev. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08185

EFFECT OF DIP ON THE SUBSURFACE STORAGE OR DISPOSAL OF FLUID IN SALINE AQUIFERS,
Louisiana Water Resources Research Inst., Baton Rouge.
J. A. D'Amico.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 747, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, August 1975. 103 p, 15 fig, 8 tab, 21 ref, 4 append. OWRT A-034-LA(2).

Descriptors: *Groundwater, *Water storage, Hydraulics, Water supply, Groundwater recharge, Injection wells, Recharge wells, Artificial recharge, Aquifers, Disposal, Computer programs.
Identifiers: *Saline aquifers, *Underground storage, *Dipping system(Wells).

Previous investigators have established the feasibility of utilizing horizontal saline aquifers for cyclic storage of fresh water and have shown that the recovery efficiency in a dipping system is lower than in a similar horizontal system. The present study was made to determine the effect of dip on the configuration, migration, and recovery of a 'bubble' of injected fresh water in a dipping aquifer of infinite areal extent utilizing a three-dimensionl rectangular miniaquifer. Experimental results showed that the lower surface of the injected bubble would not migrate and would remain radial. However, the upper surface would slide updip for all cases investigated. Dip angles ranged from 5-20 degrees. With increasing dip angle and injected bubble size the velocity of the upper surface increased, although the lower surface neither moved nor grew. For aquifers dipping at 5 degrees or less the velocity of migration of the bubble's upper surface may be approximated by a constant multiplied by the sine of the dip angle. An existing computer program was adapted to describe the three-dimensional case. The results are applicable to miscible displacement processes wherever a density difference exists between native and injected fluids in a dipping aquifer. Subsurface disposal of water-soluble wastes and enhanced recovery operations in the petroleum industry are two such examples outside the field of subsurface storage of fresh water.
W77-08204

EFFECT OF VISCOSITY RATIO ON THE RECOVERY OF FRESH WATER STORED IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
B. K. Agrawal.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 746, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, December 1975. 80 p, 15 fig, 6 tab, 26 ref, 3 append. OWRT(3) A-034-LA.

Descriptors: *Groundwater, *Water storage, Hydraulics, Water supply, Groundwater recharge, Injection wells, Recharge wells, Artificial recharge, Aquifers, *Viscosity, Computer programs.
Identifiers: *Saline aquifers, Underground storage.

Previous studies have shown the technical feasibility of storing fresh water in saline aquifers where the viscosities of injected and native fluids are essentially identical. This study was on the effect of viscosity difference on the extent of mixing between injected and native fluids in two artificially consolidated sandstones of differing thicknesses. When a lower viscosity fluid miscibly displaces a higher velocity fluid, it tends to finger into the higher viscosity fluid region. This causes an irregular boundary and larger interface between the two, with increased mixing. In a cyclic operation of injection/storage/production of a less viscous fluid in a medium containing a more viscous fluid, fingers during injection were found

to retrace themselves during production. During a cyclic process the amount of mixing which occurs may be described in terms of an effective dispersivity which is a function of viscosity ratio. This coefficient may be used in existing computer programs to predict the portion of uncontaminated injected fluid to be later recovered. This recovery efficiency is approximately the same no matter which fluid is the more viscous. The effective dispersivity may be used together with the arithmetic average viscosity to predict the performance of a cyclic process in which the fluids differ in density and viscosity. The results of this study are particularly applicable to the underground storage of heat in the form of hot water.
W77-08205

DIAGENESIS OF MIDDLE AND UPPER EOCENE CARBONATE SHORELINE SEQUENCES, CENTRAL FLORIDA.
Florida Univ., Gainesville. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W77-08208

MINIMIZING COSTS IN WELL FIELD DESIGN IN RELATION TO AQUIFER MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. A. Bostock, E. S. Simpson, and T. G. Roefs.
Water Resources Research, Vol. 13, No. 2, p 420-426, April 1977. 4 fig, 8 ref. OWRT A-024-ARIZ(10).

Descriptors: *Wells, *Costs, *Optimization, *Economic efficiency, Probability, Demand, Pumping, *Aquifers, Annual, Water table, Methodology, Decision making, Seasonal, Groundwater, Mathematical models, Operations research.
Identifiers: *Cost minimization, *Well fields, Probability density function.

For a given production rate from a proposed well field, well construction and replacement costs decrease with fewer and larger wells spaced farther apart, while pumping lift costs increase. A method for minimizing the sum of these two costs is presented which uses a two-dimensional uniform grid of wells to select a combination of well spacing and well capacity that minimizes costs for a given demand. Uncertainty in field permeability at future well sites is treated by averaging the possible outcomes over all wells in accord with a probability density function for permeability values. The method assumes an annual cycle whereby the water table declines owing to pumping in a dry season and is recharged to its initial state during a wet season. It is concluded that the method is suited by Bayesian decision theory application and that it is independent of the mathematical theory for groundwater flow used to predict aquifer response in the aquifer cell model. (Bell-Cornell)
W77-08214

APPLICATIONS OF SURFACE RESISTIVITY METHODS,
Alberta Univ., Edmonton. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W77-08244

EFFECT OF DIP ON THE STORAGE OF FRESH WATER (OR THE DISPOSAL OF WASTE) IN A SALINE AQUIFER,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
P. T. Tate.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 915, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, May 1976. 76 p, 9 fig, 5 tab, 30 ref, 2 append. OWRT A-034-LA(4).

Descriptors: Groundwater, *Water storage, Hydraulics, Water supply, *Groundwater recharge, *Injection wells, Recharge wells, Artificial recharge, Aquifers, Waste water disposal, *Groundwater movement.
Identifiers: Saline aquifers, *Dip angle(Aquifers).

The economic and technical feasibility of storing fresh water in a saline aquifer has been studied by numerous investigators. Computational procedures exist for predicting the recovery efficiency in a homogeneous, horizontal, isotropic aquifer of infinite aeral extent. This work studied the migration and recovery efficiency of a stored bubble of fluid in a non-horizontal aquifer. The experiments consisted of injecting a fluid of equal viscosity but greater density than the native fluid into an inclined synthetic sandstone miniaquifer. The fluid was injected, allowed to undergo a period of static storage, and then produced. The instantaneous composition of the produced stream was monitored to determine when the concentration of native fluid reached 3% (breakthrough). During static storage the frontal positions of both the upper and lower traces were recorded. The recovery efficiency was lower in a dipping aquifer than in ahorizontal aquifer. The recovery efficiency became less with greater dip angles and longer static storage times. The larger bottom trace of the injected bubble migrated downdip and its diameter increased during static storage. The velocity of migration of the larger trace could be measured and approximated by an equation, while for most experimental runs the movement of the smaller trace was indeterminate. Results of this study are applicable to fresh water storage or waste disposal as well as other miscible displacements in inclined aquifers.
W77-08288

WATER-LEVEL DECLINE AND PUMPAGE IN DEEP WELLS IN THE CHICAGO REGION, 1971-1975,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2F.
W77-08302

AN INVESTIGATION OF THE TECHNICAL AND ECONOMIC FEASIBILITY OF USING LOW TEMPERATURE GEOTHERMAL SOURCES IN COLORADO,
Environmental Consulting Services, Inc., Boulder, Colo.
L. W. Nannen, F. Kreith, and R. E. West.
Energy, Vol. 1, No. 2, p 179-216, March, 1977. 9 fig, 12 tab, 31 ref, 3 append.

Descriptors: *Colorado, *Economic feasibility, *Thermal water, *Heating, *Geothermal studies, Hot springs, Fuels, Piping systems(Mechanical), Wells, Heat transfer, Injection wells, Waste water disposal, Corrosion, Corrosion control, Scaling, Computer models, Public rights, Public utilities, Political aspects, Economic impact, *Feasibility studies.
Identifiers: *Glenwood Springs(Colo), *Low-temperature geothermal sources, Fuel consumption data, Geothermal space heating system design, Heat exchangers, Downhole heat exchangers, Public opinion surveys.

All the technology necessary to use low temperature geothermal sources for heating homes and buildings now exists, has been put into use in various places throughout the world, and is dependent basically only on economic and political decisions for its application in areas where thermal water is present. This report contains results of the first phase of an engineering/economic feasibility study for use of low temperature geothermal sources at Glenwood Springs, Colorado. Conversion costs of building systems, transport distance of geothermal water, and quality of the water still require further study, but it can be concluded that geothermal heat could be delivered to the area for $2 to $5 per million BTU, a price competitive with that of natural gas heating should the latter continue to escalate. It would be considerably less expensive than solar conversion at present. Besides providing a historical overview of low temperature geothermal resource development worldwide, the report raises legal and political issues pertinent to new, widespread use of geothermal water, discusses implicatons for public policy and population dynamics, and lists potential engineering problems such as scaling, corrosion and general system maintenance. (Eberle-NWWA)
W77-08310

100 MESH SAND IMPROVES HYDRAULIC FRAC RESULTS.
World Oil, Vol. 184, No. 6, p 44 May, 1977. 1 ref.

Descriptors: *Fractures(Geology), *Water wells, *Water yield improvement, Specific capacity, Rehabilitation, Sands, Oil wells, Carbonate rocks.
Identifiers: *Hydraulic fracturing.

While drilling operators for some time have been using small diameter, 100 mesh sand as a method of controlling fluid loss in high volume acid or hydraulic fracturing treatments of wells, principal benefits and application procedures are not very widely known. Penetrating of acid and fracturing jobs in carbonates often falls short of expectations due to hairline fractures in the formation which steal the working fluid and limit the extension of the main fracture from the well bore. Once the 100 mesh sand is introduced, however, normal fluid loss additives are able to bridge the sand pack in the hairline fracture and the desired effects are obtained. The sand which remains in the fractures at the completion of the treatment forms a highly permeable channel for ground water and helps to prevent fractures from closing naturally. (Eberle-NWWA)
W77-08312

WATER SUPPLY AND CONTROL DEVELOPMENTS SUMMARIZED, (ARIZONA).
For primary bibliographic entry see Field 6E.
W77-08313

THE ERDA GEOTHERMAL PROGRAM,
Energy Research and Development Administration, Washington, D.C.
R. S. H. Toms.
IEEE Transactions on Nuclear Science, Vol. NS-24, No. 1, p 29-32, February, 1977. 2 ref.

Descriptors: *Thermal power, *Government supports, *Research and development, Federal project policy, Project planning, Cost sharing, *Geothermal studies, Electric power production.
Identifiers: Resource exploration and assessment, Engineering research, *Geothermal program(ERDA).

In order to help provide viable options to exploit America's geothermal resouces, ERDA is taking a lead in research and development by investigating ways to assess existing geothermal reservoirs and their energy potential, encouraging the present geothermal industry to continue development, and directly assisting in devising new technologies for utilizing more inaccessible sources. Besides the geological and technological impediments to rapid geothermal resource development, legal and regulatory problems related to geothermal mining need to be worked out, and utility companies must be convinced to take moderate risks in implementing new procedures. ERDA hopes to discover solutions by concentrating its geothermal program on four major areas: (1) a loan guaranty program, (2) construction and operation of pilot plants, cost-shared with industry in most cases, (3) monies for advanced technology research, and (4) support for environmental and institutional studies. A new form of solicitation known as a Program Research and Development Announcement has led to the negotiation of a good many new contracts with the

ERDA Geothermal Division. A new and more generous agency patent policy is also expected to facilitate cooperation between ERDA and the private sector. (Eberle-NWWA)
W77-08314

AQUIFER MODELING HELPS FARMERS.
For primary bibliographic entry see Field 2F.
W77-08317

TRUE-TEMPERATURE DETERMINATION OF GEOTHERMAL RESERVOIRS,
Texas Instruments, Inc., Dallas, Tex.
For primary bibliographic entry see Field 7B.
W77-08318

DEEP WELLS FOR DEWATERING OFFER REAL ADVANTAGES, PART II,
Johnson Driller's Journal, Vol. 49, No. 2, p 1-3, March-April, 1977, 6 fig, 3 ref.

Descriptors: *Dewatering, *Deep wells, *Excavation, Water table, Pumping, Well screens, Observation wells, Foundations, Minnesota, Georgia.
Identifiers: Prairie Island Nuclear Plant(Minnesota), Fort Gaines Dam(Georgia).

Because of the design of dewatering wells is such that maximum drawdown with minimum yield are realized, design considerations such as pump placement must reflect this intent. Also, it should be noted that because of special atmospheric and head conditions in dewatering situations, observation wells cannot be reliably used to determine the actual water level in the aquifer. Two specific cases serve as examples of creative, efficient use of deep wells for dewatering. The Prairie Island Nuclear Plant near Red Wing, Minnesota was constructed over a thick water-table aquifer composed of alluvial sand and gravel; excavation specifications called for dewatering to 32 feet below static level. A total of 39 deep wells completed by natural development lowered the water levels to the desired elevation 20 days ahead of schedule. In a similar manner 24 deep wells dewatered a limestone aquifer and controlled artesian head to permit construction of the spillway of the Ft. Gaines, Georgia dam. (See also W77-07294) (Eberle-NWWA)
W77-08325

GROUND WATER RECHARGE IN EASTERN CONNECTICUT BASED ON SIMULATION MODELING,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 2F.
W77-08344

A PRELIMINARY ANALYSIS OF THE ENERGY AND WATER REQUIREMENTS FOR DEVELOPING GEOTHERMAL ENERGY IN ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
D. Norton, and T. Gerlach.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 047, Price codes: A02 in paper copy, A01 in microfiche. In: Proceedings, Conference on Water Requirements for Lower Colorado River Basin Energy Needs, The University of Arizona, Tucson, Arizona, May 8-9, 1975. p 107-121, 4 fig, 1 tab, 3 ref. OWRT A-054-ARIZ(1). 14-31-0001-5003.

Descriptors: *Geothermal studies, *Thermal water, Heat flow, Hydrologic data, *Energy, *Water requirements, *Arizona.

Production of energy from geothermal fluids is an attractive alternative for many reasons. Geothermal energy, unlike most other energy alternatives, does not require extensive mining, refinement, packaging, transportation, or surface storage of fuel. Major quantities of energy and water input are required to develop energy resources. If the energy inputs are based on current technology, fossil fuels are implicitly required for a large percentage of this input. Geothermal energy based power systems have two distinct advantages: (1) Resource development and delivery to the plant site consume small amounts of energy and (2) the recovery of the resource has a minor impact on man's environment. The estimated overall energy efficiency of a 2000MW geothermal power system in Arizona is approximately 20-50% (to produce 2000MW, approximately 1200MW must be consumed). This means that 80-50% of the total energy recovered from a geothermal system is required for exploration, development, power plant construction, and environmental protection. A 2000MW geothermal energy development would require at least 250 exploration wells drilled to a depth of 1.5 kilometers plus 300 wells drilled to a similar depth for actual development and recovery of subsurface thermal water. Only a similar depth for actual development and recovery of subsurface thermal water. Only 150 of the 300 wells would be producers--the remainder could be used for recharge. The energy consumed in this operation relates directly to drilling equipment and materials. This work requires fossil fuel type energy support under today's technology. The total energy requirement for both phases is 5 x 10 to the thirteenth power kcal, equivalent to 3.4 x 10 to the seventh power BBLS of crude oil. (See also W76-04005)
W77-08351

ARTESIAN WELLS.
For primary bibliographic entry see Field 6E.
W77-08397

GROUNDWATER RESOURCES OF GUAM: OCCURRENCE AND DEVELOPMENT,
Guam Univ., Agana. Water Resources Research Center.
J. F. Mink.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 236, Price codes: A13 in paper copy, A01 in microfiche. Technical Report No. 1, September 1976. 276 p, 24 fig, 17 tab, 32 ref, 4 maps, 2 append. OWRT A-001 GUAM(1), 14-31-0001-5054.

Descriptors: *Groundwater resources, Limestones, Groundwater movement, Monitoring, *Aquifers, *Hydrogeology, History, *Geochemistry, Waste disposal, Storm water, Water yield, *Water wells, *Water pollution.
Identifiers: *Groundwater resources(Guam), *Guam.

A historical account of the development of Guam's groundwater resources is given. Guam's hydrogeology is discussed and groundwater areas are indicated, distinctions being made between basal water areas, para-basal water areas, and perched water areas. Based on available data, a study is made of the geochemistry of Guam's groundwater resources. The groundwater pollution potential of different methods of surface and subsurface disposal of waste and storm water is discusses. Of special significance are calculations of the sustainable yield of the basal lens of northern Guam along with recommendations for further development of groundwater resources. Finally, recommendations are made concerning desirable locations for monitoring wells. (Winter - Guam)
W77-08448

BACTERIOLOGICAL POLLUTION IN THE DRINKING-WATER OF JORDAN,
Ministry of Health, Amman (Jordan). Dept. of Bacteriology.
For primary bibliographic entry see Field 5B.
W77-08454

HISTORIC WATER-LEVEL CHANGES AND PUMPAGE FROM THE PRINCIPAL AQUIFERS OF THE MEMPHIS AREA, TENNESSEE: 1886-1975,
Geological Survey, Memphis, Tenn. Water Resources Div.
J. H. Criber, and W. W. Parks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 778, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-67, May 1976. 45 p, 10 fig, 6 tab, 21 ref.

Descriptors: *Groundwater resources, *Pumping, *Water level fluctuations, *Aquifer characteristics, *Water utilization, *Tennessee, Withdrawal, Hydrogeology, Water wells, Potentiometric level, Water supply.
Identifiers: *Memphis area(Tenn), Groundwater management.

Annual pumpage in the Memphis, Tennessee area, for both the Memphis Sand ('500-foot' sand) and Fort Pillow Sand ('1400-foot' sand) from the time of initial pumping from these aquifers to 1975 is presented in both tabular and graphic forms. The Memphis Sand supplied 188 million gallons per day in 1975 or 95 percent of the total water used in the area. Pumpage from the Fort Pillow Sand has decreased in recent years and in 1975 was about 4 million gallons per day. Pumping increases from the Memphis Sand have caused an almost continual decline of water levels. Water-level-change may show the fluctuations in water levels for two periods of high water use. Water levels in the Fort Pillow Sand show a rise since 1963, coincidental with pumping reductions. The data suggest that a constant pumping rate will cause little water-level decline and that the water levels can be altered for efficient resource management by areally varying the distribution of pumping. (Woodard-USGS)
W77-08469

MAPS SHOWING GROUND-WATER CONDITIONS IN THE PUERCO-ZUNI AREA, APACHE AND NAVAJO COUNTIES, ARIZONA--1975,
Geological Survey, Flagstaff, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08471

DIGITAL-COMPUTER MODEL OF THE SANDSTONE AQUIFER IN SOUTHEASTERN WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-08478

ACTIVITIES OF THE WATER RESOURCES DIVISION IN CALIFORNIA.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08479

WATER RESOURCES DATA FOR CONNECTICUT, WATER YEAR 1975,
Geological Survey, Hartford, Conn. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08480

DIGITAL-MODEL ANALYSIS OF THE EFFECTS OF WATER-USE ALTERNATIVES ON SPRING DISCHARGES, GOODING AND JEROME COUNTIES, IDAHO,
Geological Survey, Boise, Idaho. Water Resources Div.
J. A. Moreland.
Idaho Department of Water Resources, Boise, Water Information Bulletin No 42, November 1976. 46 p, 19 fig, 5 tab, 11 ref.

Descriptors: *Groundwater resources, *Springs, *Water utilization, *Model studies, *Aquifer characteristics, Withdrawal, Water yield, Transmissivity, Groundwater recharge, Projections, Evaluation, *Alternative water use, *Idaho.
Identifiers: *Snake Plain aquifer(Idaho).

The users of water from the springs that discharge from the Snake Plain aquifer in Gooding and Jerome Counties, Idaho, are concerned about the potential effects that increased pumpage and changing irrigation practices may have on spring discharge. Before development of irrigated land on the Snake River Plain, the springs between Kimberly and King Hill contributed an estimated 4,200 cubic feet per second to the flow in Snake River. As agricultural lands were developed, increasing amounts of irrigation-return flow caused an increase in spring discharge. In 1966, the total spring flow exceeded 6,000 cubic feet per second. Now, increasing amounts of pumpage may reverse the trend. Using power-consumption data, 1973 pumpage for irrigation in southern Gooding and western Jerome Counties was estimated to be nearly 85,000 acre-feet. A hydrologic model was constructed to evaluate the effects of various management schemes on discharge from the springs. A constant-head boundary was simulated at the east edge of the study area to facilitate future interface with larger scale models of the entire Snake Plain aquifer. The springs, modeled as head-dependent flow, respond to stress placed on the system. Output from the model includes a map showing water-level decline and a table of computed discharges for the 12 major springs. (Woodard-USGS)
W77-08484

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1975.
Geological Survey, Albany, N.Y. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08485

A POSTSCRIPT TO THE MUTUAL PRESCRIPTION DOCTRINE--CITY OF LOS ANGELES V CITY OF SAN FERNANDO,
For primary bibliographic entry see Field 6E.
W77-08490

ALLOCATING BURIED TREASURE: FEDERAL LITIGATION INVOLVING INTERSTATE GROUND WATER,
For primary bibliographic entry see Field 6E.
W77-08491

4C. Effects On Water Of Man's Non-Water Activities

SUMMARY OF SOME CURRENT AND POSSIBLE FUTURE ENVIRONMENTAL PROBLEMS RELATED TO GEOLOGY AND HYDROLOGY AT MEMPHIS, TENNESSEE,
Geological Survey, Nashville, Tenn. Water Resources Div.
W. S. Parks, and R. W. Lounsbury.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 513/AS, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 4-76, January 1976. 34 p, 12 fig, 3 tab, 26 ref.

Descriptors: *Hydrologic aspects, *Urbanization, *Industries, *Environmental effects, *Hydrogeology, Water pollution sources, Waste disposal, Floods, Earthquake engineering, Geology, Aggregates, Foundations, Water resources, Evaluation, Planning, Land use, *Tennessee.
Identifiers: *Memphis(Tenn).

This report summarizes information concerning many aspects of the geology and hydrology at Memphis, Tenn. It also outlines some of the current problems related to the local geology and hydrology or ones that may arise as a result of urbanization and industrialization of the area. The city is in the Coastal Plain physiographic province and is underlain at shallow depths by sand, clay, silt, gravel, and lignite. These post-Midway strata (Wilcox and younger) make up geologic units belonging to the uppermost Paleocene, Eocene, and Pliocene ( ) Series of the Tertiary System and to the Pleistocene and Holocene Series of the Quaternary System. Environmental problems of immediate or future concern are associated with six general topics: (1) aggregate resources, (2) foundation materials, (3) earthquake hazards, (4) flood hazards, (5) water resources, and (6) solid waste disposal. Consideration of these topics provide an overall insight into the close interrelation of the problems and the need for coordinated studies of the geology and hydrology at Memphis. (Woodard-USGS)
W77-08174

THE EFFECTS OF URBANIZATION ON LOW FLOWS AND TOTAL RUNOFF,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-08335

WATER QUALITY IMPACTS OF URBANIZATION--A METHODOLOGY,
Economic and Social Commission for Asia and the Pacific (UN), Bangkok (Thailand). Div. of Industry, Housing, and Technology.
For primary bibliographic entry see Field 5B.
W77-08514

4D. Watershed Protection

AMERICAN SEDIMENTATION LAW AND PHYSICAL PROCESSES,
For primary bibliographic entry see Field 6E.
W77-08130

SEDIMENT YIELD AND LAND USE IN SOUTHWEST UNITED STATES,
Geological Survey, Lakewood, Colo. Water Resources Div.
R. F. Hadley.
In: Effects of Man on the Interface of the Hydrological Cycle with the Physical Environment; Proceedings of Paris Symposium, September 1974. International Association of Hydrological Sciences Publication No 113, p 96-98, 1974. 2 tab, 4 ref.

Descriptors: *Sediment yield, *Land use, *Southwest U.S., *Colorado River basin, *Erosion control, Evaluation, Semiarid climates, Livestock, Range grasses.

Comparison of the sediment discharge records at the Grand Canyon gaging station (Lees Ferry, Arizona) on the Colorado River for the two periods, 1926-1941 and 1942-1960 show that the suspended-sediment loads for the latter period are only 50 per cent of the earlier period. These data combined with studies of erosion on the Colorado Plateau rangelands indicate that changes in land use probably are responsible for much of the reduction in the sediment yield. Livestock numbers have been greatly reduced on the arid and semiarid rangelands in the past 20 years and erosion control practices have been initiated in many critically eroding areas. Experimental studies by the Geological Survey indicate that grazing control alone can reduce runoff by as much as 30 per cent and sediment yield by 40 per cent. (Woodard-USGS)
W77-08178

DATA FOR CALIBRATING UNSTEADY-FLOW SEDIMENT-TRANSPORT MODELS, EAST FORK RIVER, WYOMING, 1975,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08180

RAINFALL INFILTRATION CHARACTERISTICS FOR A SEMI-ARID WATERSHED SOIL,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2G.
W77-08206

APPLICATION OF THREE DAILY-RAINFALL RUNOFF MODELS TO FOUR AUSTRALIAN CATCHMENTS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-08218

MULTIPLE OBJECTIVE PLANNING: SMALL WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-08350

A FINITE ELEMENT MODEL TO DETERMINE THE EFFECT OF LAND-USE CHANGES ON FLOOD HYDROGRAPHS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-08450

SMALL-STREAM FLOOD INVESTIGATIONS IN MINNESOTA, OCTOBER 1958 TO SEPTEMBER 1975,
Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08481

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1976,
Geological Survey, Helena, Mont. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08482

CHEMICAL AND VEGETATIVE STABILIZATION OF SOILS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8D.
W77-08512

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

FULVIC ACID-METAL ION INTERACTIONS IN WATER,
New Hampshire Univ., Durham. Dept. of Chemistry.
J. H. Weber, and S. A. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 597, Price codes: A04 in paper copy, A01 in microfiche. New Hampshire Water Resources Research Center, Durham, Completion Report, Research

Report No. 14, (1977). 45 p, 12 tab, 40 ref. OWRT A-035hNH (2). 14-31-0001-3829.

Descriptors: *Acids, Acidic soils, *Fulvic acids, *Humic acids, *New Hampshire, Soil chemistry, *Soil analysis, *Podzols, Analytical techniques, Spectrophotometry, Volumetric analysis, *Pollutant identification, Chemical analysis.
Identifiers: Para-benzosemiquinone, *Electron spin resonance, Oyster River(NH), Metal ions.

This report emphasized the further characterization of fulvic and humic acids isolated from the B2 horizon of a Podzol soil obtained at Conway, N. H. and isolated from the Oyster River (Lee, N. H.). The authors measured the E4/E6 ratios (absorbance ratio at 465 nm/665 nm) and the absorptivities of all the humic material samples. The authors also describe the cryoscopic determination of the dissociation-corrected number-average molecular weights Mn(corr) of the soil and aquatic fulvic acid samples. The corrections for dissociation of fulvic acid were determined by a theory which utilizes the equivalents per gram and the acid dissociation constants of the fulvic acid samples. The soil and aquatic fulvic acid Mn(corr) values are 644 and 626, respectively. The authors analyzed the solid state and aqueous solution electron spin resonances (esr) spectra of the aquatic and soil fulvic and humic acids. Because the aqueous solution esr spectra mimic the behavior of the model compound para-benzosemiquinone, it was concluded that semiquionone free radicals predominate in fulvic acid. In addition, a decrease in spin concentration at a potential of 0.20 volts (vs. SCE) demonstrates that the semiquinone radicals are at least partially responsible for the reducing capability of humic materials. From the above results, a quantitative semi-quinone analysis for humic materials was devised.
W77-08102

THE UTILITY OF PALEOLIMNOLOGICAL ANALYSES OF LAKE SEDIMENTS FOR EVALUATING ACID PRECIPITATION EFFECTS ON DILUTE LAKES,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
C. L. Schofield, and J. N. Galloway.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 595, Price codes: A03 in paper copy, A01 in microfiche. Center for Environmental Research, Cornell University, Ithaca, New York. Completion Report, May 1977. 23 p, 16 fig, 3 tab, 21 ref. OWRT A-071-NY(1). 14-34-0001-7067.

Descriptors: *Paleolimnology, *Diatoms, Sediments, Lakes, *Lake sediments, Hydrogen ion concentration, Bioindicator, Pollutant identification, Acids, Ions, Precipitation(Atmospheric).
Identifiers: *Acid precipitation, Microfossils, Dilute lakes.

Sediment cores were collected from three Adirondack Mountain lakes exhibiting a wide range in pH (Honnedaga Lake, pH 4.7; Woodhull Lake, pH 5.2; Seventh Lake, pH 6.5) in July, 1975. Diatom microfossils present in the cores were categorized in terms of pH preference and an index (alpha) based on the ratio of acidophilous to alkaliphilous units was determined. The regression of index (alpha) for surficial sediments on lake pH (pH = 6.63 - .81 log alpha) was utilized to estimate lake pH for historical sediment layers. Honnedaga Lake exhibited a marked increase in acidophilous taxa in the uppermost cm. of sediment and a decrease in estimated pH from 5.5-6.0 for historical sediments to pH 5.0 for recent sediments. The other lakes showed no significant change in index alpha and estimated pH. The known history of recent acidification in Honnedaga Lake suggests that pH indices based on diatom microfossils may be sensitive indicators of lake acidification.
W77-08103

CONTINUOUS AUTOMATED MONITORING OF CHEMICAL AND PHYSICAL CHARACTERISTICS OF THE RED CEDAR RIVER,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
R. C. Ball, M. E. Stephenson, and T. W. Hardgrove.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 115, Price codes: A05 in paper copy, A01 in microfiche. Michigan State University Institute of Water Research, Technical report No. 8, September 1969. 91 p, 19 fig, 7 tab, 38 ref. M.S. Thesis. OWRT A-023-MICH(2). 14-01-0001-1482, FWPCA Training Grant 5T1-WP-109.

Descriptors: *Michigan, *Chemical properties, *Physical properties, *Monitoring, *Instrumentation, Water properties, Data collections, Dissolved oxygen, Temperature, Automation, Conductivity, Alkalinity, Turbidity, Sediments, Seasonal, Hydrogen ion concentration, Phosphorus, Chlorides, Analytical techniques, Dissolved oxygen analyzers, Water temperature, Diurnal, On-site invetigations.
Identifiers: *Automated monitoring, *Red Cedar River(Mich), *Continuous monitoring, Benthoplankton concentration, Sediment scouring, Warm-water stream, Continuous automated monitor, Specific conductance, Total phosphorus, Autotroph.

A continuous automated monitor on the Red Cedar River at East Lansing, Michigan, was operated from August, 1967, to August, 1968. Dissolved oxygen, water temperature, specific conductance, and pH were measured. In addition, total alkalinity, total phosphorus concentration, chloride and benthoplankton concentration were spot checked. Seasonal patterns and possible interrelationships of the various parameters were sought. The alkalinity and pH determinations indicated the river was highly buffered. Specific conductance measurements revealed the existence of drain discharges resulting in pronounced conductance peaks. Dissolved oxygen levels fell dangerously low only during the months of August and September. A change in the diurnal character of oxygen levels was noted after removal of macrophytes from the stream due to scouring during intense runoff. Total phosphorus concentration increased initially during a flood, then decreased because of dilution. The concentration again increased as the discharge started to decrease. Dissolved oxygen concentration was inversely related to total phosphorus concentration. The roles of turbidity and sediment scouring have a definite effect upon autotroph production as evidenced by the increased load of detached chlorophyll-bearing material after intense runoff. (Henley-ISWS)
W77-08110

DETERMINATION OF PYRIDINE IN FARM CROPS AND FISH, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
L. R. Polishchuk, and L. A. Stempkovskaya.
Gig Sanit. 2, p 69-70, 1974.

Descriptors: *Pollutant identification, *Analytical techniques, Agriculture, Fish, *Methodology, Crops, *Potatoes, Water pollution.
Identifiers: *Pyridine.

A method of determining pyridine (an environmental pollutant) in agricultural crops and fish based on the reaction with barbituric acid and the conditions for its quantitative extraction from the investigated objects and the preparation of extracts free from admixtures interfering with the determination were developed. Two methods are described, 1 for all products and the other for all products except potatoes. The determination error does not exceed +10%, sensitivity is 0.2 mg/kg and the time required for 3 parallel determinations is 1 1/2-2h.--Copyright 1975, Biological Abstracts, Inc.
W77-08126

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1975,
Geological Survey, Indianapolis, Ind. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08162

GROUND-WATER DATA FOR 1974-75 IN JOSHUA TREE NATIONAL MONUMENT, CALIFORNIA,
Geological Survey, Menlo Park, calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08164

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR NEW ORLEANS, LOUISIANA (LAKE PONTCHARTRAIN, LOUISIANA, AND VICINITY HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 8D.
W77-08165

WATER RESOURCES OF THE MYAKKA RIVER BASIN AREA, SOUTHWEST FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08167

U S GEOLOGICAL SURVEY, WATER RESOURCES DIVISION, RADIOCARBON MEASUREMENTS I,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08169

GROUND-WATER RESOURCES OF VANDERBURGH COUNTY, INDIANA,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08170

INVESTIGATION OF DETECTION LIMITS FOR SOLUTES IN WATER MEASURED BY LASER RAMAN SPECTROMETRY,
Smithsonian Institution, Washington, D.C.; and Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-08171

GROUND WATER IN THE SAN JUAN METROPOLITAN AREA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08173

GEOHYDROLOGY OF THE ALBIN AND LA GRANGE AREAS, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08176

GROUND-WATER BASIC DATA FOR RAMSEY COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08177

COMPARATIVE EXAMINATION OF ENTEROCOCCI OBTAINED FROM DRINKING WATER, FOODSTUFFS AND URINE, (IN GERMAN),
N. Rakarowa, and K. Paparkowa.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 158(2), p 194-198, 1973.

Descriptors: *Potable water, *Enteric bacteria, *Streptococci, Sampling, Epidemiology, *Urine, *Foods, *Pollutant identification, Isolation, Water pollution effects, Human diseases.
Identifiers: Bacteriocins, *Enterococci, Streptococcus-Faecalis, Streptococcus-Faecium.

Examination of enterococci isolated from urine of patients with urogenital infections revealed only Streptococcus faecalis strains. Only S. faecium strains were isolated from water samples. Both groups were equally represented among food isolates. There was a complete correlation between the phage sensitivity and the enterocinogenity of the enterococci isolated from urine. Both characteristics probably are important as epidemiological markers for the pathogenicity of the enterococci.--Copyright 1975, Biological Abstracts, Inc.
W77-08179

SELECTED HYDROLOGIC DATA, UINTA BASIN AREA, UTAH AND COLORADO,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08183

WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1975,
Geological Survey, Champaign, Ill. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08184

WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1975,
Geological Survey, Carson City. Nev. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08185

A STATISTICAL ANALYSIS OF THE MERCURY CONCENTRATIONS IN FISH FROM LAKE JOCASSEE, SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
H. D. Lienert, and W. C. Rowell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 670, Price codes: A04 in paper copy, A01 in microfiche. December 1976. 54p, 11 fig., 8 tab., 12 ref., 3 append. OWRT A-032-SC(2).

Descriptors: *Mercury, *Reservoirs, *Bass, Trout, Statistical methods, *South Carolina, *Brown trout, Lakes, Pollutant identification, Lethal limit, Water quality standards, Absorption.
Identifiers: *Lake Jocassee(SC).

Mercury concentration in the axial muscle of fish from Lake Jocassee was determined. The predominant species tested were Largemouth Bass and Brown Trout. Models were built at the ninety-five percent confidence level with respect to lake, species, and year of collection. Statistical techniques were used to discriminate between models to determine if a trend was present. It was determined that there was a definite need for more fish samples and some modifications in data collection. It was also determined that sampling should be limited to actively growing individuals rather than to older fish which are growing in weight more than in length. The concentration of mercury were higher than the Federal Food and Drug Administration's 0.5 ppm recommended allowance.
W77-08190

ARSENIC IN WATER AND FISH FROM LAKES HARTWELL, KEOWEE, AND JOCASSEE, SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
J. M. Harden.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 671, Price codes: A03 in paper copy, A01 in microfiche. August 1976. 31 p, 6 tab, 40 ref, append. OWRT A-032-SC(1).

Descriptors: *Arsenic, Fish, Reservoirs, *South Carolina, Lethal limit, Water quality standards, *Pollutant identification, Lakes, Water pollution, Absorption.
Identifiers: Lake Hartwell(SC), Lake Keowee(SC), Lake Jocassee(SC).

Arsenic concentrations in fish and water samples from Lakes Hartwell, Keowee, and Jocassee were determined. All concentrations in fish were below FDA recommended limits, and all concentrations in water were below USPHS Drinking Water Standards. One possible trend was observed, i.e., arsenic concentrations in fish followed the order Jocassee > Hartwell > Keowee. No other trends were apparent.
W77-08191

A SURVEY OF CADMIUM OCCURRENCE AND CONCENTRATION IN FISH FROM ELEVEN MAJOR RESERVOIRS IN SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
M. H. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 668, Price codes: A03 in paper copy, A01 in microfiche. December 1976. 33 p, 1 fig, 11 tab, 55 ref, append. OWRT A-032-SC(3).

Descriptors: *Cadmium, *Heavy metals, Fish, *Reservoirs, South Carolina, *Pollutant identification, Absorption, Surveys.

A total of 136 fish were collected from 11 South Carolina reservoirs and analyzed for the concentration of accumulated cadmium. All samples contained less than 5 micro-g cadmium per gram of tissue with a mean value of 0.138 micro-g/g.
W77-08192

ORGANOCHLORINE RESIDUES IN NEW ZEALAND BIRDS AND MAMMALS 2. POLYCHLORINATED BIPHENYLS,
Department of Agriculture, Wellington (New Zealand). Wallaceville Animal Research Center.
For primary bibliographic entry see Field 5C.
W77-08210

SORPTION AND FLOW OF CARBON DIOXIDE AND SOME HYDROCARBONS IN A MICROPOROUS CARBON MEMBRANE,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
R. Ash, R. M. Barrer, and P. Sharma.
Journal of Membrane Science, Vol. 1, No. 1, p 17-32, March 1976. 7 fig, 5 tab, 20 ref.

Descriptors: *Membrane processes, *Membranes, Flow, *Laboratory tests, Gases, Carbon dioxide, Helium, Diffusion, Permeability, Sorption, Isotherms, Analytical techniques, Mathematical models, Analysis, Organic compounds.
Identifiers: Carbolac carbon membranes.

The flow of He, CO2, CH4, C2H6, C3H8, n-C4H10, and neo-C5H12 was investigated using microporous carbon membranes. Physical constraint of the compacted carbon with steel plungers in a steel membrane holder substantially altered sorption equilibria and hysteresis loops in the multilayer and capillary condensation region as compared with unconstrained powder, but made little difference in the region below monolayer coverage. Capillary pressure differences between contrained compact and unconstrained powder showed maxima in the vicinity of monolayer coverage and near coverages where differential diffusion coefficients also went through maxima, which supports a hydrodynamic mechanism for sorbed fluids as monolayer coverage was approached and exceeded. For these larger uptakes, flow rates were dominated by contributions arising from the presence of sorbed films with concentration gradients. Permeabilities did not show maxima found with differential diffusion coefficients. Blockage by sorbed films of the gas phase transport of helium was investigated for hydrocarbons using helium as internal indicator. Blockage became nearly complete as sorption approached monolayer coverage. (Humphreys-ISWS)
W77-08232

IMPURITY CONCENTRATIONS IN SEA ICE,
McGill Univ., Montreal (Quebec). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W77-08237

NITROGEN AND PHOSPHORUS ANALYSES OF RAINFALL AT ROTORUA, NEW ZEALAND,
Marine Dept., Rotorua (New Zealand). Fisheries Research Div.
G. R. Fish.
Journal of Hydrology (New Zealand), Vol. 15, No. 1, p 17-26, 1976. 1 fig, 6 tab, 10 ref, 1 append.

Descriptors: *Nitrogen, *Phosphorus, *Nitrogen compounds, *Phosphorus compounds, *Rainfall, Water quality, Analytical techniques, Nitrites, Ammonia, Nitrates, Nutrients, Phosphates, Water pollution sources, Precipitation(Atmospheric), Meteorology, Chemical analysis, *Pollutant identification, Path of pollutants.
Identifiers: *Lake Rotorua(New Zealand), *Rotorua(New Zealand), Rainstorms, Rainwater quality.

Analyses of the dissolved inorganic nitrogen and phosphorus content of rainfall at Ngapuna, Rotorua, were made between 21 July 1972 and 19 March 1974. Dry fallout was excluded from the water samples by exposing collectors only when rain was falling or was imminent. The total rainfall sampled was 341 mm, and its mean solute concentration expressed in g/ha.mm (=g/cu m x 10) was 0.057 P04-P, 0.842 NH4-N and 0.215 N03-N. The mean solute concentration of 34 rainstorms (in g/ha.mm) was 0.08 P04-P, 1.83 NH4-N and 0.43 N03-N. No seasonal changes in solute concentrations were discovered. Synoptic samples collected in open country (e.g., Tongariro National Park) were similar in composition to those from Ngapuna, Rotorua, but samples collected at city sites (e.g., Christchurch) contained more phosphate. (Henley-ISWS)
W77-08242

THE FALLOUT OF NITROGEN AND PHOSPHORUS COMPOUNDS FROM THE ATMOSPHERE AT NGAPUNA, NEAR ROTORUA, NEW ZEALAND,
Marine Dept., Rotorua (New Zealand). Fisheries Research Div.
G. R. Fish.
Journal of Hydrology (New Zealand), Vol. 15, No. 1, p 27-34, 1976. 2 fig, 2 tab, 8 ref.

Descriptors: *Fallout, *Nitrogen, *Nitrogen compounds, *Phosphorus, *Phosphorus compounds, Analytical techniques, Ammonia, Nitrates, Nutrients, Phosphates, Water pollution sources, Meteorology, Chemical analysis, Fertilization, Eutrophication.

Identifiers: *Nitrogen compounds, *Lake Rotorua(New Zealand), *Rotorua(New Zealand).

A total of 183 samples of atmospheric fallout, usually collected over periods of 24 hours (never longer than 3 days) between April 1974 and April 1975, was analyzed for N and P content. Local bush fires and pollen-fall caused some changes in fallout quality, but seasonal effects generally were slight. Dry fallout contributed 0.37 g/ha.day P04-P and 0.77 g/ha.day total P (36 and 54% of the deposition on raindays), while the nitrogen contribution was 1.03 g/ha.day NH4-N and 0.24 g/ha.day N03-N (10 and 7% of the rainday deposition). The data were compared to those collected previously on rainfall only. The data were used to improve the estimate of the atmospheric contribution to the nutrient budget of Lake Rotorua. (Henley-ISWS)
W77-08243

BACTERIOLOGICAL INVESTIGATION OF ALBERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SALMONELLA ISOLATION,
Environmental Protection Service, Edmonton (Alberta). Microbiology Lab.
For primary bibliographic entry see Field 5D.
W77-08269

CHELATING AGENT ANALYSIS BY HIGH SPEED LIQUID CHROMATOGRAPHY,
Missouri Univ., Columbia. Dept. of Chemistry.
D. R. Jones, IV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 918, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. thesis, July, 1976. 176 p, 20 fig, 12 tab, 127 ref. OWRT B-095-MO(5), 14-31-0001-4099.

Descriptors: *Chelation, *Pollutant identification, Chromatography, *Heavy metals, Copper, Methodology, Analytical techniques, Path of pollutants, Spectrophotometry, Monitoring, Sewage effluents, Nitrilotriacetic acid, *Waste water treatment.
Identifiers: Metal plating wastes, Organometallics, EDTA, *Chelating agents, Atomic absorption, Spectrophotometry.

Chelating agents are important species in the transport and reactions of heavy metals in water. Methods for their analysis are needed. Described are methods of analysis for chelating agents based primarily on the separation of copper chelates by high speed liquid chromatography followed by monitoring of the copper-containing effluents by atomic absorption spectrophotometry. Details of the interface between the high speed liquid chromatograph and the atomic absorption spectrophotometer are described. Operating parameters for the chromatograph to make it compatible with atomic absorption are detailed. Separation and analysis conditions are given. The technique as applied to sewage effluents is discussed.
W77-08286

DETECTION OF PHOSPHATE ADSORPTION ONTO COAL HUMIC ACIDS,
Missouri Univ.-Columbia. Dept. of Chemistry.
L. O. Isselhardt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 998, Price codes: A06 in paper copy, A01 in microfiche. M.A. Thesis, December 1975. 106 p, 14 fig, 13 tab, 58 ref. OWRT B-110-MO(2), 14-31-0001-4170.

Descriptors: Coal, *Humic acids, *Phosphates, Adsorption, *Coal mine wastes, *Pollutant identification, Phosphorus, Waste water treatment, Water reuse, Pollution abatement, Absorption, Separation techniques.
Identifiers: Adsorption isotherms, Iron humate.

Because of their acid-base, sorption, and chelation properties, coal humic acids have some potential applications in treating some of the pollutants arising from the mining, combustion, and conversion of coal and from stack gas scrubber effluents. This thesis is part of a research program designed to determine the interaction of coal humic acids with a variety of species found in wastewaters. The uptake of orthophosphates and polyphosphates by solid coal humic acids was examined. The preparation and purification of coal humic acids and iron humates are described. Details are given for the difficult analysis of phosphates in the presence of humic substances. It was found that coal humic acids adsorb phosphates very poorly. Since these materials effectively remove heavy metal ions from water the possibility is raised of selectively removing dangerous heavy metal ions while leaving nutrient phosphate in the water for fertilizer in water used for land reclamation or crop irrigation.
W77-08294

DEVELOPMENT OF A COLUMN CHROMATOGRAPHY METHOD FOR FIELD OF PRECONCENTRATION OF TRACE METALS WITH APPLICATION TO THE HAW-CAPE FEAR RIVERS, N.C.,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
J. H. Dempsey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 878, Price codes: A05 in paper copy, A01 in microfiche. M.S. Degree in Public Health, 1976. 74 p, 8 tab, 6 fig, 46 ref. OWRT A-073-NC(1), 14-31-0001-5033.

Descriptors: *Chromatography, *Trace elements, *Metals, *Heavy metals, Ion exchange, Adsorption, Cadmium, Chromium, Copper, Mercury, Zinc, Rivers, North Carolina, Pollutant identification, Resins, Analytical techniques, Methodology, Water pollution sources.
Identifiers: *Trace metals, Dissolved trace metals, Ion exchange column, Resins, Haw River(NC), Cape Fear River(NC).

Column chromatography was investigated for adaptation as a field technique for concentrating dissolved trace metals from natural waters. Manganese oxide impregnated acrylic fibers, a chelating resin (Chelex 100), a cation exchange resin (AG-50W) and an anion exchange resin (AG-1) were employed in preliminary work. Ion exchange resins were the most satisfactory and the final design for field use consisted of a cation and an anion exchange column in series. Natural water spiked with CR51 as a tracer indicated that soluble Cr(III) and Cr(VI) could be separated by the technique. A portable field unit was constructed and used to carry out a one year survey of Cd, Cr, Cu, Pb, and Zn in the Haw-Cape Fear Rivers of North Carolina. Elevated concentrations of Cr, Cu, and Cd were observed in the upper industralized areas while Zn and Pb appeared to have sources throughout the basin. Concentration ranges in microgram/l were <0.10-1.22 Cd, <0.1-26.8 Cr, 0.0-9.1 Cu, 1.1-74.0 Pb and 2.9-74.0 Zn. (Stewart-NC State)
W77-08299

MERCURY ACCUMULATION IN TROUT OF SOUTHERN MISSOURI,
Missouri Univ.-Rolla. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-08304

CHROMOSOME MUTATIONS IN A FERN POPULATION GROWING IN A POLLUTED ENVIRONMENT: A BIOASSAY FOR MUTAGENS IN AQUATIC ENVIRONMENTS,
Massachusetts Univ., Amherst. Dept. of Botany.
E. J. Klekowski, and B. B. Berger.
American Journal of Botany, Vol. 63, No. 2, p. 239-246, February 1976. 16 fig, 3 tab, 3 ref. OWRT A-063-MASS(2), 14-31-0001-5021.

Descriptors: *Bioassay, *Massachusetts, Water pollution effects, *Ferns, Industrial wastes, Pollutant identification, Cytological studies, Spores, Aquatic plants.
Identifiers: *Chromosome mutations, *Osmunda regalis, *Millers River(Mass).

A population of royal ferns, Osmunda regalis, which is periodically submersed by the waters of the Millers River was found to have a very high frequency of chromosome mutations. The Millers River is located in western Massachusetts and is heavily polluted with industrial wastes. Approximately 43% of meiotic samples collected in 1973 from the Millers River population were heterozygous for mutations such as paracentric inversions or reciprocal translocations, whereas less than 1% of meiotic samples from nearly non-polluted control populations were such heterozygotes. Cytological analysis within royal fern clones indicates that practically all of the chromosome mutations were post-Zygotically induced and that at least 64% were induced since 1969. Over 26,000 spore mother cells were analyzed for chromosome aberrations.
W77-08305

PYRO- AND TRIPOLY-PHOSPHATE CONTENTS OF SEDIMENTS,
Missouri Univ.-Columbia. Dept. of Agronomy.
R. W. Blanchar, and D. C. Riego.
Water, Air and Soil Pollution, Vol. 7, p 27-31, 1977. 1 fig, 2 tab, 6 ref. OWRT A-059-MO(3), USDI-OWRR-14-31-0001-3825.

Descriptors: *Phosphates, Phosphorus, *Sediments, *Pollutant identification, Methodology, Analytical techniques, Chromatography, Anion exchange.
Identifiers: *Polyphosphates, *Pyrophosphates, *Sediment analysis.

A method to determine pyrophosphate (PP) and tripolyphosphate (TPP) in sediments was developed. Sediment was extracted with 2% EDTA + 0.1 M NH4F followed by a second extract of 2% EDTA + 1N NaOH. Orthophosphate (OP), PP, and TPP were separated by anion exchange chromatography, the fractions collected, and P determined after extraction into isobutanol. The limit of detection of the method was 0.5 micro-g P g-1 sediment. Fourteen sediments were tested and the highest TPP found was 1.8 micro-g P g-1 sediment. Thirteen of the sediment samples contained less than 1 micro-g P g-1 as TPP. Only three of the 14 samples contained more than 1 micro-g P g-1 as PP. The highest level of PP (8.5 micro-g P g-1) was found in sediment from an animal waste lagoon. The error for samples containing 36.9 micro-g P g-1 as PP was plus or minus 7.6, and for TPP at 12.3 micro-g P g-1 the error was plus or minus 3.3. The values for PP and TPP were underestimated by 6 and 36%, respectively.
W77-08306

EFFECT OF SOME CHEMICAL ELEMENTS ON THE ACCUMULATION OF CESIUM-137 IN FRESHWATER FISH, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5C.
W77-08322

A PRODUCTIVITY STUDY OF THE ROANOKE RIVER ABOVE NIAGRA DAM IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W77-08333

FLUORIDE ANALYSIS OF WATER-TREATMENT-PLANT SLUDGES,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.

W77-08342

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, VOLUME I-A, TECHNICAL SESSION PRESENTATIONS, AGRICULTURE-ENVIRONMENT.
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W77-08408

APPLICATION OF EREP, LANDSAT AND AIRCRAFT IMAGE DATA TO ENVIRONMENTAL PROBLEMS RELATED TO COAL MINING,
Earth Satellite Corp. Washington, D. C.
R. V. Amato, O. R. Russell, K. R. Martin, and C. E. Wier.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 309-327, September 1975. 8 fig, 2 tab, 7 ref.

Descriptors: *Coal mines, *Kentucky, *Indiana, *Remote sensing, *Environment, Land use, Strip mines, Mapping, Monitoring, Spoil banks, Mining, Water pollution sources, Surveys, Coal mine wastes, Land management, Land reclamation, Satellites(Artificial), Aerial photography, Evaluation, Topography.
Identifiers: LANDSAT, Skylab.

The synoptic and repetitive views of aerial remote sensing records offer valuable environmental and dynamic change data in areas of both surface and underground coal mining. Depending upon the accuracy of requirements, these data are available through both low and high level aircraft surveys as well as LANDSAT and EREP (SKYLAB) imagery. Remote sensors can provide timely and accurate information on surface mining status and reclamation progress, coal mine refuse piles and slurry ponds, acid water and silation problems, and various aspects of environmental impact. Remote sensing techniques were used to study coal mining sites within the Eastern Interior Coal Basin (Indiana, Illinois, and western Kentucky), the Appalachian Coal Basin (Ohio, West Virginia, and Pennsylvania), and the anthracite coal basins of northeastern Pennsylvania. Airborne sensors included multispectral scanners, multiband cameras, and standard mapping cameras loaded with panchromatic, color, and color infrared films. The research that was conducted in these areas is a useful prerequisite to the development of an operational monitoring system that can be employed periodically to supply state and federal regulatory agencies with supportive data. Further research, however, must be undertaken to systematically examine those mining processes and features that can be monitored cost effectively using remote sensors and for determining what combination of sensors and ground sampling processes provide the optimum combination for an operational system. (See also W77-08408) (Humphreys-ISWS)
W77-08429

POSSIBILITIES AND ROLE OF BIOLOGICAL ANALYSIS IN EVALUATING THE DEGREE OF POLLUTION OF WATER BODIES, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
A. V. Makrushin.
Gidrobiol Zh. 10(2), p 98-104, 1974.

Descriptors: *Bioindicators, *Bioassay, *Industrial wastes, Toxicity, *Pollutant identification, *Bacteriology, Analytical techniques, Potable water, Water quality standards.

Using biological analysis (indicator organisms), it is possible to detect one-time or continuous pollution. The biological method permits finding the source of pollution by moving upstream. The source is found by chemical and bacteriological methods only if pollution is constant. Biological analysis is cheaper and faster than bacteriological and chemical analysis. Using the biological method, pollution by industrial wastes can be detected where it cannot be found by other methods. The existing variants of biological analysis need improvement, but because of the high sensitivity of aquatic organisms to the prolonged effect of small concentrations of toxic substances the composition of aquatic biocenoses is the best criterion of the fitness of water for human consumption.--Copyright (c) 1975, Biological Abstracts, Inc.
W77-08430

QUANTITATIVE WATER QUALITY WITH LANDSAT AND SKYLAB.
Kansas Univ., Lawrence.
H. L. Yarger, and J. R. McCauley.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 347-370, September 1975. 21 fig, 2 tab, 16 ref.

Descriptors: *Water quality, *Remote sensing, *Kansas, *Surface waters, Reservoirs, Water temperature, Dissolved solids, Suspended solids, Secchi disks, Phosphates, Potassium, Nitrates, Analysis, Monitoring, Satellites(Artificial), Chlorophyll, Measurement.
Identifiers: LANDSAT, Skylab.

LANDSAT Multispectral Scanner (MSS) reflectance levels are useful for quantitative measurement of suspended solids up to at least 900 ppm. MSS band ratios derived from computer-compatible tape (CCT) can measure suspended solids with 67% confidence level accuracy of 12 ppm over the range 0-80 ppm, and 35 ppm over the range 0-900 ppm. Suspended solids contour maps can be easily constructed from CCT's for water bodies larger than approximately 100 acres. Rationing suppresses MSS reflectance level dependence on seasonal sun angle variation and permits measurement of suspended load the year round in the middle latitudes. These LANDSAT results are based on correlation studies between MSS CCT's and 170 water samples taken from three large Kansas reservoirs coincident with 16 different LANDSAT passes over a period of 13 months. Skylab imagery, S190A and S192, from a single pass over three reservoirs, compared favorably to LANDSAT results up to 100 ppm. No samples were obtained with suspended solids greater than 100 ppm during the Skylab overpass. Typical mid-continent values for variables such as sun angle, wind speed, and temperature, do not significantly affect the correlation between satellite band ratios and suspended solids. The relatively high inorganic suspended solids, characteristic of mid-continent reservoirs, dominate the reflected energy present in the satellite spectral bands. Dissolved solids concentrations up to 500 ppm and algal nutrients up to 20 ppm are not detectable. The RED/GREEN ratio may have a weak negative correlation with total chlorophyll above about 8 micrograms/l. (See also W77-08408) (Humphreys - ISWS)
W77-08431

LANDSAT-1 DATA AS IT HAS BEEN APPLIED FOR LAND USE AND WATER QUALITY DATA BY THE VIRGINIA STATE WATER CONTROL BOARD,
Virginia State Water Control Board, Richmond. Div. of Surveillance and Field Studies.
P. L. Trexler, and J. L. Barker.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 371-418, September 1975. 22 fig, 7 tab, 7 ref.

Descriptors: *Water quality, *Land use, *Remote sensing, *Virginia, *Monitoring, Reservoirs, Watersheds(Basins), Land management, Land classification, On-site investigations, Water sampling, Surface waters, Census, Turbidity, Secchi disks, Satellites(Artificial), Spatial distribution, Data processing, Analytical techniques.
Identifiers: LANDSAT, Pixels.

In a joint project with the Virginia State Water Control Board and NASA, water quality monitoring possibilities from LANDSAT were demonstrated, both for direct readings of reflectances from the water and for indirect monitoring of changes in use of land surrounding Swift Creek Reservoir. Film products were shown to have insufficient resolution, and all work was done by digitally processing computer-compatible tapes. Perhaps the greatest potential contribution of LANDSAT is through indirect interpretation, by detecting changes in land cover in a watershed. Land cover maps of the 18,000 hectare Swift Creek Reservoir watershed were prepared for two dates in 1974. A significant decrease in the pine cover was observed in a 740 hectare construction site within the watershed. A measure of the accuracy of classification was obtained by comparing the LANDSAT results with visual classification at five sites on a U-2 photograph. Such changes in land cover can alert personnel to watch for potential changes in water quality. (See also W77-08408) (Humphreys - ISWS)
W77-08432

THE LANDSAT-1 MULTISPECTRAL SCANNER AS A TOOL IN THE CLASSIFICATION OF INLAND LAKES,
National Eutrophication Survey, Corvallis, Oreg.
D. H. P. Boland, and R. J. Blackwell.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 419-442, September 1975. 13 fig, 3 tab, 11 ref.

Descriptors: *Classification, *Lakes, *Water quality, *Remote sensing, *Minnesota, *Michigan, *New York, *Wisconsin, Surface waters, Eutrophication, Trophic level, Data processing, Monitoring, Surveys, Analytical techniques, Satellites(Artificial), Phosphorous, Chlorophyll, Nitrogen, Conductivity.
Identifiers: LANDSAT.

This study focused on relationships between LANDSAT-1 multispectral scanner (MSS) data and the trophic status of a group of lakes located in the north-northeastern part of the United States. MSS data were used to predict the magnitudes of two trophic state indicators, to estimate lake position on a multivariate trophic scale, and to automatically classify lakes according to their trophic state. Initially, principal component ordiantion was employed to ascertain the trophic state of 100 lakes using the indicators: chlorophyll a, conductivity, inverse of Secchi transparency, total phosphorus, total organic nitrogen, and productivity as measured by a standard algal assay yield test. The resultant PCI values were indicative of the lakes' positions on a multivariate trophic scale. MSS data for some 20 lakes were extracted from computer-compatible tapes (CCT's) using a binary marking technique. Output was in the form of descriptive statistics and photographic concatenations. MSS color ratios were incorporated into regression models for the prediction of Secchi disc transparency, chlorophyll a, and lake position on the trophic scale. Lake trophic state-MSS relationships were also examined using three-dimensional color ratio models. Automatic image processing techniques were used in conjunction with MSS data and trophic state index values to classify each

lake pixel-by-pixel. Classification products included both gray scale and color-coded photographic prints. It appears that the LANDSAT-1 MSS has the capability of providing supplemental data relating to water quality in inland lakes. Further refinement in the sensor and the data processing techniques should make multispectral imagery collected from space platforms a valued tool in lake survey and monitoring activities. (See also W77-08408) (Humphreys - ISWS)
W77-08433

TROPHIC STATUS OF INLAND LAKES FROM LANDSAT,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
L. T. Fisher, and F. L. Scarpace.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM-X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 443-450, September 1975. 3 fig, 1 tab, 2 ref.

Descriptors: *Lakes, *Water quality, *Wisconsin, *Remote sensing, *Data processing, Analytical techniques, Data storage and retrieval, Costs, Surface waters, Trophic level, Eutrophication, Satellites(Artificial).
Identifiers: LANDSAT.

A cooperative program involving university researchers and natural resource managers utilized LANDSAT data to produce an economical trophic status assessment of 3,000 Wisconsin lakes. Computer programs were developed which allow easy, rapid access to LANDSAT data and which can be used by non-research personnel for production data extraction. Capital expenses were low, and operating costs were very reasonable compared to expenses to acquire on-site data of comparable quality. (See also W77-08408) (Humphreys-ISWS)
W77-08434

THE USE OF LANDSAT-1 IMAGERY FOR WATER QUALITY STUDIES IN SOUTHERN SCANDINAVIA,
Lund Univ., (Sweden). Dept. of Physical Geography.
U. Hellden.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 451-468, September 1975. 12 fig, 15 ref.

Descriptors: *Lakes, *Water quality, *Remote sensing, *Foreign countries, Surface waters, Water pollution, Satellites(Artificial), Data processing, Analytical techniques, Instrumentation.
Identifiers: *Sweden, LANDSAT, Densitometer.

In order to find out the possibilities of using LANDSAT-1 images for environmental studies, with special references to water quality studies, test areas in southern Scandinavia were selected. The MSS images of different bands were compared under the magnification of an Interpretoscope, and densitometric analyses were performed in a Schnellphotometer. The possibility of tracing pollution plumes was studied in the Oresund outs de Copenhagen. The effect of different sewers and the circulation of the polluted water was analyzed in various situations. The variation in reflectivity of a great number of lakes in South and Middle Sweden was studied by means of densitometric analyses, and significant regional differences were found. The correlation with with in situ measurements of water quality of the sampled lakes was fairly good. (See also W77-08408) (Humphreys-ISWS)
W77-08435

REMOTE SENSING APPLICATIONS IN THE INVENTORY AND ANALYSIS OF ENVIRONMENTAL PROBLEMS,
Environmental Protection Agency, Warrenton, Va. Environmental Photographic Interpretation Center.
C. E. Howard, Jr., and C. A. Waters, Jr.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 585-598, September 1975. 10 fig.

Descriptors: *Monitoring, *Environment, *Remote sensing, *Census, Water pollution sources, Air pollution, Feed lots, Landfills, Projects, Satellites(Artificial), Aerial photography, Environmental effects.
Identifiers: LANDSAT, Skylab.

The Environmental Protection Agency, through the Environmental Photographic Interpretation Center (EPIC), is actively engaged in the extraction of environmentally related data from both high resolution and multispectral imaging systems. From its inception, the EPIC has researched the various sensing systems available from both a cost effective and information content standpoint. Through interagency agreements and cooperative programs such as the NASA Aircraft Support Program, imagery has been acquired in areas where EPA has operational requirements. Presently, the efforts of EPIC are directed toward the inventory and analysis of many types of pollution sources, both point and non-point. To date (1975), in its brief 1 1/2 year existence, EPIC has found that the nature of its requirements has almost exclusively demanded the use of high resolution photography. (See also W77-08408) (Humphreys-ISWS)
W77-08438

SOME EXPERIMENTAL DATA ON THE STUDY OF THE BIOLOGICAL ACTION OF ETHYLBUTYLAMINE AS A WATER POLLUTION FACTOR, (IN RUSSIAN),
Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR). Div. of Public Hygiene.
S. A. Zyabbarova, M. N. Kuklina, and L. E. Yakovleva.
Gig Sanit. 3, p 106-107, 1974.

Descriptors: *Water pollution, Organic compounds, Biology, *Lethal limit, *Water quality standards, *Pollutant identification.
Identifiers: *Ethylbutylamine.

Standardization of ethylbutylamine (EBA) in water bodies was attempted to study its biologic action. EBA is a colorless transparent liquid. It boils at 108 C, has a molecular weight of 101.99, a specific weight of 0.7391, and is soluble in water. It can enter water bodies as a component of sewage water and affects the organoleptic qualities of water (e.g., its smell and taste). Its biological action was studied on white rats and mice. LD50 is 273.2-347.4 mg/kg for rats, and 315.1-514.3 mg/kg for white mice. EBA doses of 0.02, 0.3, and 6 mg/kg were used for 6 mo. Blood tests did not show any changes. Tests on sacrificed animals were more sensitive, indicating a decrease of vitamin C content in the liver for 6 mg/kg EBA. For 3 mg/kg EBA, adrenal glands' weight coefficient increased, while spleen weight coefficient decreased. The adrenal glands weight coefficient in animals given 6 mg/kg was similar to the one in the control group, while the decrease observed in the spleen weight coefficient was statistically unreliable. Histological studies did not show intoxication in internal organs. A 0.5 mg/l (0.025 mg/kg) concentration of EBA in water has no toxic effect. The 0.5 mg/l EBA concentration in water bodies is recommended as the allowed level.--Copyright 1975, Biological Abstracts, Inc.
W77-08439

INVERTEBRATE COLONIZATION OF ARTIFICIAL SUBSTRATES IN SAN LEANDRO CREEK,
California Univ., Berkeley. Dept. of Forestry and Conservation.
K. B. Roby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 067, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, (1976). 63 p, 14 fig, 8 tab, 52 ref. (California Water Resources Center Project UCAL-WRC-W-411). OWRT-A-047-CAL(1).

Descriptors: *Invertebrates, *Artificial substrates, *Benthic fauna, Water quality, *California, *Bioindicators, Sampling, Monitoring, Variability, *Instrumentation, Pollutant identification.
Identifiers: *San Leandro Creek(Calif), Berkeley area(Calif).

In recent years much attention has been given to the use of artificial substrates for sampling benthic communities. The major impetus for their increased use comes from the Environmental Protection Agency's use of artificial substrates in water quality monitoring. The general consensus of workers who have used artificial substrates is that they possess advantages not found in more traditional benthic sampling methods. Uniform habitat and surface area, reduced sampling time and difficulty are among the quoted attributes of artificial substrates. After one summer of mixed results, it was decided to scrutinize the effectiveness of the sampler. A small stream comparable to others sampled during the project was chosen near the Berkeley Campus. The objective was to investigate the factors affecting the performance of the sampler. Specifically, information concerning the colonization time and identification of factors causing variability was acquired, and some tentative evaluations were attempted. (Snyder-California, Davis)
W77-08443

SPECTROANALYTICAL PARAMETERS OF FUNGAL METABOLITES: OOSPOREIN AND DESMETHOXYVIRIDIOL,
Auburn Univ., Ala. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W77-08449

THE EUTAW-MCSHAN AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08466

DISSOLVED SOLIDS, HARDNESS, AND ORTHOPHOSPHATE OF SURFACE-WATER RUNOFF IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08467

WATER-RESOURCES INVESTIGATIONS IN SOUTH DAKOTA, 1976.
Geological Survey, Huron, S.D. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08468

MAPS SHOWING GROUND-WATER CONDITIONS IN THE PUERCO-ZUNI AREA, APACHE AND NAVAJO COUNTIES, ARIZONA--1975,
Geological Survey, Flagstaff, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08471

WATER RESOURCES DATA FOR CONNECTICUT, WATER YEAR 1975,
Geological Survey, Hartford, Conn. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08480

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1974-75 WATER YEARS,
Geological Survey, Austin, Tex. Water Resources Div.
J. Rawson, and E. S. Chitwood.
Texas Water Development Board, Austin, 1977. 169 p, 18 fig, 84 tab, 13 ref.

Descriptors: *Water quality, *Reservoirs, *Texas, Water analysis, Chemical analysis, Dissolved solids, Dissolved oxygen, Hydrogen ion concentration, Water temperature.

Periodically since October 1961, the U.S. Geological Survey, in cooperation with State, Federal, and local agencies, has made comprehensive water-quality surveys of selected reservoirs in Texas. During the 1970 water year, the program was expanded to include periodic sampling of many other reservoirs in the State where water-quality surveys were not made. Water-quality data collected before October 1973 have been published previously. This report contains the results of water-quality surveys of 17 reservoirs and chemical analyses of samples collected periodically from 58 reservoirs. (Woodard-USGS)
W77-08483

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1975.
Geological Survey, Albany, N.Y. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08485

THE MATHEMATICAL DESCRIPTION OF THE BOD REACTION IN STREAM WATER,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W77-08493

A COMPARISON OF THE METHODS FOR CALCULATING THE CONSTANTS FOR THE FIRST ORDER BOD EQUATION,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W77-08494

DESIGN OF A WATER QUALITY MONITORING NETWORK,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
R. A. Berndt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 520, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 89 p, 13 fig, 14 tab, 17 ref. OWRT A-065-NC(1). 14-31-0001-4033.

Descriptors: Sampling, *Priorities, Design, *Networks, Water quality, *Monitoring, *Water quality standards, *Design criteria, Pollutant identification, Water analysis.
Identifiers: *Water quality monitoring network.

The aim is to examine the design of a water quality monitoring network for the objective of enforcement of water quality standards. The strategy for monitoring consists of the parameters sampled, the number and location of sampling stations, and the frequency of sampling. Parameters sampled are essentially those included in the water quality standards. Principal component analysis is used to identify important parameters. Number of sampling stations is dependent on the available resources of the monitoring agency. Priority among the total stations is determined by probability of violation, principal component analysis, population density and graphical technique. Information content and t tests are used to determine frequency of sampling. (Stewart-NC State)
W77-08497

BACTERIAL GROWTH ON DISSOLVED ORGANIC COMPOUNDS IN FRESH-WATER RESERVOIRS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. I. Romanenko, and E. P. Nikiforova.
Mikrobiologiya 43(1), p 133-137, 1974.

Descriptors: *Bacteria, Organic matter, *Organic compounds, *Pollutant identification, Reservoirs, Filters, *Mycobacterium.
Identifiers: Agar, USSR, Oligocarbophilic bacteria, *Membrane filter technique, *Bacterial growth, *Rybinsk reservoir(USSR).

Water from the Rybinsk reservoir (USSR) filtered through an asbestos filter, was used as a growth medium for bacteria. The content of dissolved organic substance in the medium was 13.4 mg C/l. Flasks containing 100 ml of the medium were sterilized and inoculated with several drops of water. The absence of bacterial cells in the medium enabled monitoring of the growth of oligocarbophilic bacteria by direct count on membrane filters. The bacterial growth was very intensive in this medium at 20-26C, the generation time was 1-3 h. The bacterial number, calculated by direct count and by counting the number of colonies on MPA meat peptone agar was the same during the intensive growth. Lower amounts of the bacteria were detected after prolonged storage on MPA. The growth rate of mycobacteria was highest in this medium.--Copyright 1975, Biological Abstracts, Inc.
W77-08498

CRYSTAL STRUCTURE ANALYSIS OF SELECTED PESTICIDES BY SINGLE CRYSTAL X-RAY DIFFRACTION: THE CRYSTAL AND MOLECULAR STRUCTURE OF PADAN,
Rhode Island Univ., Kingston. Dept. of Chemistry.
F. J. Pickles.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 579, Price codes: A04 in paper copy, A01 in microfiche. M. S. Thesis, 1975. 46 p, 3 fig, 17 tab, 33 ref. OWRT A-051-RI(2). 14-31-001-5040.

Descriptors: *Pesticides, *Pesticide residues, *Molecular structure, *Crystallography, *Pollutant identification, *X-ray diffraction, Insecticides, Chlorinated hydrocarbon pesticides, Chemical analysis.
Identifiers: *Padan, Nereistoxin, Chloinergic activity, Structure - activity correlation.

The solution of the crystal and molecular structure of Padan by single crystal X-ray diffraction confirmed that the compound under investigation is 1, 3-bis(thiocarbamoyl)-2-N,N-dimethylamino-propane hydrochloride. The results show that the structure of Padan is very similar to that of acetylcholine. This similarity suggests that the toxicity of this insecticide may be due to its activity in cholinergic systems.
W77-08503

THE EFFECT OF SOLUBLE ORGANIC MATTER ON THE UTILIZATION OF PHENOXY HERBICIDES BY PSEUDOMONAS SP.,
Rhode Island Univ., Kingston. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-08504

A METHOD FOR QUANTITATIVE DETERMINATION OF AMMONIFYING AND DENITRIFYING BACTERIA IN WATER WITH APPLIED EXAMPLES FROM GRAVEL-PIT POOLS, (IN CZECH),
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Limnobiologisches Institut.
I. Daubner, and R. Ritter.
Int Rev Gesamten Hydrobiol. 57(4), p 517-522, 1972.

Descriptors: *Bacteria, *Pollutant identification, Ponds, Gravel pits, Methodology, *Denitrification, *Analytical techniques, *Ammonification.
Identifiers: *Ammonifying bacteria, *Denitrifying bacteria, Gravel pits, *Membrane filter technique.

Using a new and simple membrane filter technique, the determination of ammonifying and denitrifying bacteria in water together with their identification 'in situ' was achieved. The membrane filter (MF) together with the grown bacterial colonies is either put on a paper filter saturated with the reagents or the reagents are applied dropwise to another wet sterile MF laid on top of the original. After 1-2 min the positive (colored) colonies are counted. The method was compared with the 'MPN'-method (most probable number) on different water samples and was applied during 1970 in investigations on gravel-pit pools. This method gives sightly higher bacterial counts than the MPN-method, but only in 1 instance was the difference significant. The method is precise and rapid, thus it is suitable for routine work.--Copyright 1975, Biological Abstracts, Inc.
W77-08509

POLLUTION INDICATOR BACTERIA ASSOCIATED WITH MUNICIPAL RAW AND DRINKING WATER SUPPLIES,
Ontario Ministry of the Environment, Rexdale. Lab. Service Branch.
J. A. Clark, and J. E. Pagel.
Canadian Journal of Microbiology, Vol. 23, No. 4, p 465-470, April, 1977. 2 tab, 11 ref.

Descriptors: *Bacteria, *Pollutant identification, *Bioindicators, *Potable water, *Municipal water, Analysis, Microorganisms, Analytical techniques, *Public health, Membrane processes, Fermentation, Water supply.
Identifiers: Most probable number technique.

The membrane filter (MF) and presence-absence (P-A) methods were used to determine the relative frequencies of the most commonly isolated pollution indicator bacteria associated with raw and drinking waters. A total of 3819 bacterial cultures were isolated in samples from 55 Ontario municipalities. The cultures were 82% Enterobacteriaceae and 18% oxidase-positive organisms. The Enterobacteriaceae were 92% lactose fermenters; 59% of these were aerogenic at 35 C and 14% at 44.5 C. Seventy-six percent of the oxidase-positive organisms were negative for lactose fermentation. About 1% of the lactose-fermenting cultures were aerogenic and oxidase-positive at 35 C. Frequency distributions were similar for both raw and drinking water isolations, but Escherichia doubled their frequency in raw water. Klebsiella organisms were preferentially cultured from MF plates and Enterobacter were isolated about twice as frequently as other coliform genera studied. The MF technique would not detect non-lactose fermenting coliform colonies, but this could be offset by the Aeromonas colonies. Coliform isolates would be undetected by the MPN technique because at least 25% were either anaerogenic or non-lactose fermenters. (Collins-FIRL)
W77-08516

CONFIRMATION OF THE SINGLE-STEP MEMBRANE FILTRATION PROCEDURE FOR ESTI-

MATING PSEUDOMONAS AERUGINOSA DENSITIES IN WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
B. J. Dutka, and K. K. Kwan.
Applied and Environmental Microbiology, Vol. 33, No. 2, p 240-245, February, 1977. 1 fig, 6 tab, 18 ref.

Descriptors: *Analytical techniques, *Filtration, *Membranes, *Pseudomonas, Performance, *Bacteria, Coliforms, Separation techniques, Analysis, Waste water treatment, *Bioindicators, Pollutant identification, Pathogenic bacteria.
Identifiers: Brodsky-Nixon MacConkey agar-membrane filtration, Most-probable-number(MPN).

Pseudomonas aeruginosa concentrations in water have become recognized as an indicator of pollution and as a pathogen. Determination procedures have been developed including membrane filtration and most-probable-number (MPN). Two membrane filter processes and MPN were compared to determine their relative efficiencies in enumerating P. aeruginosa from Canadian water and sewage samples. The Brodsky-Nixon MacConkey agar-membrane filtration procedure was a 24-hour procedure using a commercially available medium. Density estimates were based on the presence of fluorescence. It was found that large coliform populations interfered with the development of P. aeruginosa colonies. The method was judged unsuitable for application to natural and effluent waters. The other membrane filter process employed proline and ethanol. Results indicated that the specificity of membrane filter procedures confirmed 92-99% of the organisms as P. aeruginosa, while MPN verification rates varied from 64 to 86%. For all but sewage samples, a 3-4 day incubation period at 41.5 C provides the best data results with membrane filtration. This procedure, with mPA or mPA medium B, is a simple and rapid technique which avoids the extended procedures necessitated by the MPN technique. (Collins-FIRL)
W77-08518

ENTEROVIRUS TYPES IN ISRAEL SEWAGE,
Hadassah Medical School, Jerusalem (Israel).
B. Fattal, and M. Nishmi.
Water Research, Vol. 11, No. 4, p 393-396, 1977. 1 fig, 2 tab, 16 ref. EPA S-800990.

Descriptors: *Viruses, *Pollutant identification, *Analytical techniques, Public health, Diseases, Microorganisms, Analysis, Microbiology, Water pollution sources, Waste water treatment, Sewers, Enteric bacteria.
Identifiers: *Israel.

Picked virus and neutralization test methods were described for the isolation and identification of enteroviruses in the sewage of various Israeli communities. Grab and gauze pad methods were used to collect the sewage samples. The first method resulted in the finding of 489 isolates. These included 74% polioviruses; 10% Coxsackie Type B, Coxsackie A9 or Echo 9; and 16% Echo and other strains of enteroviruses. Fifty-two samples were tested for polio and non-polio viruses with the neutralization method. An average of 37% were found to be polioviruses. These percentages were higher than those obtained with other test methods. Regular virus monitoring of sewage would give a qualitative view of the enteroviruses in sewage and of the prevalence of enteroviral diseases of the population. (Collins-FIRL)
W77-08519

RAPID AGAR POUR-PLATE TECHNIQUE FOR DETECTION AND ENUMERATION OF FAECAL COLIFORMS IN SEWAGE,
National Environmental Engineering Research Inst., Nagpur (India).
P. M. Phirke.
Indian Journal of Environmental Health, Vol. 18, No. 3, p 183-190, July, 1976. 4 tab, 16 ref.

Descriptors: *Analytical techniques, *Pollutant identification, *Coliforms, Pollutants, Sewage treatment, Waste water treatment, Analysis, *Bacteria, Sewage effluents, Water pollution control.
Identifiers: Most-probable-number(MPN), Rapid agar pour-plate method.

The rapid agar pour-plate technique was developed to estimate coliform populations in sewage. The technique involved the homogenization of sewage samples which were then mixed with a sterile saline solution. Appropriate dilutions were placed in separate sterile petri dishes. Rapid agar, melted and cooled to 50-55 C, was added to the petri dishes and thorough mixing followed. Incubation at 41.5 C + 0.5 C in a water-jacketed air incubator for 7 to 8 hours followed solidification of the medium. After incubation, the yellow or orange coliform colonies were counted with a Qubec colony counter. Necessary computations were then made to adjust the results for tabulation. The technique was found to be quite sensitive and reliable. Results were consistent and reproducible with a 12.63% to 12.93% coefficient of variation. A specificity for fecal coliforms was a prime characteristic of this technique and comparisons with the MPN procedure revealed no significant differences. This method has the advantage of yielding absolute numbers as test results. (Collins-FIRL)
W77-08520

IMPROVED METHOD FOR THE DETERMINATION OF ETHYLENEDIAMINETETRAACETIC ACID IN AQUEOUS ENVIRONMENTAL SAMPLES BY GAS-LIQUID CHROMATOGRAPHY,
Water Pollution Research Lab., Stevenage (England).
J. Gardiner.
The Analyst, Vol. 102, No. 1211, p 120-123, February, 1977. 1 fig, 2 tab, 3 ref.

Descriptors: *Analytical techniques, *Chromatography, *Chemical reactions, *Pollutant identification, Liquid wastes, Sewage treatment, Waste water treatment, Laboratory tests, Analysis, Water purification, *Organic acids, Gas Chromatography.
Identifiers: *Ethylenediaminetraacetic acid.

The determination of ethylenediaaminetetraacetic acid (EDTA) in sewage, sewage effluents, and rivers is important because EDTA might lower the effect of adsorption and precipitation reactions in removing trace metal contaminants. Colorimetric and complexomtric analytical methods were unsuccessful; gas-liquid chromatography dterminations presented problems. A method was proposed using 1,6-hexanediaminetetraacetic acid (HDTA) as an internal standard. The sample is filtered and the filtrate is extracted with chloroform; it is then acidified with formic acid and the HDTA is added. After evaporation, but before precipitation, the filtrate is rinsed and further evaporated under a stream of nitrogen and in an oven. The tube is drawn in the middle in a gas-oxygen flame, and an esterifying solution is added. The tube is sealed, placed in boiling water, and centrifuged in a tube containing a phosphate buffer solution. After separation, the chloroform layer is transferred to a small sample tube and evaporated in the solvent under a nitrogen stream. The residue is dissolved in acetone and injected on to the gas-liquid chromatographic column. The mean recovery for this method is 98.6% with a 13.1% standard deviation. (Collins-FIRL)
W77-08521

CHLOROBIPHENYLS AND PCB'S: FORMATION DURING CHLORINATION,
Georgia State Univ., Atlanta. Dept. of Biology.
P. E. Gaffney.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 401-404, March, 1977. 3 tab, 14 ref.

Descriptors: *Chlorination, *Disinfection, *Polychlorinated biphenyls, Municipal wastes, Industrial wastes, Treatment facilities, Toxicity, Chemical reactions, Analytical techniques, Chromatography, *Waste water treatment.
Identifiers: *Chlorobiphenyls.

A study was conducted to discover if chlorobiphenyls were produced during actual and laboratory simulation of water and waste water treatment plant operation. Samples were spiked with biphenyl and chlorinated, extracted with hexane, and analyzed by gas chromatography. Results showed that various chlorobiphenyl isomers were produced during final chlorination. These and other organochlorines were produced in the laboratory chlorination of municipal plant influent and effluent. Mono- and dichlorobiphenyl were produced in the absence of iron; more were produced in its presence. Laboratory chlorination slightly increased dichlorobiphenyls concentrations in influents, but reduced them in effluents. Studies are being continued on the effect of these compounds on water and waste water treatment, on downstream ecosystems, and on water use. (Collins-FIRL)
W77-08538

IMPROVED GALVANIC DISSOLVED OXYGEN SENSOR FOR ACTIVATED SLUDGE,
Fischer and Porter Co., Warminster, Pa.
R. Poole, and J. Morrow.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 422-428, March, 1977. 7 fig, 9 ref.

Descriptors: *Pollutant identification, *Dissolved oxygen, *Monitoring, *Measurement, Equipment, *Activated sludge, Membranes, Electrolytes, Electrodes, Mechanical engineering, Analysis, *Waste water treatment.
Identifiers: Galvanic sensor.

A galvanic dissolved oxygen sensor which uses gold as the cathode and copper as the anode was developed. The gold electrode is covered with a gas-permeable, liquid impermeable teflon membrane to separate the cell from the test solution. The interior chamber has an electrolyte capacity of 60 centimeters. A thermistor is cemented to the sensor body. The sensor can operate continuously for 15 months before recharge is necessary. The membrane is easily replaced in field operation and good temperature compensation results from its exposure to constant load resistance at all temperatures. Field tests produced good results in aeration tanks. Agitators are not necessary when the sensor is used in aeration tanks. (Collins-FIRL)
W77-08539

DETERMINATION OF BOD AFTER FREEZING WATER SAMPLES (BESTIMMUNG DES BSB NACH EINFRIERUNG DER WASSERPROBEN),
B. Wachs.
Munchner Beitrage zur Abwasser-, Fischerei- und Flussbiologie, Vol 27, p 179-204, 1977. 12 fig, 9 tab, 28 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Freezing, *Biochemical oxygen demand, Bacteria, Flocculations, Temperature, Chemical oxygen demand, Organic matter, Carbon, *Waste water treatment, Chemical properties.

The effect of freezing and storing waste water samples on their biochemical and chemical parameters was studied. Waste water samples that cannot be analyzed on the site should be stored deep-frozen at -40 to -70C. Since a high percentage of the bacteria are irreversibly damaged by deep-freezing, samples thawed after such storage should be inoculated with mechanically or biologi-

cally purified municipal waste water before BOD measurement. As freezing results in the flocculation of additional organic substance that remains in the sample, it is necessary to eliminate the settling substances before freezing. With a BOD5 range of 10-50 mg/liter, storage at -20 to -30C can result in BOD5 losses of up to 20% compared with those of a fresh sample. The loss does not exceed 10% in a BOD5 range of 50-2,000 mg/liter. The BOD5, COD and TOC values measured in samples with BOD5 over 2,000 mg/liter, and stored at the above temperature, may be higher than those measured in fresh samples. The chemical and bacteriological parameters decrease progressively with storage time in the frozen state, especially in samples with low organic matter content, and in samples frozen and stored at relatively high subzero temperatures. (Takacs-FIRL)
W77-08546

SUSPENDED SOLIDS MEASUREMENT GIVES IMPROVED CONTROL,
Instruments (H. F.) Ltd., Bolton (Ontario).
E. S. Posgate.
Water and Wastes Engineering, Vol. 14, No. 3, p 30, 32, 35-36, March, 1977. 5 fig.

Descriptors: *Measurement, *Monitoring, *Automatic controls, Analysis, Equipment, *Suspended solids, Polymers, Flow rates, Physical properties, Chemical properties, Waste water treatment, Water purification.
Identifiers: Turbidimeters.

Turbidimeters have been adapted for monitoring and control at water and waste water plants. These reduce costs by regulating chemical input to actual demand. The basic process is a combination of gravimetric analysis with linear instruments for direct measurement in ppm of suspended solids. Factors involved in the use of this equipment are the type of water source, upstream discharges to the water source, seasonal climate, and weather changes. There is not a simple answer to what suspensions can be monitored directly. The major factor is that the suspension have uniform characteristics over a long term. Possible applications are moitoring activated sludge concentration and controlling flow rate for return to the primary stage, proportioning polymer input in sludge dewatering, final effluent monitoring, measuring sludge volume index, and making daily suspended solids measurements in advanced treatment systems. The automactic control system can reduce costs. (Collins-FIRL)
W77-08568

RELIABLE PH MEASUREMENT WHEN EFFLUENT CONDITIONS GET TOUGH,
Electrofact, Plymouth, Minn.
R. J. Kidder.
Pollution Engineering, Vol 9, No 4, p 30-33, April, 1977. 5 fig.

Descriptors: *Pollutant identification, *Automatic controls, *Hydrogen ion concentration, *Measurement, Instrumentation, Electrodes, Electrical properties, Monitoring, Equipment, Treatment facilities, Waste water treatment.

The reliability and use of pH measurement by automated systems was evaluated. Many components are available, and it was suggested that proper selection would produce a reliable and trouble-free system. Electrical components were listed and their electrical characteristics were briefly described, as were the problems associated with them. The reference electrodes discussed were of two types: diffusion or solid state electrodes, and flowing junction electrodes. Measuring electrodes were described and their design criteria were presented. They should be able to tolerate wide pH variations without chemical attack at ambient temperature, be suited to low pH solutions at high temperatues, and they should be constructed to provide suitable operation at low temperatures. Installation problems include unreliable or erroneous readings from common mode or ground loop voltages and fouling by filming or solid deposits. Various solutions were offered for these problems. (Collins-FIRL)
W77-08592

5B. Sources Of Pollution

IRRIGATED AGRICULTURE: NONPOINT AND POINT SOURCE WATER POLLUTION,
For primary bibliographic entry see Field 5G.
W77-08116

DEEP WATER RESOURCES OF THE LIMESTONES OF FRANCHE-COMTE: PROBLEMS OF QUANTITY AND QUALITY, (IN FRENCH),
For primary bibliographic entry see Field 4B.
W77-08122

SUMMARY OF SOME CURRENT AND POSSIBLE FUTURE ENVIRONMENTAL PROBLEMS RELATED TO GEOLOGY AND HYDROLOGY AT MEMPHIS, TENNESSEE,
Geological Survey, Nashville, Tenn. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-08174

DRIFT VELOCITIES OF SURFACE FILMS OVER WAVES,
Connecticut Univ., Storrs. Inst. of Water Resources.
M. C. Mohr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 661, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, 1977. 95 p, 35 fig, 10 tab, 1 append, 25 ref. OWRT A-059-CONN(1), 14-31-0001-5007.

Descriptors: *Oil spills, *Oil-water interfaces, *Waves(Water), *Films, *Wind velocity, *Turbulent boundary layers, Oil pollution, Laboratory tests, Path of pollutants.
Identifiers: *Oil slicks, *Drift velocities, *Wind-generated waves, *Mechanically-generated waves, *Wave steepness, *Surface film convection, *Stokes waves, Laboratory wind-wave channel, Pollution control operations, Estuaries, Oceans.

Oil spillage into the marine environment has become a serious problem in recent years. The analysis of the convection of an oil slick under oceanic conditions is an essential tool for pollution control operations. The drift of an oil slick on the sea is under the influence of both wind and waves. Research was initiated to study the convection of a surface film under the action of wind- and mechanically-generated waves in a laboratory wind-wave channel by using polyethylene sheets. In order to simulate the drift of an oil slick in a laboratory channel, the film size should be greater than two wavelengths for the wind-waves and one wavelength for mechanically-generated waves. The drift velocity over wind-waves is a function of wind velocity and wave steepness. However, the ratio of drift velocity to the shear velocity of the turbulent air boundary layer was found to correlate uniquely with the wave steepness for sufficiently large wave steepness. For the mechanically-generated waves, the film drift velocity is larger than the surface particle drift of the Stokes waves. In a wave field characterized by wave steepness, the effect of the wind on the drift velocity of surface films predominates over that due to waves. (de Lara-Connecticut)
W77-08193

THE EFFECT OF AERATION OF WATER JET SPREADING,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 8B.
W77-08197

THE INFLUENCE OF PRECIPITATION ON BIOCHEMICAL OXYGEN DEMAND ON NINE STREAMS IN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geography.
D. V. Dunlap.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 724, Price codes: A07 in paper copy, A01 in microfiche. Ph.D. Dissertation, January 1976, 114 p, 6 fig, 11 tab, 62 ref, 4 append. OWRT A-025-NJ(11). 14-31-0001-3830.

Descriptors: *Biochemical oxygen demand, *New Jersey, *Precipitation(Atmospheric), *Streams, *Streamflow, Temperature, Spatial distribution, Temporal distribution, *Air temperature.

The influence of precipitation, streamflow and temperature on biochemical oxygen demand (BOD) on nine streams in central and northern New Jersey is examined with the goal of determining the time factors and spatial distribution of BOD as influenced by precipitation. From August 1969 to March 1972, 530 samples were taken with simultaneous observations of BOD concentration, streamflow, and air temperature (as an approximation to water temperature), along with precipitation for various time periods prior to observation time. Sites were chosen in sandy and clay soils, and for each soil texture there was a wooded area, a farm area and a residential area. Most of the watersheds covered areas of less than 11 square miles, but one was a river basin of 258 square miles. Stepwise regression techniques were applied to the data using precipitation intervals ranging from 1 to 24 hours duration. Short-term intervals of precipitation from 1 to 6 hrs. were the most effective time periods for the regression equations. Streamflow and BOD concentrations were both so closely related to BOD load that they were dropped from the models. Air temperature seemed to have little effect on the response of BOD load. Bivariate linear regression was undertaken to determine if any direct relationship might exist between BOD load and various periods of antecedent precipitation. Precipitation in the 6 to 12 hours prior to observation time appears to be most closely related to BOD load in the 4 watersheds with the most observations. Significant seasonal differences were manifested. The correlation of streamflow and BOD load was found to be statistically significant on 5 of the streams investigated, with major differences between different streams.
W77-08203

MINERAL CYCLING IN RESERVOIRS,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-08217

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; THE WIND-DRIVEN CURRENTS AND CONTAMINANT DISPERSION IN THE NEAR-SHORE OF LARGE LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
Y-Y. P. Sheng.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 694, Price codes: A10 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Contract Report H-75-1, Report 17-5, October 1975. 215 p, 95 fig, 46 ref, 7 append. Army DACW39-74-C-0080.

Descriptors: *Water circulation, *Winds, *Lake Erie, *Model studies, Lakes, Mathematical models, Currents(Water), Circulation, Pollutants, Effects, Water pollution, Dispersion, Path of pollutants, Suspended solids, Airports, Islands, Hydrodynamics.
Identifiers: Wind-driven currents, Jetport effects.

The wind-driven circulation and dispersion of contaminants in a near-shore region of Lake Erie were studied by means of numerical models. The first problem studied was that of the thickness of the coastal boundary layer in a large lake. In this study, the non-linear acceleration and Coriolis force terms were included in the equations of motion. Next, a major study of the steady-state and time-dependent currents in the near-shore Cleveland area of Lake Erie, under present conditions and as modified by large man-made structures or islands, e.g., a jetport in the lake, was made. The effects of (1) a jetport island approximately 6 miles offshore of Cleveland, and (2) a land-fill extension of this island to shore, were examined in detail. The island was found not to affect the flow appreciably, while the extension to the shore modified the flow significantly. The calculations generally required a fine near-shore grid coupled with a coarser off-shore grid. In time-dependent calculations, a small time step was used in the near-shore, while a larger one was used in the offshore. The proper coupling procedure was studied in detail. The three-dimensional, time-dependent dispersion equation has been solved for various conditions. A vertically stretched coordinate system was used to incorporate the variable bottom topography. The flow and dispersion of a contaminant from a point source (the Cuyahoga River) in the near-shore were studied, using the velocities obtained from the numerical hydrodynamic models. Effects of horizontal diffusion, gravitational settling, and bottom boundary conditions were examined. With some modification, the numerical models developed in this report can be applied to study the near-shore regions of other large lakes and the Ocean. (Sims-ISWS)
W77-08220

A PREDICTIVE MODEL FOR TRANSIENT TEMPERATURE DISTRIBUTIONS IN UNSTEADY FLOWS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
D. R. F. Harleman, D. N. Brocard, and T. O. Najarian.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 922, Price codes: A06 in paper copy, A01 in microfiche. Report 175, November 1973. 103 p, 29 fig, 4 tab, 4 ref, 1 append. EPA R800429.

Descriptors: *Path of pollutants, *Water temperature, *Unsteady flow, *Model studies, Mathematical models, Water quality, Temperature, Distribution patterns, Powerplants, Nuclear powerplants, Hydroelectric plants, Heat, Heated water, Cooling water, Reservoirs, Estuaries, Water pollution, *Thermal pollution, Flow, Heat transfer, Discharge(Water), Pollution, *Pennsylvania, *Maryland.
Identifiers: *Temperature distribution, *Conowingo Reservoir(Penn-Md).

The factors contributing to the heat exchange across the free surface of a body of water were reviewed, and quantitative relationships for the calculation of the heat fluxes were summarized. Mathematical models were described which determine the temperature distribution in natural bodies of water. A one dimensional steady model in which the temperature distribution is a function of longitudinal distance was used to show that, when the longitudinal variation of water temperatures is small (up to 10 F), the influence of the water surface temperature variation on the widely used surface heat transfer coefficient can be neglected. Another mode was a one dimensional unsteady model in which the temperature distribution is a function of longitudinal distance and time. The flow was unsteady and non-uniform, and meteorological conditions and boundary conditions were compared with measurements of natural water temperatures in Conowingo Reservoir during various periods of time in April and September 1972. (Sims-ISWS)
W77-08221

NITROGEN AND PHOSPHORUS ANALYSES OF RAINFALL AT ROTORUA, NEW ZEALAND,
Marine Dept., Rotorua (New Zealand). Fisheries Research Div.
For primary bibliographic entry see Field 5A.
W77-08242

THE FALLOUT OF NITROGEN AND PHOSPHORUS COMPOUNDS FROM THE ATMOSPHERE AT NGAPUNA, NEAR ROTORUA, NEW ZEALAND,
Marine Dept., Rotorua (New Zealand). Fisheries Research Div.
For primary bibliographic entry see Field 5A.
W77-08243

SANITARY AND HYGIENIC CHARACTERISTICS OF SUBSURFACE WATERS OF THE TSELINOGRAD AND TURGAI OBLASTS, (IN RUSSIAN),
Tselinogradskii Meditsinskii Institut (USSR). Dept. of General Hygiene.
N. I. Anan'ev.
Gig Sanit. 4, p 206-208, 1974.

Descriptors: Public health, Subsurface waters, *Groundwater, *Aquifers, Mineralogy, *Iron, *Fluoride, Artesian waters, Desalination, Water purification, Potable, Waste water treatment.
Identifiers: Oblasts, Tselinograd, Turgai, USSR.

In chemical composition the groundwaters of the Tselinograd and Turgai districts in the Kazakh SSR, USSR, are distinguished by considerable diversity even in the same aquifer and after by high mineralization. A relatively high Fe content and low F content was noted in the water of almost all aquifers. The alluvial infiltration waters or river valleys, having low mineralization, good discharge and sufficient supplies, are most promising for supplying populated areas. Because of their stagnant nature and high mineralization, the artesian waters are unsuitable for drinking, but can be used after distillation plants.--Copyright 1975, Biological Abstracts, Inc.
W77-08253

METHOD OF DISPERSING OIL IN WATER,
Imperial Chemical Industries Ltd., London (England). (Assignee).
For primary bibliographic entry see Field 5G.
W77-08260

THE ACCUMULATION AND DISTRIBUTION OF ORGANOCHLORINES AND SOME HEAVY METALS IN AMERICAN FALLS RESERVOIR FISHES, WATER AND SEDIMENT,
Idaho State Univ., Pocatello. Dept. of Zoology.
J. C. Kent.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 914, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1976. 79 p, 6 fig, 8 tab, 102 ref. OWRT A-043-IDA(1), 14-34-0001-6013.

Descriptors: Reservoirs, Sediments, *Chlorinated hydrocarbon pesticides, *DDT, *Dieldrin, *Polychlorinated biphenyls, *Mercury, Water pollution, *Cadmium, Metals, Fish, *Idaho, *Heavy metals, Distribution, Path of pollutants, *Pesticide residues, Lethal limit.
Identifiers: *American Falls Reservoir(Idaho), *Organochlorines.

Chlorinated hydrocarbon residues (DDT metabolites, dieldrin, and PCB's) were found in fish flesh samples and sediment in American Falls Reservoir. The concentration and type of chlorinated hydrocarbon varied with fish species and age. The mean value for PCB's in large suckers was 671/ug/kg. The Environmental Protection Agency has recommended PCB concentrations in any sample consumed by any bird or mammal be no greater than 500 ug/kg. Chlorinated hydrocarbons were not detected in the water samples. Mercury and cadmium were found in all species analyzed for those particular metals. Results indicate that the Food and Drug Administration's standard of 0.5 mg/kg may be exceeded in crappie, suckers, and large rainbow trout. The mean value for mercury in water was 0.9 ug/1. The Environmental Protection Agency has recommended for the protection of fish and predatory aquatic organisms, that total mercury concentration in unfiltered water should not exceed 0.2 ug/1 at any time or place. The World Health Organization has recommended daily intake of cadmium not be more than 70 ug/day. Consumption of fishes from the reservoir would exceed the recommended limit. The maximum concentration of cadmium in the water was seven times the value given by the National Academy of Sciences, considered to be an environmental threat. Arsenic was found only in the sediments and water. It was not detected in any of the fishes sampled.
W77-08287

A QUANTITATIVE STUDY OF ORGANIC CARBON DECOMPOSITION AND NITROGEN TRANSFORMATIONS IN SEWAGE SLUDGE-SOIL SYSTEMS,
Rutger - The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
Y. P. Hsieh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 924, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Thesis, May 1976, 168 p, 29 fig, 17 tab, 130 ref. OWRT A-038-N.J.(2), 14-31-0001-5030.

Descriptors: *Sewage disposal, Soil water, *Decomposing organic matter, *Waste disposal, Computer models, Carbon, *Carbon dioxide, Sewage sludge, Ammonium, *Nitrates, Temperature, Soil moisture, Nitrogen, *Soil contamination.
Identifiers: *Organic carbon.

A quantitative study of rate of sewage sludge decomposition in soil was made, with emphasis on the effect of soil moisture content and soil temperature on rate of release of CO2, NH4 and NO3. Sewage sludge was found to contain two families of organic compounds, one group which decomposed rapidly and one group that resisted decomposition. The half life of sewage sludge in soil was found to vary with the amount of sewage sludge added to soil. A model describing the decomposition of sewage sludge in soil was prepared.
W77-08291

THE INFLUENCE OF BRACKISH-WATER INTRUSION ON MACROINVERTEBRATE ASSOCIATIONS OF THE LOWER TCHEFUNCTE RIVER, LOUISIANA,
New Orleans Univ., La. Dept. of Biological Sciences.
M. M. Mulino.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 933, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, August 1975. 99 p, 1 fig, 13 tab, 65 ref. OWRT A-038-LA(1).

Descriptors: Estuarine environment, Chemical analysis, *Invertebrates, Bioindicators, *Brackish water, *Louisiana, Lakes, Surveys, Ecology, *Saline water intrusion, Water pollution.

Identifiers: Lake Pontchartrain(La), Estuarine pollution, *Tchefuncte River(La).

An ecological survey was conducted of the lower Tchefuncte River, Louisiana, June-November 1974. The Tchefuncte drains into Lake Pontchartrain, a large oligohaline estuary. Brackish lake water enters the river channel when flow is minimal. Maximum extent of brackish-water intrusion was determined as approximately 9 miles from the river mouth during October. Eighty-six macroinvertebrate taxa were collected in the study area, 17 marine and 69 predominantly fresh-water. Balanus improvisus, Victorella pavida, Rithropanopeus harrisii, Gammarus sp., Melita nitida, and an unidentified polyclad flatworm existed at the river mouth in limnetic conditions and colonized upriver habitats during maximum brackish-water intrusion when salinity reached approximately 0.79 ppt in these areas. These organisms are proposed as short-term indicators of the extent of brackish-water intrusion. Rangia cuneata, Congeria leucophaeta, and Cordylophora caspia existed under limnetic conditions only in the tidal area of the river. Since these organisms appear dependent upon brackish water for their continued existence in the river, they are proposed as long-term indicators of the extent of brackish-water intrusion. Physicochemical parameters measured included salinity, specific conductance, chlorides, turbidity, color, settleable matter, pH, phenolphthalein alkalinity, total alkalinity, free carbon dioxide, dissolved oxygen, total hardness, sulfate, ammonium nitrogen, nitrate nitrogen, orthophosphate, and total iron. These parameters are discussed in relation to seasonal trends and in relation to similar ones in comparable habitats.
W77-08292

BENTHIC MICROBIAL COMMUNITY RESPIRATION OF A SOFT-WATER LAKE,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2H.
W77-08296

DEVELOPMENT OF A COLUMN CHROMATOGRAPHY METHOD FOR FIELD OF PRECONCENTRATION OF TRACE METALS WITH APPLICATION TO THE HAW-CAPE FEAR RIVERS, N.C.,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W77-08299

DIFFUSE AGRICULTURAL POLLUTION: THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS,
Wisconsin Univ. Madison. Dept. of Agricultural Economics.
R. R. Schneider.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 126, Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Thesis, 1976. 190 p, 29 fig, 57 tab, 8 maps, 67 ref, 3 append. OWRT A-063-WIS(1). 14-31-0001-4050.

Descriptors: *Economics, Regulation, Water pollution control, *Sediments, *Nutrients, Agriculture, *Management, *Fertilizers, *Costs, *Wisconsin, Dairy industry, *Agricultural runoff, Water pollution sources, Farm wastes, *Nitrates, Groundwater, Nitrogen, Path of pollutants, Alternative costs.
Identifiers: *Dairy farms.

The study examines policies designed to curtail 3 types of diffuse agricultural pollution, namely, 1. runoff from winter-spread manures; 2. sediment in rill and sheet erosion; 3. nitrate pollution of the ground water resulting from field-applied manure and chemical nitrogen. Policies tested on 4 farm sizes at 4 locations are: 1. enforce Wisconsin's Model Sediment Control Ordinance; 2. prohibit manure spreading in winter; 3. prohibit winter manure spreading on sloped land; 4. prohibit winter manure spreading close to streams, lakes and open ditches; 5. restrict excess of applied nitrogen over estimated plant uptake of nitrogen; 6. combine 1, 3, 4 and 5 above; 7. combine 1, 2 and 5 above; 8. restrict average total sediment yield. Effects of these policies in the glaciated and unglaciated regions of the state are explored. Estimation of appropriate data for the economic analysis (partial competitive equilibrium) is an integral part of the study. Marginal cost of pollution reduction is calculated for each policy and a cost curve is generated for a sediment policy on selected farms. Data include physical quantities of pollutant reduction. Major conclusions are: 1. Sediment limit should be differentiated by region; 2. Sediment limits based on ton/acre/farm is superior to ton/acre/field; 3. Nitrate pollution from manure and chemicals is unlikely to be a major problem in Wisconsin; 4. Assuming compliance, the restriction of winter-spread manure to slopes of 4 percent or less is superior to complete prohibition of winter spreading.
W77-08329

STATISTICAL CHARACTERIZATION OF DILUTE PARTICULATE SUSPENSIONS IN TURBULENT FLUID FIELDS,
Illinois Univ. at Urbana-Champaign. Dept. of Nuclear Engineering.
C. C. Meek.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 052, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Thesis, 1972. 174 p, 54 fig, 4 tab, 33 ref, 4 append. OWRT A-019-ILL(4), B-042-ILL(2). 14-31-0001-3077.

Descriptors: *Dispersion, *Turbulent flow, *Water pollution, Air pollution, Instrumentation, *Turbulence, *Sedimentation, *Velocity, *Particle size, Particle shape, Isotropy.
Identifiers: *Particulate transport, Particulate behavior, Stokesian drag.

Analytically, a theory simplified by the restrictive constraints of isotropy and Stokesian drag has been developed. Assumption of a reasonable particle energy spectrum allowed calculation of various statistical quantities important in the determination of the particle's turbulent motion. By such an analysis three characterizing parameters were found. Two describe inertial effects due to the particle's size and density. They were found to be of prime importance in the determination of the ratio of the particle's fluctuating velocity variance to that of the fluid. The crossing of the particle from one region of correlated fluid turbulence to another by virtue of its free fall velocity is described by the third parameter. This parameter was shown to be of particular importance in limiting the particle's velocity correlation. The two effects, of inertial and of free fall velocity, together act to determine dispersion. A well parameterized particle experiment was undertaken. Analysis of the particles' behavior in the turbulent flow gave a three dimensional characterization of their motion. In particular calculations of velocity variances, autocorrelations, and energy spectra were made. Comparison of theoretical prediction to experimental observation showed good agreement as long as the underlying assumptions inherent in the theoretical derivation were valid. Agreement suffered when these assumptions proved less valid. In particular non-Stokesian drag and anisotropic effects caused disagreement between theory and experiment.
W77-08330

THE EFFECTS OF URBANIZATION ON LOW FLOWS AND TOTAL RUNOFF,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-08335

POSSIBILITIES AND ROLE OF BIOLOGICAL ANALYSIS IN EVALUATING THE DEGREE OF POLLUTION OF WATER BODIES, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 5A.
W77-08430

FOX CHAIN OF LAKES INVESTIGATION AND WATER QUALITY MANAGEMENT PLAN,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2H.
W77-08442

A STUDY OF COOLING INITIALLY UNIFORM AND THERMALLY STRATIFIED LAYERS OF WATER,
Purdue Univ. Lafayette, Ind. School of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W77-08444

SELECTIVE WITHDRAWAL AND HEATED WATER DISCHARGE: INFLUENCE ON THE WATER QUALITY OF LAKES AND RESERVOIRS PART I - SELECTIVE WITHDRAWAL,
Wisconsin Univ. -Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5G.
W77-08447

GROUNDWATER RESOURCES OF GUAM: OCCURRENCE AND DEVELOPMENT,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W77-08448

BACTERIOLOGICAL POLLUTION IN THE DRINKING-WATER OF JORDAN,
Ministry of Health, Amman (Jordan). Dept. of Bacteriology.
A. Shehabi.
Environmental Conservation, Vol 3, No 3, p 197-199, Autumn, 1976. 2 tab, 7 ref.

Descriptors: Bacteriology, *Groundwater resources, *Water pollution sources, *Potable water, *Water pollution effects, *Human diseases, Water pollution control, Water pollution, Water resources, Water demand, Available water, Water quality, Sewage disposal, Solid wastes, Industrial wastes, Diseases, Groundwater, Aquifers, Enteric bacteria.
Identifiers: *Jordan.

Many factors contribute to water pollution in Jordan. Among these are the inadequate means of sewage disposal, the obsolete methods employed in the management of solid waste, and the problems associated with industrial activity in high population density areas. Several aspects of bacteriological pollution control in the drinking water of Jordan are discussed. Water samples were collected from several areas of Jordan and analyzed. The results presented indicate that the present pollution-index of Jordan's water supply is significantly high in some regions. This is a major cause for alarm, as the bacteriological pollution of the underground water sources has been found to originate largely from excretal sources. The conclusion is reached that intensive efforts should be launched in order to prevent further pollution of groundwater in Jordan. (Jamail-Arizona)
W77-08454

WATER QUALITY IN THE TEXAS COASTAL BASINS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
M. H. Frere, and O. D. Workman.

USDA Publication No ARS-S-163, May 1977. 8 p, 11 fig, 2 tab, 7 ref.

Descriptors: Water analysis, *Water quality, Basins, *Irrigation water, *Nitrates, Land use, Water resources, *Texas, *Gulf coastal plain, Water utilization.
Identifiers: *Texas coastal basins, Gulf coast basin.

Ten years of water-quality records were examined to evaluate the usability of water in the Texas coastal basins, particularly for agriculture, and to determine if agriculture was affecting water quality. Average values of 7 water-quality parameters in 2 periods (1964-69 and 1969-74) were calculated for 23 rivers and basins. The quality of water for agricultural use decreased from the northeast to the southwest. The low quality of water in some basins requires special management for use. Nitrate concentrations were examined in relation to streamflow, seasons, land use, and years. The evidence did not indicate that agricultural activities were seriously degrading the stream water. (ARS)
W77-08465

TIME OF TRAVEL OF SOLUTES IN THE EAST FORK TRINITY RIVER, NOVEMBER 1975; AND ELM FORK TRINITY RIVER, DECEMBER 1975; TRINITY RIVER BASIN, TEXAS,
Geological Survey, Fort Worth, Tex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08472

LONGITUDINAL DISTRIBUTION OF SELECTED MICRONUTRIENTS IN NORTHERN SAN FRANCISCO BAY DURING 1973,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5C.
W77-08487

PHYTOPLANKTON PRODUCTION AND ENUMERATION IN NORTHERN SAN FRANCISCO BAY DURING 1972,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5C.
W77-08488

IMPLICATIONS OF SEASONAL CHEMICAL AND PHYSICAL FACTORS ON THE PRODUCTION OF PHYTOPLANKTON IN NORTHERN SAN FRANCISCO BAY,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5C.
W77-08489

THE MATHEMATICAL DESCRIPTION OF THE BOD REACTION IN STREAM WATER,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.
J. P. Hewitt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 529, Price codes: A07 in paper copy, A01 in microfiche. PhD. Thesis, May 1973, 121 p, 13 fig., 19 tab., 59 ref., 3 append. OWRT A-025-N.J.(10). 14-31-0001-3830.

Descriptors: *Biochemical oxygen demand, Kinetics, *Oxygen demand, *Mathematical models, *Regression analysis, Decomposing organic matter, Oxygen sag, Pollutants, Water pollution, Model studies.
Identifiers: *First order kinetics, *Second order kinetics, *Retardation equations, *Simultaneous first order kinetics.

The mathematical description of the Biochemical Oxygen Demand, BOD, for stream water samples is examined. Mathematical expressions which have been offered as alternatives to the first order model are considered for possible application in stream water BOD modelling. All BOD models were fitted to the BOD data using the Gauss-Newton iteration method for solving non-linear regression problems, Biomedical Computing Program BMDX85. The first order model fails to describe adequately the BOD process as evidenced by the poor distribution of residual errors. Other order models, from first to fourth order in steps of 0.5, failed to improve the residual error distribution. The retardation model could not be successfully fitted to stream water BOD data, and where obtained, the distribution of the residual errors was slightly improved as compared to the first order model. A BOD model was proposed of the type $dL/dt = -kL - k'L(1 + t2)$ which on integration produces an equation which in 65% of the cases examined gave significant reductions in residual sum of squares. (Hunter-Rutgers)
W77-08493

A COMPARISON OF THE METHODS FOR CALCULATING THE CONSTANTS FOR THE FIRST ORDER BOD EQUATION,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.
J. P. Hewitt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 518, Price codes: A04 in paper copy, A01 in microfiche. M. S. Thesis, June 1971. 67 p, 1 fig., 10 tab., 23 ref, 2 append. OWRT A-025-N.J.(9). 14-31-0001-3230.

Descriptors: *Biochemical oxygen demand, *Kinetics, *Oxygen demand, *Mathematical models, *Regression analysis, Decomposing organic matter, Oxygen sag, Pollutants, Water pollution, Model studies, Methodology.
Identifiers: *First order kinetics.

Six simplified methods for calculating first order BOD constants were compared with the original Reed-Theriault procedure, using BOD vs t data for 20 receiving water samples from the state of New Jersey. None of the simplified methods proved acceptable. Deviations of up to 158% were observed for k values and up to 315% for Lo values. The use of such methods should be avoided.
W77-08494

PREDICTION MODELS OF REAERATION RATE FOR MOUNTAIN CREEKS,
Utah State Univ. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5G.
W77-08501

PHOSPHORUS EXCHANGE AT THE SEDIMENT-WATER INTERFACE OF SELECTED NARRAGANSETT BAY SEDIMENTS,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W77-08502

FOREST FERTILIZATION AND WATER QUALITY IN THE NORTH CAROLINA PIEDMONT,
North Carolina State Univ., Raleigh. School of Forest Resources.
S. G. Sanderford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 621, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 53, March 1975. 42 p, 1 fig, 11 tab, 35 ref. OWRT A-085-NC(2), 14-31-0001-5033.

Descriptors: *Fertilization, Water quality, Nutrients, Nitrogen, Phosphorus, Potassium, Drainage, Forest management, *Forest watersheds, Loblolly pine trees, *North Carolina.
Identifiers: *Nutrient losses.

The study was established to determine the effects of N-P-K fertilization on water quality in a forested watershed in the North Carolina Piedmont. A proportional water sampler was used to monitor natural nutrient levels from January 1972 through March 1973. Approximately one-eighth of the watershed was then fertilized (110 kg-N/ha, 24 kg-P/ha, and 47 kg-K/ha) and nutrient monitoring continued through March 1974. Continuous streamflow hydrographs and precipitation records were maintained for the experiment's duration. Comparisons were made between pre and post-treatment nutrient concentrations and losses from the watershed. Only very slight changes in dissolved NO3-N, NH4-N, P, K, Ca, and Mg concentrations were detected following treatment. All concentrations were very low. Kilogram per hectare nutrient losses in the dissolved state were not significantly increased following treatment. Seasonal nutrient level variations, although observed, were slight. It was concluded that forest fertilization had no detrimental effects on water quality. (Stewart-NC State)
W77-08508

FRACTIONATION AND CONTROL OF IRON IN CHANNELIZED AND SWAMP DRAINAGE STREAMS IN NORTH CAROLINA,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
D. S. Vodopich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 625, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, May 1975. 56 p, 5 fig, 8 tab, 35 ref. OWRT A-080-NC(2), 14-31-0001-5033.

Descriptors: *Channel improvement, *Swamps, *Iron, Organic matter, Water quality, *Drainage, Streambeds, Organic carbon, Phosphorus, Heavy metals, Chemical analysis, *North Carolina, Sediment transport, Streams.
Identifiers: *Channelization, *Factionation(Iron), Iron analysis, Organic carbon.

A channelized stream and swamp drainage stream in eastern North Carolina were investigated as to their capacity to transport and fractionate iron. Several water quality parameters were considered with special attention given to organic matter as a control. Between May and September 1974, measurements of dissolved oxygen, pH, temperature, conductivity, flow, organic carbon, and iron, including organically complexed iron, were made and correlated. The two stream systems were found to fractionate and discharge iron differently both qualitatively and quantitatively. The mean total iron concentration of the swamp and channelized streams were 2.06 and 1.46 mg/l respectively. The swamp was consistently higher in both the percentage of total iron dissolved and the percentage of organically complexed iron dissolved. Suspended particulate matter was a major influence on fractionation. The major role of organic matter was the production of a reducing environment rather than a significant binder of iron. (Stewart-NC State)
W77-08510

WATER QUALITY IMPACTS OF URBANIZATION--A METHODOLOGY,
Economic and Social Commission for Asia and the Pacific (UN), Bangkok (Thailand). Div. of Industry, Housing, and Technology.
K. F. Jalal.
Journal of the Environmental Engineering Division-ASCE, Vol. 103, No. EE1, p 49-57, February, 1977. 2 fig, 4 tab, 2 append.

Descriptors: *Model studies, *Urban runoff, Water quality, Design, Planning, Pollutant identification, Cities, Urban areas, Water quality control, Economics.

Identifiers: STORM runoff model.

The STORM (Storage Treatment Overflow Runoff Model) model was used in Canada to investigate the effects of urbanization on water quality. Three steps are involved in the application of the model for this purpose: long-term simulation of runoff quantity and quality for all planning alternatives; comparison of alternatives; and determination of the storage-treatment relationship and the optimum storage-treatment combination for the preferred alternative. Using the model can produce the optimum storage-treatment combinations for meeting a given water quality objective at minimum cost. (Collins-FIRL)
W77-08514

FACTORS AFFECTING THE DENITRIFICATION RATE IN TWO WATER-SEDIMENT SYSTEMS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Microbiology.
J. F. van Kessel.
Water Research, Vol. 11, No. 3, p 259-267, 1977. 9 fig, 4 tab, 32 ref.

Descriptors: *Denitrification, *Temperature, *Dissolved oxygen, Sediments, Evaluation, Analysis, Physical properties, Chemical properties, Activated sludge, Nitrogen, *Nitrates, Sediment-water interfaces.

Two water-sediment systems were studied to analyze denitrification rates, and to determine the effects of temperature, dissolved oxygen, nitrate concentrations in the water above the sediment, and the thickness of the sediment layer on these rates. Sediment A was from the top 10 centimeters of a ditch containing effluent of an activated sludge aeration treatment facility using slurry from meat production calves. Type B was from a similar layer for a ditch containing water drained from arable land. Denitrification was slightly decreased when dissolved oxygen increased from 0 to 2 milligrams/liter in overlying water. Further increases in DO concentrations had no further decreasing effect. Denitrifiction depended on nitrate concentrations in the overlying water when these concentrations were low. It occurred more independently as the nitrate concentrations increased. Denitrification began after an extended lag at 4 C. Denitrification, as well as nitrification, proceeded rapidly at 15 and 25 C. With nitrate-nitrogen concentrations of 25.2 milligrams/liter, a 7 millimeter layer of sediment A and a 14 millimeter layer of sediment B influenced denitrification. Added means of nitrate transport into the sediments were expected to produce lower denitrification rates in natural environments. (Collins-FIRL)
W77-08517

TRENCHING SLUDGE MAY BE SAFE.
For primary bibliographic entry see Field 5E.
W77-08594

5C. Effects Of Pollution

IMPACT OF TOXIC CLONES OF BLUE-GREEN ALGAE ON WATER QUALITY AS RELATED TO AQUATIC ANIMALS,
New Hampshire Univ., Durham. Dept. of Zoology.
P. J. Sawyer, M. Ikawa, and J. J. Sasner, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 594, Price codes: A03 in paper copy, A01 in microfiche. New Hampshire Water Resources Research Center, Durham, Completion Report, Research Report No. 12, (1977). 35 p, 3 fig, 4 tab, 39 ref. OWRT A-021-NH(5). 14-31-0001-3029.

Descriptors: *Cyanophyta, Anabaena, *Toxicity, Eutrophication, *Algal toxins, Algae, Aquatic algae, North America, Water quality, *New Hampshire, Oxygen, Chromatography, *Biodegradation, Decomposing organic matter, Water pollution effects.
Identifiers: *Anabaena flos-aquae, *Microcystis aeruginosa, *Aphanizomenon flos-aquae, Toxic species, *Oxygen depletion.

The literature indicates that toxic blooms of blue-green algae occur widely. Gorham (1966) cited references describing blue-green algal poisonings from Russia, Argentina, Australia, Morocco, Bermuda, Brazil and Finland. In North America these blooms have been most frequently reported from North Dakota, South Dakota, Minnesota, Iowa, Wisconsin, Illinois, Michigan, Alberta, Saskatchewan, Manitoba and Ontario (Gorham, 1966). Several species of blue-green algae have been associated with these toxic blooms in North America, but the most commonly occuring toxic species are Anabaena flos-aquae, Microcystis, aeruginosa and Aphanizomenon flos-aquae. All three of these occur from time to time in New Hampshire and they occur in both toxic and non-toxic forms. Problems concerning the toxicity of these species occur when heavy concentrations of them decompose naturally. The products of decomposition plus toxic substances from within the cells cause death or illness to many mammals, birds and fishes at that time. Also, associated with the decomposition of large amounts of organic matter, low oxygen concentrations may occur. The combination of toxic substances and low oxygen levels is rapidly fatal to many aquatic organisms. This is the usual manner of toxic manifestations.
W77-08104

EFFECT OF METALS ON PHOTOSYNTHESIS OF MARINE PHYTOPLANKTON, (IN RUSSIAN),
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
S. A. Patin, and V. N. Tkachenko.
Biol Nauki. 17(5), p 67-69, 1974.

Descriptors: *Photosynthesis, *Mercury, *Copper, Metals, *Phytoplankton, Water pollution effects, *Marine algae, Salts, Nutrients, Seasonal, Primary productivity.
Identifiers: Ditylum-Brightwellii, Gyrodinium-Fissum, Nephrochloris-Salina.

A study of the effect of Hg and Cu salts on 3 spp. of marine unicellular algae (Ditylum brightwellii, Gyrodiniuum fissum, Nephrochloris salina) in culture showed that the rate of C assimiltion drops considerably at concentrations of these salts equal to or less that the maximum allowable concentration (5-10 micro-g/1) in water. The biological after effects of water pollution, at least with respect to primary production, may depend on the level of pollution and on the season The data suggest a greater resistance of unicellular algae to the effect of high concentrations of Hg (10 micro-g/1 and higher) in the presence of an excess of nutrients.--Copyright 1975, Biological Abstracts, Inc.
W77-08160

COMPARATIVE EXAMINATION OF ENTEROCOCCI OBTAINED FROM DRINKING WATER, FOODSTUFFS AND URINE, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W77-08179

A STATISTICAL ANALYSIS OF THE MERCURY CONCENTRATIONS IN FISH FROM LAKE JOCASSEE, SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5A.
W77-08190

ARSENIC IN WATER AND FISH FROM LAKES HARTWELL, KEOWEE, AND JOCASSEE, SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5A.
W77-08191

A SURVEY OF CADMIUM OCCURRENCE AND CONCENTRATION IN FISH FROM ELEVEN MAJOR RESERVOIRS IN SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5A.
W77-08192

EFFECTS OF PH AND INORGANIC CARBON CONCENTRATIONS UPON COMPETITION BETWEEN ANABAENA FLOS-AQUAE AND SELENASTRUM CAPRICORNUTUM,
Maine Univ., Orono. Dept. of Civil Engineering.
J. A. Olofsson, Jr., and F. E. Woodard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 720, Price codes: A04 in paper copy, A01 in microfiche. University of Maine Land and Water Resources Institute, Completion Report, April 1977. 55 p, 18 fig, 6 tab, 60 ref. OWRT A-034-ME(1).

Descriptors: Water pollution effects, Water pollution control, Algae, *Anabaena, Competition, Inhibitors, Lakes, Management, *Photosynthesis, Eutrophication, *Hydrogen ion concentration, Carbon, *Cyanophyta, *Chlorophyta, Dominant organisms.
Identifiers: Affinity, Algal bloom initiation, Carbonic anhydrase activity, Diamox, Dominance, Anabaena flos-aquae, Photosynthetic rate, *Selenastrum capricornutum, *Total inorganic carbon.

Relative competitiveness of a selected green alga and blue-green alga was examined in relation to culture pH and total inorganic carbon (CT) in an effort to uncover a mechanism which might be influential in blue-green algal bloom initiation. Short-term growth experiments were conducted employing Anabaena flos-aquae, a bloom forming blue-green alga, and Selnastrum capricornutum, a green alga. A. flos-aquae, at a given level of CT, exhibited increasing photosynthetic rate as pH increased, and reached a maximum in the region of pH 9.5 to 10.0. S. capricornutum, however, exhibited decreasing photosynthetic rates as pH was increased. Photosynthetic rates of A. flos aquae exceeded those of S. capricornutum above pH 7.5, indicating potential pH-related enhancement of blue-green photosynthesis. Carbonic anhydrase was implicated in facilitating photosynthetic rates in A. flos-aquae by using a specific inhibitor of carbonic anhydrase activity. Outside the pH range of 8.35 to 9.0, when the inhibitor Diamox (5-acetamido-1,3,4-thiadiazole-2-sulphonamide) was introduced, significantly reduced photosynthetic rates were observed in A. flos-aquae. It was concluded that A. flos-aquae was a higher affinity for inorganic carbon (as evidenced by photosynthetic rates) than does S. capricornutum due to carbonic anhydrase activity. An overall conclusion is that periodic dominance of the lacustrine phytoplankton by bloom forming blue-green algae may be related to competitive uptake of inorganic carbon facilitated by carbonic anhydrase activity. Facilitated carbon transport in blue-green algae may provide additional insight into the management of blue-green algal blooms in surface water resources.
W77-08200

SPRAY IRRIGATION OF TREATED MUNICIPAL SEWAGE EFFLUENT AND ITS EFFECT ON CHEMICAL PROPERTIES OF FOREST SOIL,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.

W77-08202

ORGANOCHLORINE RESIDUES IN NEW ZEALAND BIRDS AND MAMMALS 2. POLYCHLORINATED BIPHENYLS,
Department of Agriculture, Wellington (New Zealand). Wallaceville Animal Research Center.
S. R. B. Solly, and V. Shanks.
New Zealand Journal of Science, Vol. 19, p. 53-55, 1976. 1 tab, 13 ref.

Descriptors: *Polychlorinated biphenyls, *Birds, *Mammals, *Wildlife, *Absorption, Path of pollutants, Foodchains, Mode of Action, Water quality, Toxicity, Analytical techniques, Laboratory tests, Toxins.
Identifiers: *New Zealand, *Bioaccumulation, *Tissue analysis, Kingfisher, Gannet, Giant petrel, Dolphins, Fur seals, Sea-leopard, Halcvon sancta, Sula serrator, Macronectes giganteus, Delphinus delphis, Arctocephalus tersteri, Ogmorhinus leptonyx.

Between September 1966 and July 1973, 627 specimens of wildlife comprising 61 species of birds and 17 species of mammals were analysed for polychlorinated biphenyls. Specimens were colected from the 3 main islands of New Zealand, from the Chatham, Kermadec, and Snares groups of islands, and from Campbell Island and Norfolk Island. Residues were found in 57 specimens comprising 16 species of birds, these were either carnivorous or omnivorous. High individual residues were found in a kingfisher, a gannet, a giant petrel, and in captive dolphins, fur seals, and a sea-leopard. (See also W70-09978) (Katz).
W77-08210

MINERAL CYCLING IN RESERVOIRS,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
D. W. Toetz.
Available from the National Technical Information Service, Springfield, VA 22161 as ORO-425 430, Price codes: A02 in paper copy, A01 in microfiche. Presented at Symposium on Reservoir Resources, November 1974, Durant, Okla. 2 fig., 1 tab., 56 ref. OWRT A-049-OKLA(2), AEC AT-(40-1)-4254.

Descriptors: *Reservoirs, *Cycling nutrients, *Nitrogen, Phosphorus, Limiting factors, Reviews, *Oklahoma.
Identifiers: *Nitrogen sources, *Literature review, Mineral cycling.

A selective litetature review of nitrogen cycling and its impact on studies of eutrophication in Oklahoma reservoirs cites factors involved in quantification of a reservoir nutrient budget. Inputs of biologically-useable nitrogen in the form of precipitation, gas, and by means of biological fixation are discussed, as are nitrogen releases from newly-flooded soils and soils inundated by rising water lvels. The importance of river influents to impoundments as they relate to varous land uses of the drainage basin and seasons is also described. The impacts of groundwater as a nitrogen source, atmospheric precipitation, and biological nitrogen fixation by heterocystous bluegreen algae, some bacteria and fungi are also reviewed. Various nitrogen loss pathways are discussed: sinkage to the sediments, fish catch, aquatic macrophyte removal, groundwater recharge, hypolimnetic withdrawal during stagnation, and biological recycling. Management strategies for reservoirs should be related to models incorporating the major mechanisms affecting the whole system. (Auen-Wisconsin).
W77-08217

THE ACCUMULATION AND DISTRIBUTION OF ORGANOCHLORINES AND SOME HEAVY METALS IN AMERICAN FALLS RESERVOIR FISHES, WATER AND SEDIMENT,
Idaho State Univ., Pocatello. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W77-08287

BIOCHEMICAL TRANSFORMATION AND DETOXIFICATION OF MERCURY IN AQUATIC ENVIRONMENT,
Georgia Univ., Athens. Dept. of Food Science.
M. K. Hamdy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 926, Price codes: A05 in paper copy, A01 in microfiche. Georgia Environmental Resources Center, Atlanta, Report ERC 02-77, February 1977. 86 p, 24 fig. OWRT B-69-GA(3), 14-31-0001-3870.

Descriptors: Resistance, *Food chains, *Enteric bacteria, *Mercury isolation, Inhibition, *Absorption, Cultures, Trophic level, Rubber, *Pollution abatement, Water pollution control.
Identifiers: *Biotransformation, *Methylmercury, *Enterobacter aerogenes, *Detoxification of Hg2+, Enzyme inhibition, NADH inactivation, Reversal of inhibition, Oxalacetate, 203Hg2+-uptake, Depuration, Biotransference, *Chemisorption by rubber.

Mercury-resistant cultures were isolated from sediments and adapted to resist higher levels of Hg2+. One of these cultures, identified as Enterobacter aerogenes, was able to produce methyl mercury (MM) from HgCl2. It appears that the transformation of Hg2+ to MM is a detoxification process by the bacteria. Mercury not only affected intact bacterial cells but also inhibited their enzymes and many of their metabolites, particularly NSDH, the coenzyme moity of LDH and MDH enzymes. Mercury inactivated NADH but this reaction can be reversed by the addition of oxalacetate. Mercury uptake, concentration and depuration by cells of different trophic levels was affected by the form of mercury, incubation time and temperature and by the age of cells. The rate of transference of 203Hg2+ decreased with trophic levels of food chains. Rubber was an excellent inert agent for effectively removing Hg2+ and is recommended for control of mercury pollution.
W77-08289

THE INFLUENCE OF BRACKISH-WATER INTRUSION ON MACROINVERTEBRATE ASSOCIATIONS OF THE LOWER TCHEFUNCTE RIVER, LOUISIANA,
New Orleans Univ., La. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W77-08292

BENTHIC MICROBIAL COMMUNITY RESPIRATION OF A SOFT-WATER LAKE,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2H.
W77-08296

MERCURY ACCUMULATION IN TROUT OF SOUTHERN MISSOURI,
Missouri Univ.-Rolla. Dept. of Chemistry.
E. T. Lloyd, W. T. Schrenk, and J. O. Stoffer.
Environmental Research, Vol. 13, p 62-73, 1977. 4 fig, 1 tab, 20 ref. OWRT A-083-MO(2), 14-34-0001-5025.

Descriptors: Mercury, Fish, *Missouri, *Absorption, Trout, Pollutant identification, Analytical techniques, Water pollution effects.
Identifiers: Atomic absorption.

A study of mercury accumulation in trout taken from the trout parks and streams of southern Missouri is presented. Mercury in trout is determined by digestion in nitric acid, sulfuric acid, and potassium permanganate, followed by reduction and aeration for measurement by cold vapor atomic adsorption. The mercury accumulation in the trout ranged from 0.1 to 0.3 ppm of mercury (micro-g of mercury/g of tissue). Previous analysis of trout collected in the mid- to late 1940s from the same areas indicated mercury accumulations of approximately 3 ppm. Over the past 25 years, there appears to be a decrease in mercury found in trout of southern Missouri.
W77-08304

CHROMOSOME MUTATIONS IN A FERN POPULATION GROWING IN A POLLUTED ENVIRONMENT: A BIOASSAY FOR MUTAGENS IN AQUATIC ENVIRONMENTS,
Massachusetts Univ., Amherst. Dept. of Botany.
For primary bibliographic entry see Field 5A.
W77-08305

CHARACTERISTICS OF THE BIOTIC CYCLE OF LAKE BAIKAL, (IN RUSSIAN),
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 2H.
W77-08321

EFFECT OF SOME CHEMICAL ELEMENTS ON THE ACCUMULATION OF CESIUM-137 IN FRESHWATER FISH, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
A. G. Pakulo.
Gig Sanit. 6, p 111-113, 1974.

Descriptors: *Magnesium, *Sodium, *Sulfates, *Bicarbonates, Freshwater fish, *Chlorides, Water pollution effects.
Identifiers: *Cesium-137.

A change of the concentrations of Mg, Na, sulfate and bicarbonate in water does not affect the content of Cs-137 in freshwater fish. On increasing the content of chlorides in water by 10-20-fold the accumulation coefficient of Cs-137 in bones decreases by a factor of 2-3 and in muscles by a factor of 3-4.--Copyright 1975, Biological Abstracts, Inc.
W77-08322

THE PRODUCTIVITY OF FOULING ORGANISM ASSOCIATIONS IN LAKE ZELENETSKOE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
A. F. Alimov, and V. N. Nikulina.
Gidrobiol Zh. 10(2), p 29-35, 1974.

Descriptors: Lakes, *Primary productivity, Fouling, Littoral, *Diatoms, Aquatic algae, Diptera, Mayflies, Gastropods, Oligochaetes, Stoneflies, Water pollution.
Identifiers: *Achnanthes-minutissima, *Lake Zelenetskoe(USSR), *Fouling organisms.

In the rocky littoral of Lake Zelenetskoye diatoms are predominant, especially Achnanthes minutissima. The animal fouling organisms are mainly Chironomidae, Plecoptera and Ephemeroptera larvae as well as oligochaetes and gastropods. Algal productivity is close to 0.18.kcal/m2 or 27% of the total phytoplankton production; animal biomass exceeds 1.6-2.3% of the fouling community biomass. No strength in trophic relations was observed between animals of the fouling community. Algae play an important role in primary production in a lake of low productivity.--Copyright 1975, Biological Abstracts, Inc.
W77-08323

LAKE NAIVASHA AND LAKE NAKURU: AN ECOLOGICAL COMPARISON BETWEEN TWO BIRD LAKES IN EAST AFRICA, (IN SWEDISH),
Uppsala Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 2H.
W77-08324

A PRODUCTIVITY STUDY OF THE ROANOKE RIVER ABOVE NIAGRA DAM IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
J. H. Sherrard, and J. L. Hoyle.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 114, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 104, June 1977. 65 p, 21 tab, 12 fig, 43 ref. OWRT B-063-VA(1).

Descriptors: *Eutrophication, Nutrients, *Nitrogen, *Phosphorus, *Virginia, *Bioassay, Sampling, Monitoring, *Pollutant identification, *Productivity, Algae, Anabaena, *Growth rates, Water pollution effects.
Identifiers: *Roanoke River(Va), Selenastrum capriconutum, *Smith Mountain Lake(Va), *Algal assay, *Algal growth potential.

Deterioration of the water quality in the upper end of the Roanoke River of Smith Mountain Lake due to eutrophication has caused much concern. The Smith Mountain Lake impoundment was constructed in 1965 as a pump storage facility to generate electrical energy and has served as a major recreational area for Southwestern Virginia. Eight sampling stations were established along the length of the Roanoke River from an agricultural area in Montgomery County through the urban area of Roanoke Salem to Niagra Dam above Smith Mountain Lake. On 12 occasions, approximately once a month, grab samples were taken at the sampling stations. Samples were analyzed for general parameters and for nitrogen and phosphorus. The Algal Assay Procedure Bottle Test (Environmental Protection Agency, 1971) was conducted with the samples, and in addition, with samples in which phosphorus and/or nitrogen spikes were added to determine potential productivity and to determine which element was limiting productivity. Results demonstrate that the algal assay bottle test is useful in correlating phosphorus concentrations with algal growth rate. Phosphorus was found to limit the algal growth in the Roanoke River above the Roanoke wastewater treatment plant for Selenastrum capricornutum and Anabaena flos-aquae, the two algal species used in this study. Maximum specific growth rates tended to increase with increasing phosphorus concentration.
W77-08333

HYPOPHTHALMICHTHYS MOLITRIX (VAL.)) FOR INCREASING FISH PRODUCTIVITY AND DECREASING THE LEVEL OF EUTROPHICATION OF DNIEPER RESERVOIRS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
P. S. Vovk.
Vopr Ikhtiol. 14(3), p 406-414, 1974.

Descriptors: Fish reproduction, *Eutrophication, Reservoirs, *Cyanophyta, *Carp, Fish food organisms, Fish diets, Fish, Seston, Anabaena, Toxicity, *Algal toxins, Water pollution effects.
Identifiers: Anabaena-hassalii, Anabaena-scheremetievi, Anabaena-variabilis, Aphanizomenon-flos-aquae, *Hypophthalmichthys-molitrix, Microcystis-aeruginosa, Oscillatoria-agardhii, USSR, *Silver carp, *Dnieper River reservoirs(USSR).

The role is shown of blue-green algae (Aphanizomenon flos-aquae, Oscillatoria agardhii, Anabaena variabilis, A. scheremetievi, A. hassalii, etc., and especially Microcystis aeruginosa) in feeding of the silver carp (Hypophthalmichthys molitrix) and their food significance for other fish species in reservoirs on the Dnieper River (USSR). The problem of the possible effect of toxic excretion of blue-green algae on the silver carp is discussed. It is expedient to stock the silver carp for foraging in the reservoirs in order to increase fish productivity and decrease the level of eutrophication of these water bodies due to the utilization of a considerable part of the seston.--Copyright 1975, Biological Abstracts, Inc.
W77-08364

TROPHIC STATUS OF INLAND LAKES FROM LANDSAT,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5A.
W77-08434

FOX CHAIN OF LAKES INVESTIGATION AND WATER QUALITY MANAGEMENT PLAN,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2H.
W77-08442

INVERTEBRATE COLONIZATION OF ARTIFICIAL SUBSTRATES IN SAN LEANDRO CREEK,
California Univ., Berkeley. Dept. of Forestry and Conservation.
For primary bibliographic entry see Field 5A.
W77-08443

POPULATION DYNAMICS AND SPECIES DIVERSITY OF ICHTHYO-PARASITOFAUNA OF THE BUFFALO NATIONAL RIVER,
Arkansas Univ., Fayetteville. Dept. of Zoology.
R. V. Kilambi, and D. A. Becker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 235, Price codes: A06 in paper copy, A01 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Publication No. 48, 1977. 85 p, 2 fig., 17 tab., 27 ref. OWRT A-029-ARK(1), CX 700040182.

Descriptors: Worms, Fish diseases, Water pollution effects, Mortality, Copepods, Water quality, *Arkansas, Bass, Sunfishes, *Fish parasites, Growth rates, Seasonal.
Identifiers: *Darters, Bertalanffy growth formula, River pool, Riffle, Seasonal abundance, Gyros, Flukes, *Buffalo National River(Ark).

Monthly fish collections using electro-shocking instruments and seines were made at upstream, midstream, and downstream stations from January 1974 through February 1975 on the Buffalo River, Arkansas. A sharp decrease in smallmouth bass (SMB) marginal scale increment was evident during May for age group 1+. The estimated length weight relationship for SMB was: log W = 3.0 log L - 4.97666 with an average condition factor of 1.1. A Bertalanffy growth formula for describing growth of SMB was Lt = 583 (1 - e 0.14 (t + 0.48). SMB were estimated to attain 95% of the asymptotic length at 21 years and weigh 4.6 lb. Annual mortality rate was lower for SMB of the Buffalo River than other reported U.S. waters. Forty-one species of fish were collected of which the most abundant fishes in pools were the Longear sunfish and the Big eye shiner. The number of fishes collected among pools was significantly different while seasonal abundance was not. The most abundant species in riffles were the Yoke darter and Rainbow darter. Thirty-two species of helminth and copepod parasites were taken from 127 SMB with all fish infected with at least one species. Parasites infecting high percentages of hosts and occurring in large average numbers of parasites per fish were Gyros, Pyloric caecal and intestinal flukes, and the spiny-headed worm. Icthyoparasite mean diversity indicies revealed a rich and diverse fauna with site and seasonal distributions indicative of a complex ecosystem. There were no significant correlations between any parasites and recorded water quality parameters. (Barnes - Arkansas)
W77-08446

REPRODUCTION RATE AND PRODUCTIVITY OF BACTERIA IN THE PONDS OF THE KARAMET-NIYAZ FISHERY FARM, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
O. I. Bogdanovich.
Gidrobiol Zh. 10(2), p 22-28, 1974.

Descriptors: *Bacteria, Ponds, *Fish hatcheries, *Productivity, *Reproduction, Seasonal, Fertilization, Water pollution effects.
Identifiers: Aristichthys-nobilis, Ctenopharyngodon-idella, Hypophthalmichthys-molitrix, *Turkmen-SSR, USSR, Silver carp, Bighead, White amur.

The time of bacterial brood succession was determined for ponds using different fertilizer application patterns in the turkmenian SSR (USSR). Average seasonal fluctuations were 10-30 h in spring, 30-70 h in summer and 20-35 h in autumn. No relation between the reproduction rate and intensification measures applied was found. Daily bacterial productivity and daily P/B (Production/biomass)-coefficient (based on destruction) were calculated. Infertilized ponds the daily bacterial productivity reached 2.57-4.50 mg/1, in unfertilized ponds and in the channel this index was lower 0.2-2.1 mg/1. The daily P/B-coeffiecient was 0.30-3.57. Silver carp (Hypophalmichthys molitrix), bighead (Aristichthys nobilis) and white amur (Ctenopharyngodon idella) are raised in the ponds.--Copyright 1975, Biological Abstracats, Inc.
W77-08462

THE ECOLOGICAL SIGNIFICANCE OF ANTIBIOTIC SUBSTANCES EXCRETED BY ALGAE IN WATERS, (IN POLISH),
Polskie Towarzystwo Przyrodnikow im. Kopernika, Warsaw.
S. Niewolak.
Wszechswiat. 7/8, p 194-196, 1973.

Descriptors: *Ecology, Algae, *Antarctic, *Waterfowl, *Algal toxins, Bacteria, Fungi, Bactericides, Fungicides, Water pollution effects.
Identifiers: *Phaeocystis-pouchetii, *Antibiotic properties(Algae).

Inhibition of microflora development in the alimentary tract of antarctic water fowl during maximal development of Phaeocystis pouchetii suggested that algae might be a source of antibiotics. Consequently, 4 groups of antibiotic substances produced by algae were distinguished. Algae directly or indirectly influenced the density of fish in waters. They were also shown to have bactericidal and fungicidal properties. Antibotic substances produced by algae could be used as a preservative in the fish processing industry. Antibiotic properties of a number of algae are listed in tabular form. --Copyright 1975, Biological Abstracts, Inc.
W77-08463

LONGITUDINAL DISTRIBUTION OF SELECTED MICRONUTRIENTS IN NORTHERN SAN FRANCISCO BAY DURING 1973,
Geological Survey, Menlo Park, Calif. Water Resources Div.
T. J. Conomos, and D. H. Peterson.
In: Proceedings of a Workshop on Algae Nutrient Relationships in the San Francisco Bay and Delta, held at Clear Lake, California, November 8-10, 1973: The San Francisco Bay and Estuarine Association, p 103-126, 1975. 12 fig, 6 tab, 23 ref.

Descriptors: *Aquatic microorganisms, *Phytoplankton, *Nutrients, *Estuarine environment, *Bays, *California, Phosphates, Nitrates, Nitrites, Ammonia, Silicates, Turbidity, Seasonal, Distribution patterns.

Identifiers: *San Francisco Bay estuary, Micronutrients, Seasonal fluctuations.

Investigations in the San Francisco Bay estuary during 1972 indicate that seasonal variations in micronutrient concentrations are associated with seasonal variations in phytoplankton abundances. Micronutrient concentrations are generally lower in summer than winter. During summer the river input of micronutrients to the estuary is high; during winter the converse is generally true. Certain micronutrient distributions tend to be more conservative in winter than summer, suggesting their distributions are dominated by advective and diffusive processes in winter. (Woodard-USGS)
W77-08487

PHYTOPLANKTON PRODUCTION AND ENUMERATION IN NORTHERN SAN FRANCISCO BAY DURING 1972,
Geological Survey, Menlo Park, Calif. Water Resources Div.
E. P. Scrivani.
In: Proceedings of a Workshop on Algae Nutrient Relationships in the San Francisco Bay and Delta, held at Clear Lake, California, November 8-10, 1973: The San Francisco Bay and Estuarine Association, p 127-146, 1975. 4 fig, 2 tab, 46 ref.

Descriptors: *Phytoplankton, *Ecosystems, *Estuarine environment, *Bays, *California, Nutrients, Aquatic microorganisms, Diatoms, Dissolved oxygen, Water chemistry, Photosynthesis, Distribution patterns.
Identifiers: *San Francisco Bay estuary, Phytoplankton productivity.

The phytoplankton and primary productivity of north San Francisco Bay, California, were investigated during hydrographic surveys in 1972. Samples were collected on a near-monthly basis in the main channel of the estuary. A phytoplankton standing stock maxima occurred in the Suisun Bay region. During peak periods, the cell numbers typically exceeded 1500 cells/milliliter and reached a maximum starting in June and continuing through early October. Diatoms were the most abundant phytoplankton in early spring. Primary productivity values correlated with standing stock distributions. Maximum values were obtained during late summer, and suggest that daily waste input is a minor source of nitrogen utilized by phytoplankton. The most productive area appears to be the null zone region of the estuary. In this region, the main channel does not have excessive phytoplankton concentrations that would lead to development of predominantly nuisance species or to serious dissolved oxygen deficiency. (Woodard-USGS)
W77-08488

IMPLICATIONS OF SEASONAL CHEMICAL AND PHYSICAL FACTORS ON THE PRODUCTION OF PHYTOPLANKTON IN NORTHERN SAN FRANCISCO BAY,
Geological Survey, Menlo Park, Calif. Water Resources Div.
D. H. Peterson, and T. J. Conomos.
In: Proceedings of a Workshop on Algae Nutrient Relationships in the San Francisco Bay and Delta, held at Clear Lake, California, November 8-10, 1973: The San Francisco Bay and Estuarine Association, p 147-165, 1975. 4 fig, 3 tab, 56 ref.

Descriptors: *Phytoplankton, *Estuarine environment, *Bays, *California, *Nutrients, Phosphates, Nitrates, Nitrites, Ammonia, Seasonal, Distribution patterns, Chemical properties, Physical properties, Aquatic microorganisms.
Identifiers: *San Francisco Bay estuary, Micronutrients, Seasonal fluctuations.

Northern San Francisco Bay, California, has a single summer-fall peak in phytoplankton cell abundance and productivity. The summer distribution of micronutrients in the main channel is controlled primarily by the distribution of phytoplankton: the highest abundance of phytoplankton persists in the inner regime (null zone) of the estuary and the lowest concentrations of micronutrients occur there. Under present conditions, if summer river discharge decreases and water residence time increases, the phytoplankton population should increase and the dissolved micronutrient concentrations decrease. Nitrogen can be depressed to growth-rate limiting concentrations only during periods of high phytoplankton abundance (during late summer). Increased insolation may increase productivity per unit area in both winter and summer, but increased availbility of nitrogen may increase productivity per unit area only in summer. (Woodard-USGS)
W77-08489

RESPONSE OF OAT AND SPINACH TO SEWAGE SLUDGE APPLICATION IN SOIL,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Soils and Crops.
S. I. Nahedh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 530, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis. September 1975. 141 p, 11 fig, 30 tab, 129 ref, 8 plates. OWRT A-038-NJ(1). 14-31-0001-4030.

Descriptors: *Oats, *Spinach, *Sewage sludge, Salinity, Nitrogen, Phosphorus, Copper, Zinc, Crop response, Hydrogen ion concentration, Salts, Germination, Dissolved solids, Sludge disposal, Growth rates.
Identifiers: *Aerobic sludge *Anaerobic sludge.

A greenhouse study was conducted to determine the effect of sewage sludge amended soils on the growth of oats and spinach. Dissolved salts and pH effected germination and growth. The plants were analyzed for copper, zinc, nitrogen and phosphorus. The results of these experiments in which 0, 20, 40 and 80 T/A of aerobic and anaerobic sludges were used have indicated that spinach responded well to the anaerobic sludge applied to a Freehold sandy loam soil at pH 5 and 7. An increase in the yield over the control was obtained at all anaerobic sludge rates except at the 80 T/A. Application of the aerobic sludge had an adverse effect on spinach yield, particularly when applied to pH 5 soil. The yield increased only after application of 20 T/A to the pH 7 soil. The oats yield increased with the 20 T/A application of the aerobic sludge to pH 5 soil, but the yield decreased drastically with more sludge applications to soils of either pH. The anaerobic sludge increased the yield only at the 40 T/A, then it either leveled off (at pH 5), or decreased (at pH 7) at the 80 T/A rate. The aerobic sludge was more effective in increasing yield than the anaerobic sludge. The aerobic sludge caused more uptake of phosphorus, nitrogen, zinc, copper by oat and spinach than the anaerobic sludge. The results also indicated that the aerobic sludge degraded rapidly in the soil, while the anaerobic sludge was more stable and did not decompose as rapidly.
W77-08495

AVAILABILITY OF ALUMINUM PHOSPHATE COMPLEXES TO A GREEN ALGA IN VARIOUS CULTURE MEDIA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.
W77-08496

BACTERIAL GROWTH ON DISSOLVED ORGANIC COMPOUNDS IN FRESH-WATER RESERVOIRS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5A.
W77-08498

A PREDICTIVE PHOSPHORUS MODEL FOR LAKES - SENSITIVITY ANALYSIS AND APPLICATIONS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
W. J. Snodgrass, and C. R. O'Melia.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 607, Price codes: A03 in paper copy, A01 in microfiche. (1975). 29 p, 6 fig, 6 tab, 10 ref. Paper presented at 38th Annual Meeting of American Society of Limnology and Oceanography, June 23-26, 1975, Dalhousie University, Halifax, Nova Scotia, Canada. OWRT A-074-NC(3). 14-31-0001-4033.

Descriptors: Epilimnion, Hypolimnion, *Phosphorus, *Eutrophication, *Model studies, Nutrients, Cycling nutrients, Lakes, Analysis, *Forecasting.
Identifiers: Predictive model for lakes, Sensitivity analysis.

Included are (1) a brief summary of a predictive model for phosphorus in lakes that has been developed and tested, (2) some additional verification of this model, (3) analysis of the sensitivity of model predictions to several model parameters, and (4) conclusions based on this sensitivity analysis. This model introduces two reactions which are usually not considered in limnological investigations. First, a mean-depth dependent exchange of P across the thermocline is developed, based primarily on empirical evidence. Second, natural aggregation or flocculation of particles in lake waters is considered, based primarily on conceptual arguments. The model has been verified in two ways. First, model predictions of the effects of lake depth on eutrophication have been compared with Vollenweider's observations (1968) and gave good agreement. Second, predictions of the total phosphorus concentrations in lakes at the end of the winter circulation (TP) have been compared with field measurements made by other investigators in several lakes. Agreement between predicted and observed results was excellent. (Stewart-NC State)
W77-08499

THE SOLUBILITY OF PARTICULATE PHOSPHORUS IN THE EFFLUENT FROM ALUM TREATMENT OF WASTEWATER AND PHOSPHORUS SOLUTIONS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.
W77-08500

PHOSPHORUS EXCHANGE AT THE SEDIMENT-WATER INTERFACE OF SELECTED NARRAGANSETT BAY SEDIMENTS,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
M. J. Petti.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 622, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 89 p, 21 fig, 4 tab, 25 ref. OWRT B-052-RI(2). 14-01-0001-4123.

Descriptors: *Phosphorus, *Sediments, Nutrients, Bays, *Rhode Island, *Sediment water interfaces.
Identifiers: *Nutrient flux, *Narragansett Bay(RI).

In developing an understanding of water quality and its management, it is necessary to understand the materials balance or materials flux within a given water system. Among these materials are various pollutants, chemicals, gases, nutrients, biological communities, etc. The interaction of these materials (best described by the rate and extent of reaction) governs the overall aging process of a water system. Such an aging process and the parallel process of eutrophication can proceed naturally or be accelerated artificially. The objective of this study is to investigate an aspect of the

materials balance in Narragansett Bay, Rhode Island. The material of primary concern is phosphorus, and the process under consideration is nutrient flux. Nutrient flux or exchange of phosphorous at the sediment-water interface with the water column above, as determined in the laboratory, of selected bay sediments is described. Two series of experiments were conducted. Each experimental series is composed of microcosm studies performed in the laboratory. The first series studies the release and uptake of phosphorus, to and from the water column, by the sediments in aerobic and anaerobic environments and a constant flushing rate.
W77-08502

THE EFFECT OF SOLUBLE ORGANIC MATTER ON THE UTILIZATION OF PHENOXY HERBICIDES BY PSEUDOMONAS SP.,
Rhode Island Univ., Kingston. Dept. of Microbiology.
C. W. Dimock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 528, Price codes: A04 in paper copy, A01 in microfiche. M. S. Thesis, 1975. 52 p, 11 fig, 9 tab, 21 ref. OWRT A-050-RI(2). 14-31-0001-5040.

Descriptors: Water pollution effects, Pollutant identification, *Pesticides, *Biodegradation, Metabolism, Herbicides, *Pseudomonas, Organic matter, *Microbial degradation, 2-4-D, 2-4-5-T, Organic compounds, Organic acids.
Identifiers: 2-4-5-TP.

Eight organisms of the genus Pseudomonas were isolated from soil and water samples by conventional enrichment techniques. They were used to compare the microbial degradation of the three phenoxy herbicides: 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichloro-phenocyacetic acid (2,4,5-T), and 2-(2,4,5-trichlorophenoxy)-propionic acid (2,4,5-TP). 2,4,-D was readily attacked in a mineral salts medium by cultures adapted to this compound. The same concentrations of 2,4,5-T and 2,4,5-TP, however, were attacked only in the presence of a compound such as sodium benzoate, which served as a growth substrate. A comparison of cultures grown on benzoate and an herbicide, and on benzoate alone, showed no difference in cell yield. This suggests that no carbon or energy for growth was obtained from herbicide utilization, which is characteristic of cometabolism. It has previously been reported that the toxic and recalcitrant metabolite, 3,5-dichlorocatechol (3,5-DDC) accumulates during the cometabolism of 2,4,5-T. This might similarly hold true for 2,4,5-TP. The intermediates, 3,5-DCC, and 2,4,5-trichlorophenol (2,4,5-TCP) were not detected in the culture medium during the study, however, it was demonstrated that increasing quantities of bacteriological peptone and beef extract (0.08 mg/ml or o.40 mg/ml) increased the utilization of all three herbicides. This supplement provided only a small increase in growth however in the absence of sodium benzoate, 2,4,5-T and 2,4,5-TP utilization remained equally stimulated, but cell yield was much less. This indicates that the organic matter directly stimulated cell metabolism of the herbicides and did not simply increase growth. Beef extract and peptone contain substances known to be stimulatory to microbial metabolism. When added separately to cultures, these substances produced essentially the same effect. It seems that the 2,4,5-T and 2,4,5-TP were oxidized more extensively than previously reported.
W77-08504

THE LIMNOLOGY OF A NORTH CAROLINA MILLPOND WITH SPECIAL REFERENCE TO HISTORICAL CHANGES AS EVIDENCED BY SEDIMENT CORE ANALYSIS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
C. F. Knud-Hansen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 624, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 67 p, 10 fig, 7 tab, 61 ref, 4 append. OWRT A-078-NC(1), 14-31-0001-5033.

Descriptors: *Eutrophication, Nutrients, Nitrates, Phosphates, *Tropic level, *Limnology, Water quality, Surface waters, Aquatic algae, Diatoms, *North Carolina, *Oligotrophy, Water pollution effects, Lake sediments.
Identifiers: *Silver Lake(NC).

Silver Lake, built in 1785 in the Coastal Plain of North Carolina to run a corn mill, was found in 1974 to A moderately oligotrophic with respect to physical, chemical and biological parameters. Primarily due to a 623:1 drainage area to lake surface area ratio (75.1 square miles:77 acres), the calculated nutrient loading rates are 373.5 g N/m2/yr and 12.5 g P/m2/yr. These very high rates do not lead to eutrophic conditions presumbly because of an average detention time of 2.4 days, and little accumulation or retention of nutrients in this shallow (mean depth of 5.1 feet or 1.9 m) lake. Silver Lake was phosphorus limited as evidenced by the ratio of nitrogen to phosphorus loading as well as by the results of algal assay. A 13 cm lake sediment core was analyzed for oxidizable carbon, dry weight and diatom community structure at each centimeter of depth. A linear regression of the relationship between percent oxidizable carbon and number of diatoms per gram dry weight resulted in a negative correlation coefficient of 0.66. The dominant genera of diatoms shifted twice during the history of the lake. (Stewart-NC State)
W77-08507

FOREST FERTILIZATION AND WATER QUALITY IN THE NORTH CAROLINA PIEDMONT,
North Carolina State Univ., Raleigh. School of Forest Resources.
For primary bibliographic entry see Field 5B.
W77-08508

A METHOD FOR QUANTITATIVE DETERMINATION OF AMMONIFYING AND DENITRIFYING BACTERIA IN WATER WITH APPLIED EXAMPLES FROM GRAVEL-PIT POOLS, (IN CZECH),
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Limnobiologisches Institut.
For primary bibliographic entry see Field 5A.
W77-08509

PERSISTENCE OF MYCOBACTERIUM BOVIS BCG IN SOIL AND ON VEGETABLES SPRAY-IRRIGATED WITH SEWAGE EFFLUENT AND SLUDGE,
Public Health Service, Cincinnati, Ohio. Div. of Microbiology.
D. J. Van Donsel, and E. P. Larkin.
Journal of Food Protection, Vol. 40, No. 3, p 160-163, March, 1977. 3 fig, 1 tab, 20 ref.

Descriptors: Irrigation, *Sludge disposal, *Sewage effluents, Soil contamination effects, Microorganisms, Vegetation, Municipal wastes, Analysis, Waste water treatment, Public health.
Identifiers: *Mycobacterium bovis BCG.

Land disposal of sludge is currently under consideration in the United States, and studies are being conducted on the potential public health hazards which might be inherent in this practice. Tubercle bacilli represent a particular threat because they generally survive conventional waste water treatment processes. Cultured Mycobacterium bovis BCG was added to activated sludge and to unchlorinated secondary effluent, which was then sprayed onto lettuce or radish plants grown outdoors in plywood boxes. Soil suspensions and vegetable washings were assayed for BCG. The 90% reduction time on effluent-sprayed radishes was 6 days, and on sludge-sprayed radishes it was 4 days, which was not a significant difference. The results for lettuce was too variable to permit estimation of survival rates. Consistent, low-level isolation of the organisms indicated that a certain amount had become attached to the plants. Washout of the inoculum from the plots by rainfall was apparently minimal. Soil temperatures were high during the test period, and heat probably killed many of the mycobacteria. The results must be interpreted with caution in view of the known large differences between mycobacterium grown in vitro and in vivo, and because of the numbers of tubercle bacilli found in urban sewage are very difficult to estimate. (Collins-FIRL)
W77-08525

CHLORINE COMBINING WITH SEWAGE,
For primary bibliographic entry see Field 5D.
W77-08571

5D. Waste Treatment Processes

REORGANIZING POLLUTION CONTROL IN THE U.K.
Wessex Water Authority, Bristol (England).
For primary bibliographic entry see Field 5G.
W77-08111

STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR THE EXPLOSIVES MANUFACTURING POINT SOURCE CATEGORY (PROPOSED RULES),
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08113

OPERATION AND IMPACT OF NPDES IN REGION II, PART I,
Environmental Protection Agency, New York. Caribbean Construction Grants Branch.
For primary bibliographic entry see Field 5G.
W77-08117

TOWARD CLEANER WATER IN THE PACIFIC NORTHWEST AND ALASKA--THE NATIONAL WATER PERMIT PROGRAM.
Environmental Protection Agency, Seattle, Wash. Public Affairs Office.
For primary bibliographic entry see Field 5G.
W77-08121

RECLAMATION OF ANTHRACITE COAL REFUSE USING TREATED MUNICIPAL WASTEWATER AND SLUDGE,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sopper, L. T. Kardos, and L. E. DiLissio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 666, Price codes: A06 in paper copy, A01 in microfiche. Research Publication 94, Institute for Research on Land and Water Resources, University Park, December 1976. 95 p, 62 tab, 21 fig, 74 ref, append. OWRT B-069-PA(5). 14-31-0001-4038.

Descriptors: *Sewage effluents, *Sewage disposal, *Revegetation, *Sewage sludge, Municipal wastes, Calcium, Phosphorus, Nitrogen, Legumes, *Grasses, Trees, *Pennsylvania, Water reuse, Vegetation effects, Waste disposal, Coal mine wastes, Recycling.
Identifiers: *Liquid digested sludge, *Anthracite mining refuse, Tension lysimeters, Ground cover.

The study determined the feasibility of using municipal sewage effluent and liquid digested sludge to facilitate the revegetation of anthracite mining refuse. Four boxes, 4 x 32 x 4 feet deep, were

filled with anthracite coal refuse from a mining operation. The refuse was planted with eight species of trees, and seeded with eight species of both grasses and legumes. The boxes were then treated with sewage effluent and liquid digested sludge. Weekly percolate samples were collected at the 6 inch and 42 inch refuse depths with tension lysimeters. Treatments were applied for 19 weeks. Most tree species showed a significant response to treatment. The application of sludge appears to be necessary for successful establishment of a dense ground cover. Maximum grass and legume dry matter productions and percent areal covers were observed. Chemical analyses of the grasses revealed an increase in the content of nitrogen, phosphorus and calcium with each increase in fertilizer value of treatment. Application of treated domestic sewage increased the pH of the coal refuse at each level of treatment. Results indicate that revegetation of anthracite coal refuse is possible through the application of treated municipal wastewater. (Sink-Penn State)
W77-08189

INVOLVEMENT OF FREE RADICALS IN THE CATALYTIC OXIDATION OF PHENOL IN AQUEOUS SOLUTION,
Delaware Univ., Newark. Dept. of Chemical Engineering.
A. J. Sadana.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 810, Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Thesis, June 1975. 194 p, 27 fig, 8 tab, 83 ref, 3 append. OWRT A-014-DEL(11).

Descriptors: Oxidation, *Catalysts, *Chemical reaction, *Phenol, *Kinetics, *Industrial wastes, Wastewater treatment, Ultimate disposal, Chemical wastes.
Identifiers: *Aqueous-Phase Oxidation, *Wet Air Oxidation, *Catalytic oxidation, Free Radicals.

Aquueous-phase atalytic oxidation of phenol over supported copper oxide was studied from 369 to 452 degrees K and 14.7 to 250 psig oxygen pressure in batchwise mode. The reaction involves an induction period and a steady-state activity regime. The initial rate is first order in phenol and one-half order in oxygen. Free radical involvement in the heterogeneously catalyzed oxidation of phenol was established. Reaction networks are similar for the heterogeneously and homogeneously catalyzed oxidation of phenol as far as quinones. Intermediates such as organic acids, which are observed in homogeneous oxidation, were not observed in the heterogeneouusly catalyzed oxidation. Aqueous-phase heterogeneously catalyzed oxidation removes organic carbon, initially charged as phenol, from solution efficiently at moderate temperatures and pressures. The less severe conditions required for aqueouus-phase catalytic oxidation of organics make it appear much more economical than non-catalyzed wet air oxidation. (Katzer-Delaware)
W77-08201

SPRAY IRRIGATION OF TREATED MUNICIPAL SEWAGE EFFLUENT AND ITS EFFECT ON CHEMICAL PROPERTIES OF FOREST SOIL,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
J. L. Richenderfer, W. E. Sopper, and L. T. Kardos.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 808, Price codes: A03 in paper copy, A01 in microfiche. USDA Forest Service General Technical Report NE-17, 1975. 24 p. 18 tab., 17 fig., 10 ref., append. OWRT C-5169(no. 4205)(1), B-001-PA (10), B-020-PA (15), B-047-PA (5), B-069-PA (2), and B-083-PA (1). 14-31-001-4205.

Descriptors: *Sewage effluents, *Forest soils, *Drainage water, Phosphorus, Boron, Manganese, Sodium, Potassium, Chemical properties, Sewage disposal, Waste disposal, Waste water disposal, Water reuse.
Identifiers: *Spray irrigation, *Land disposal, *Land irrigation, *Sewage effluent disposal, Soil samples, Exchangeable hydrogen.

The Waste Water Renovation and Conservation Project at The Pennsylvania State University was begun to determine the feasibility and effectiveness of land irrigation as a method of municipal sewage effluent disposal. Irrigation was begun in 1963 on an old-field area, hardwood stand, and a red pine plantation on Hublersburg silt loam soil. In 1965, irrigation was begun in a hardwood stand located on Morrison sand loam soil on State Game Lands. Soil samples were collected in the fall of 1963, 1967, and 1971. The samples were taken with a Veihmeyer tube by 1-foot depth increments to 5 feet. Of the 11 constituents analyzed, only potassium, sodium, manganese, exchangeable hydrogen, boron, and phosphorus had significant changes in concentration over time. Potassium, manganese, exchangeable hydrogen, and boron decreased significantly over time while sodium and phosphorus increased significantly over time. After 9 years of spray irrigation with treated municipal wastewater, there were no indications that the treatment had any detrimental effects on the soil. (Sink-Penn State)
W77-08202

MATHEMATICAL AND EXPERIMENTAL INVESTIGATION OF NONSTEADY STATE THICKENING OF AN IDEAL SLURRY,
Delaware Univ., Newark, Dept. of Civil Engineering.
J. B. McVaugh, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 799, Price codes: A08 in paper copy, A01 in microfiche. M.S. Thesis, May 1975. 157 p, 33 fig, 7 tab, 47 ref, 4 append. OWRT A-025-DEL(3).

Descriptors: Sedimentation, *Sludge, *Sludge treatment, *Settling basins, *Laboratory tests, *Wastewater treatment, *Slurries, Water pollution control, Design, Suspensions, Sludge disposal, Separation techniques, Calcium carbonate, *Mathematical models.
Identifiers: *Thickening.

The purpose was to develop a mathematical model which could be used to describe non-steady state sludge thickening in a sedimentation tank or thickener in which zone settling takes place. The model was used in calculating such parameters as sludge bed depth and solids concentrations in thickener overflow and underflow, and was based on hypothetical overloading and underloading transients imposed on a continuous thickener settling a plastic bead slurry and a CaCo3 slurry. The model qualitatively described the behavior of the parameters when compared to the behavior predicted by solids flux theory. To test the validity of the model, a laboratory scale continuous thickener was constructed to settle a slurry of laboratory grade CaCo3. The thickener consisted of a plexiglass column 13.97 cm I.D. by approximately 265 cm height, with appropriate pumps and accessories to conduct batch and continuous thickening experiments. (Dick-Delaware)
W77-08207

STATUS OF REVERSE OSMOSIS DESALINATION TECHNOLOGY,
Office of Water Research and Technology, Washington, D.C. Membrane Processes Div.
For primary bibliographic entry see Field 3A.
W77-08225

YEAR ROUND COOLING WATER FROM THE COLD WEATHER OF WINTER,
J. C. St. Clair.
U.S. Patent No. 3,997,112, 5 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 953, no 2, p 618, December 14, 1976.

Descriptors: *Patents, *Cooling water, *Industrial water, *Irrigation, Irrigation water, Water pollution sources, Reservoirs, Irrigation practices, Water reuse.

Cooling water at 39 deg. F is made available at low cost all year round by erecting towers in farmer's fields and spraying the water in the air around the towers to cool the water during the winter. The cooled water is collected and stored in a lake. During the summer the same towers and water spraying system is used to act as a permanent irrigation system with the water from the lake sprayed when needed on the farmer's crops. Since the use of the cold water from the lake for cooling water have to and can easily afford to pay for the whole system which includes a very good drainage system, farmers will greatly profit and therefore greatly favor the installation of such a system on their farms. With such a system the installers and owners of such a system can put polluting substances, in the irrigation water, that normally cannot be dumped in rivers, and the farmer's fields will act as a costless area where bacteria break down most polluting substances such as most industrial chemicals and sewage liquids. Electric lights can be installed on the towers and the farmers fields can be illuminated during the night and the crop yields increased by 10 to 25%. (Sinha-OEIS)
W77-08251

SANITARY AND HYGIENIC CHARACTERISTICS OF SUBSURFACE WATERS OF THE TSELINOGRAD AND TURGAI OBLASTS, (IN RUSSIAN),
Tselinogradskii Meditsinskii Institut (USSR). Dept. of General Hygiene.
For primary bibliographic entry see Field 5B.
W77-08253

THE ROLE OF PROTOZOA IN BIOLOGICAL PURIFICATION OF OIL INDUSTRY SEWAGE, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Neftekhmicheskikh Protsessov, Kiev (USSR).
A. D. Strom, I. P. Danilevskaya, I. F. Tikhonruk, H. D. Vasilenko, and V. V. Vitli Nskaya.
Gidrobiol Zh. 10(2), p 49-54, 1974.

Descriptors: *Protozoa, Water purification, *Biological treatment, Optimization, Sewage treatment, *Waste water treatment, *Oil wastes, Industrial wastes.

An optimal technological system was developed for alkylphenol production waste purification. A relationship was found between the quality of the purified water and the number and variety of Protozoa. The experimental data were mathematically processed to establish optimal parameters for the purification process.--Copyright 1975, Biological Abstracts, Inc.
W77-08254

METHOD OF PURIFICATION OF WASTE WATER BY TREATMENT WITH ZIRCONIUM SALT,
Shikoku Paper Mfg. Co. Ltd. (Japan). (Assignee).
B. Ayukawa.
U.S. Patent No. 3,997,439, 11 p, 5 ref; Official Gazette of the United States Patent Office, Vol 953, no 2, p 718, December 14, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Pulp wastes, *Water purification, Coagulation, Suspended solids, Chemical precipitation, Separation techniques, Pulp and paper industry.
Identifiers: *Zirconium salts.

This invention relates to a method for purification of water in which soluble octavalent polymer cation forming water soluble zirconium salts are used to coagulate and precipitate suspended substances and colloidal dispersed particles as well as non-colloidal dissolved organic and inorganic substances in waste water. The object of the invention resides in complete removal of suspended substances and colloidal dispersed particles as well as complete or partial removal of non-colloidal dissolved low molecular organic substances in the waste water derived from chemical pulping and paper mills so that oxygen demand and color are minimized and transparency is maximized in one process. (Sinha-OEIS)
W77-08255

THE EFFECT OF DIFFERENT FLOCCULANTS ON THE ELIMINATION OF TRACE ELEMENTS AND POLYCYLIC HYDROCARBONS IN THE WATER PURIFICATION PROCESS, (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
H. Kunte, J. K. Reichert, and J. Borneff.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 158(6), p 530-540, 1974.

Descriptors: *Trace elements, Flocculation, Organic compounds, Water purification, *Waste water treatment, *Metals, Filtration, Pilot plants.
Identifiers: Trace metals, Metaloids, *Rhine River(Germany).

Water from the river Rhine was purified in a refiltration flocculator (pilot plant) using ferric chloride (30-36 g/m3), aluminum sulfate (70-100 g/m3), and 'ferri-Floc' (60-90 g/m3) as flocculants, the latter being a commercial product manufactured from residues of bauxite processing. The 3 substances, used at an optimal dosage, were equally efficient for reduction in turbidity, KMnO4 value, and concentrations of metals-metaloids. The elimination rate for the total of the 4 carcinogenic hydrocarbons 3,4-benzypyrene, 3,4-benzfluoranthene, 11,12-benzfluoranthene and indeno (1,2,3-cd) pyrene was 71-73% with ferric chloride, 80-87% with aluminum sulfate and 77-88% with 'ferri-Floc.' The most active carcinogen, 3,4-benzpyrene, was reduced by 90%. In all cases the concentrations after flocculation corresponded to values normally found in the ground water. Trace metals and metaloids were not affected in the same way. Only Ar, Hg, Fe, Mo and V were reduced in the majority of experiments. Cd, Cr, Co, Cu, Li, Ni, Pb, Se, Sr and Zn behaved differently. Since the raw water values were rather low, these results can not be regarded as a failure of the flocculation process. At such low concentrations these elements probably can not be removed by any kind of flocculation, a complete removal is not even desirable because many have a biological function in the body.--Copyright 1975, Biological Abstract, Inc.
W77-08256

KRAFT MILL RECOVERY SYSTEM,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y. (Assignee).
W. A. Fuller.
U.S. Patent No. 3,996,097, 3 p, 9 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 271, December 7, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Bleaching wastes, *Water reuse, Sodium chloride, Salts, Sodium compounds, Separation techniques, *Recycling.

During pulping operations, sodium chloride is dissolved in the pulping liquor and tends to remain in the chemical recovery cycle. Kraft pulping mills located in the interior or those supplied with logs which have not been salt water transported do not generally face this problem now; however, in the future, reuse of water to limit discharge of pollutants from a kraft mill may results in a significant buildup of sodium chloride in the recovery system. A precipitator catch containing sodium sulfate, sodium carbonate, sodium chloride and organic materials is removed from the precipitator to a slurry tank where sufficient water is added to produce a readily flowable or pumpable aqueous slurry. Carbon dioxide in an amount sufficient to convert the sodium carbonate to the less soluble bicarbonate is fed to the slurry by any suitable means, such as sparging, and the resultant slurry containing sodium sulfate, sodium chloride, sodium bicarbonate and organic materials which slurry is directed to a suitable filter and filtered to produce a filter cake containing essentially sodium sulfate and sodium bicarbonate, and a filtrate containing essentially sodium chloride. The filtrate is then removed from the system. (Sinha-OEIS)
W77-08258

PRECOAT FOR PERMEABILITY SEPARATION SYSTEMS,
Universal Oil Products Co., Des Plaines, Ill. (Assignee).
W. M. Conn.
U.S. Patent No. 3,996,131, 5 p, 4 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 282, December 7, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Separation techniques, Reverse osmosis, Membrane processes, Absorption, Clays, Activated carbon, Permeability.
Identifiers: Ultrafiltration processes.

The use of ultrafiltration and reverse osmosis for the separation or concentration of materials which include compositions such as greasy materials has been greatly restricted or entirely avoided. A system and composition which ensures the satisfactory operation of a reverse osmosis or ultrafiltration permanent membrane and system by effectively removing the hydrophobic and greasy materials before they can reach the membrane surface is disclosed. A composition comprising a clay or silicious absorbent or similar materials and activated carbon may be laid upon the membrane surface smoothly and evenly through the use of a normal pressure (i.e. up to 800 psi or more) and flow through-out the reverse osmosis or ultrafiltration system. Once deposited upon the membrane surface the composition will intercept the large large hydrophobic and undesirable molecules by absorption on the clay. Oily and other organic molecules, including dissolved materials likely to foul the membrane, will be adsorbed on the activated carbon. When the precoat layer is filled to capacity it is necessary to remove the precoat by flushing it. For the flushing procedure, the pressure is generally reduced and the velocity or flow rate of water being passed through the system is increased. It is helpful to follow the flushing step with a cleaning step by using a small amount of conventional laundry detergent which will remove much of the material which may have adhered to the membrane. (Sinha-OEIS)
W77-08259

LIQUID WASTE TREATMENT APPARATUS,
J. E. Prince, F. E. Terry, and W. H. Mullins.
U.S. Patent No. 3,996,139, 4 p, 3 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 284, December 7, 1976.

Descriptors: *Patents, *Waste water treatment, *Water treatment, *Water pollution treatment, Water quality control, *Aeration, Oxygenation, Industrial wastes, Farm wastes, Equipment.

A self-contained extraction, aeration and return unit capable of intrusion into existing liquid circuits is provided. The unit can intrude either as a supplementing step, such as for boosting aeration rates in existing aerating vessels, or as a preliminary step either immediately before the remaining treatment steps or at a geographically remote point which permits action of the oxygen in the waste liquid while enroute to a treatment plant. The invention is not limited to use in the treatment of sewage but has application in any liquid circuit where aeration is required such as reducing mineral content of potable water and aquaculture applications. In addition to its use as an oxygenating aerator, the unit or the preferred form of the aspirating aerator may be employed to infuse relatively cooler air into warm or hot waste liquid and thereby reduce the temperature of waste liquid. The unit includes an aspirator having an elongate mixing chamber downstream of the aspiration point and a liquid pump. (Sinha-OEIS)
W77-08263

APPARATUS FOR CONTINUOUS LIQUID-LIQUID EXTRACTION OF WATER WITH A SOLVENT,
Aktiebolaget Tellusond, Goteborg (Sweden). (Assignee).
For primary bibliographic entry see Field 5F.
W77-08264

SOURCES, CHARACTERISTICS AND TREATMENT AND DISPOSAL OF INDUSTRIAL WASTES CONTAINING HEXACHLOROBENZENE,
TRW Systems and Energy, Redondo Beach, Calif.
S. C. Quinlivan, M. Ghassemi, and T. V. Leshendok.
Journal of Hazardous Materials, Vol. 1, No. 4, p 343-359, March, 1977. 1 fig, 9 tab, 11 ref.

Descriptors: *Chemical wastes, *Pesticides, *Toxicity, Industrial wastes, Solvents, Pesticide residues, Food chains, *Waste water disposal, *Waste water treatment, Environmental effects, Landfills, Incineration.
Identifiers: *Hexachlorobenzene.

Hexachlorobenzene (HCB) is a hazardous contaminant found in certain industrial wastes. It is toxic, has a potential for bioaccumulation in the food chain, and is stable physically, chemically, and biologically, enabling it to persist environmentally. The toxic effect of this chemical is chronic rather than acute, appearing most conspicuously as liver dysfunction. Serious incidents of environmental contamination have resulted from the mismanagement of wastes and products containing HCB. A study was therefore conducted to provide information on the major sources of wastes containing HCB, on the treatment and disposal methods used for these wastes, and on the cost of treatment and disposal. Of the 14 industry types identified as HCB producers, the pesticide and chlorinated solvents industries accounted for almost all HCB wastes, which amount to an estimated 4,305 tons per year. In producing Dacthal, PCNB, mirex, simazine, atrazine from chlorinated solvent production. The wastes are variously transported by forklift, truck, pipeline, heated tank trucks and rail. Prior to ultimate disposal they are stored as solid waste cubes under plastic cover and in water-covered lagoons. The disposal methods include land disposal, incineration, resource recovery, municipal sewage treatment, and atmospheric emission. Land disposal is the most prevalent method and can be environmentally acceptable with adequate soil covers of 4 to 6 feet, intermediate plastic layers to reduce the sublimation rate, and a sound geological site capable of containing leachates. Incineration with controlled emission, and by-product recovery appear to be the most desirable methods for destroying these wastes. Disposal cost data were not available. (Kutcher-FIRL)
W77-08265

REMOVING EXPLOSIVES FROM WASTEWATER,
College of Petroleum and Minerals, Dhahran (Saudi Arabia).

R. K. Andren, R. McDonnell, B. Stevens, and J. M. Nystrom.
Industrial Wastes, Vol. 23, No. 2, p 28-31, 49, March/April, 1977. 8 fig, 1 tab, 6 ref.

Descriptors: *Explosives, *Organic compounds, *Polymers, *Adsorption, Chemical wastes, Industrial wastes, Pilot plants, Toxicity, Activated carbon, Organic wastes, Waste disposal, *Waste water treatment.
Identifiers: Nitrobodies, RDX, HMX, Trinitrotoluene, Dinitrotoluene.

Pilot plant studies were run at the Iowa Ammunition Plant, Burlington, to establish the effectiveness of using a continuous polymeric adsorption process for removing trinitrotoluene (TNT), dinitrotoluene (DNT), and other hazardous nitrobodies, such as cyclotrimethylenetrinitramine (RDX) and cyclotrimethylenetetranitramine (HMX), from the waste streams of explosives production plants. These wastes contain highly colored, toxic, and explosive elements. Treatment methods employing neutralization, settling, dilution, and biological treatment are problematic or ineffective. Activated carbon adsorption will remove many organic materials, but its use for nitroaromatics is limited, as is its capacity for restoration. The polymeric adsorbent studied, Amberlite XAD-4, is composed of hard, non-porous resin beads resembling ion exchange resins but lacking ionic groups. This adsorbent can be regenerated for many cycles of operation and has a superior capacity for aromatic nitrobodies, although it is less effective for the non-aromatic RDX. The treatment process suggested would utilize too parallel polymeric adsorption columns in a one-on, one-off mode. Two smaller polishing columns would be similarly operated. Recoverable solvent will regenerate the loaded adsorbent, leaving a concentrated aqueous sludge of explosive contaminants for ultimate disposal. This process would not remove all color, however; using the polymeric adsorbent and activated carbon as polishers in series would do so. The regenerated resin would remove residual RDX. The advantages of this treatment method are low chemical costs and substantially reduced solid waste disposal problems and hazards. (Kutcher-FIRL)
W77-08266

OZONE EFFECT OF SYNTHETIC RUBBER WASTE TREATMENT,
University of Southern California, Los Angeles. Environmental Engineering Div.
K. Y. Chen, and R. W. Okey.
Industrial Wastes, Vol. 23, No. 2, p 46-48, March/April, 1977. 5 fig, 2 tab, 3 ref.

Descriptors: *Ozone, *Organic compounds, Industrial wastes, Chemical oxygen demand, Rubber, Pilot plants, *Waste water treatment.

Tests were conducted on the use of ozone for treatment of wastes from synthetic rubber production in order to provide data for a 10 gpm pilot plant which was later designed, constructed, and operated on site. The possibility of using ozone was investigated due to the continued fouling of a water recovery evaporator employed after alum coagulation and sedimentation in the production of high quality process water. Experiments were performed and the results reported on the relationship between COD versus time in the ozonation of rubber and tire waste water at different standard cubic feet per hour bubbling rates. It was demonstrated that ozone treated effluents exerted substantial influence on oxygen uptake, as compared to untreated effluent. This suggests that ozonation of persistent organic compounds followed by conventional biological treatment may be a solution to the problem of treatment of many non-biodegradable organic compounds. The ozone reaction was found to be best carried out in the middle pH range of 6.0 to 8.5, sometimes necessitating a buffer system to maintain this pH level. (Kramer-FIRL)
W77-08267

WASTE IMPOUNDMENT EFFICIENCY AT SUGAR MILL,
K. M. St. PE.
Sugar Journal, Vol. 39, No. 11, p 25-26, April, 1977. 1 tab.

Descriptors: *Biological treatment, *Carbohydrates, *Organic wastes, *Food processing industry, Aerobic treatment, Anaerobic conditions, Lagoons, Biochemical oxygen demand, Dissolved oxygen, Industrial wastes, *Waste water treatment, Oxygenation, *Oxidation lagoons.
Identifiers: *Sugar mill wastes.

Sugar mill impoundment waters occasionally exhibit a low BOD5 of less than 10 parts per million along with an absence or small quantity of dissolved oxygen, ranging from 0.0 to 1.0 ppm. This phenomenon occurs in impoundments where sunlight penetration is restricted by heavy vegetative growths. The bacterial action necessary for organic waste decomposition is explained, and the efficiency differences are illustrated for impoundments receiving direct sunlight and for those which do not. Sugar can be decomposed by anaerobic and aerobic bacteria. In ponds with high organic waste loads, anaerobic bacteria are used for the initial decomposition, but for discharge into state waters, a final aerobic stage is necessary. This requires free or dissolved oxygen, often obtained by mechanical aeration. Phytoplankton may also be used, at less expense to large mill impoundments than mechanical aeration. The phytoplankton need sunlight to produce oxygen photosynthetically. Where sunlight is not available the impoundment wastes remain unoxygenated, anaerobic bacterial growth is encouraged, the effluent has a low BOD5, and contains little oxygen. The results from tests with two ponds differing in sunlight and vegetation showed that the pond without vegetative-sunlight restrictions produced completely stabilized, well-oxygenated wastes, whereas the other one was less efficient in producing a high quality effluent. (Kutcher-FIRL)
W77-08268

BACTERIOLOGICAL INVESTIGATION OF ALBERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SALMONELLA ISOLATION,
Environmental Protection Service, Edmonton (Alberta). Microbiology Lab.
J. M. Vanderpost, and J. B. Bell.
Applied and Environmental Microbiology, Vol. 33, No. 3, p 538-545, March, 1977. 1 fig, 8 tab, 22 ref.

Descriptors: *Bacteria, *Food processing industry, *Disinfection, *Salmonella, Municipal wastes, *Industrial wastes, *Waste water treatment, Treatment facilities, Membrane processes, Public health, *Isolation, *Canada, Bioindicators.
Identifiers: *Meat packing plant wastes.

Eleven meat-packing plants in Alberta, Canada, were investigated to assess the occurrence and numbers of indicator bacteria and of Salmonella in their treatment facilities and final effluents. The purpose of the study was to help establish guidelines and standards for these effluents, and to determine whether disinfection is necessary. Municipal sewage in Alberta does not ordinarily undergo disinfection, so that organisms eventually are released to rivers. Washwater and manure are the sources of Salmonella in these plants. The effluent samples were tested by Standard Methods membrane filtration procedures. Results showed that the bacteriological quality of final effluents was very poor, resembling raw sewage in the numbers of indicator organisms, ranging from the hundreds of thousands to millions per milliliter. Primary treatment using settling and flotation was ineffective in reducing the number of bacteria. While secondary treatment reduced the bacteria by 99%, it could not be clearly determined that this treatment had much influence on Salmonella reduction. Salmonella were found in the final effluents of 78% of the plants, including the one using secondary treatment. The 21 Salmonella serotypes isolated did not resist antibiotics. Some of the coliform and fecal coliform isolates were resistant to the antibiotics chloramphenicol, tetracycline, and ampicillin. There is a concern that this resistance might be transferred to Salmonella. Disinfection of the wastes could prevent this potential health hazard. (Kutcher-FIRL)
W77-08269

OCCUPATIONAL CHARACTERISTICS AND BIOLOGICAL KINETIC CONSTANTS OF EXTENDED AERATION PROCESS,
Asian Inst. of Tech., Bangkok (Thailand).
P. Y. Yang, and Y. K. Chen.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 678-688, April, 1977. 12 fig, 6 tab, 14 ref.

Descriptors: *Kinetics, *Aeration, *Waste water treatment, *Food processing industry, Activated sludge, Organic compounds, Chemical oxygen demand, Biological treatment.
Identifiers: *Extended aeration.

A study is presented of investigations into the performance of a continuous-flow extended aeration system meant to treat soluble organic waste water from soft drink bottling plants. The aeration systems were tested with and without the assistance of partial chemical hydrolysis for sludge recycling. In both cases, the biological kinetic constants evaluated were the yield constant, the specific organism decay rate, the saturation concentration, and the maximum growth rate. With hydrolysis, a 75% reduction in sludge production was obtained; the maximum growth rate decreased 64.5%, and the specific organism decay rate decreased 65.6%. Several wastes from different soft drinks and from milk were used to evaluate these constants. It appears that the type of organic waste rather than the substrate concentration is most important in varying the constants. It was concluded that if the average biochemical removal efficiency, in terms of COD, is greater than 96.2%, soluble organic effluents can be treated by the extended aeration activated sludge processes, with total sludge recycling. Using acid hydrolysis is in this instance irrelevant. Acid hydrolysis applied to a portion of the return sludge can maintain the biological solids concentration within a certain range. It can also produce a nitrified effluent which will enhance the endogenous oxygen uptake rate and the specific substrate utilization rate of the sludge. (Kutcher-FIRL)
W77-08270

CLOSED-LOOP SYSTEM SEPARATES OIL FROM PREWASH OVERFLOW,
Miller Brewing Co., Milwaukee, Wis.
D. Erwin.
Industrial Wastes, Vol. 23, No. 2, p 26-27, 50, March/April, 1977. 1 fig.

Descriptors: *Oil wastes, *Metals, *Aluminum, Industrial wastes, *Waste water treatment, *Recycling, Water reuse.
Identifiers: Closed-loop systems, *Brewery canning wastes.

A closed-loop system is described which separates oil from the prewash rinse water of the aluminum can finishing process at the Miller Brewing Company. The prewash stage generates up to 50% of the waste overflows; 90% of the oil can be removed by this closed system which also provides for the recirculation of water. A water electrolyte solution is sprayed onto the cans to break down the oil emulsion with which they are coated. The oil-laden overflow is passed into a cylindrical tank with a truncated top. The oil is then directed to a top-mounted recovery belt from which the oil is scraped; it is next discharged to a holding tank

for reclamation. The rinse water, now free of oil, is returned to the prewash stage. The tank can be periodically purged of dirt, solids, and electrolyte accumulations. Blowdowns of 100 to 200 gpd are adequate to keep the loop clean. The system is controlled automatically to maintain the desired two percent electrolyte concentration, and to assure an oil/water interface variation in the separation tank of not more than one half inch. This keeps the water below the oil removal belt and the oil level high enough for optimum contact with the belt. The advantages of this system are reduced water and chemical consumption, and the recovery of oil for reuse or sale. (Kutcher-FIRL)
W77-08271

REDUCTION OF MERCURY, COPPER, NICKEL, CADMIUM, AND ZINC LEVELS IN SOLUTION BY COMPETITIVE ADSORPTION ONTO PEANUT HULLS, AND RAW AND AGED BARK,
Francis Marion Coll., Florence, S. C. Dept. of Chemistry and Physics.
R. W. Henderson, D. S. Andrews, G. R. Lightsey, and N. A. Poonawala.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 3, p 355-359, March, 1977. 1 fig, 2 tab, 11 ref.

Descriptors: *Organic compounds, *Waste water treatment, *Adsorption, Bacteria, Municipal wastes, Industrial wastes, *Mercury, *Copper, *Nickel, *Cadmium, *Zinc, Heavy metals, Toxicity, Metals, Ions.
Identifiers: *Peanut hulls, Bark, *Metal ions.

Organic matter in waste water is oxidized in municipal plants by bacteria. When industrial and municipal wastes are combined, the bacteria are rendered ineffective by the metallic ions often contained in the wastes. A study was therefore conducted to test the ability of low-cost organic residues in removing toxic metal ions from waste water. Raw and composted southern pine bark and peanut hulls were tested for their capacity to adsorb mercury, copper, nickel, cadmium and zinc. Peanut hulls were able to adsorb significant quantities of all the metals. The smaller the peanut hull particle size, the greater the amount of metals adsorbed. At high metal concentrations they removed 117 mg metal/g solid, or 11.2% of the total. At lower concentrations, 24.4% of the metals were removed. Copper was removed to a moderate degree when pine bark was the adsorbent, but other metals were not. Composted bark, however, adsorbed large percentages of all the metals except for mercury and zinc in low concentrations. Using organic residues might be a practical way of handling wastes when only occasional shock loads are expected. Otherwise, the standard methods of ion-exchange, activated carbon, and reverse osmosis would be required. (Kutcher-FIRL)
W77-08272

PERFORMANCE OF DUAL-MEDIA FILTERS--I,
Standard Oil Co. (Ohio), Cleveland.
M. A. Brody, and R. J. Lumpkins.
Chemical Engineering Progress, Vol. 73, No. 4, p 83-86, April, 1977. 4 fig, 2 tab.

Descriptors: *Filtration, *Oil wastes, *Suspended solids, *Pilot plants, Industrial wastes, Activated sludge, *Waste water treatment, Activated carbon, *Filters, Pennsylvania.
Identifiers: *Refinery wastes, *Dual media filters.

The waste water treatment plant at the refinery of the BP Oil Corporation in Marcus Hook, Pennsylvania, consists of API separators, surge basins, sand filters, and an activated carbon adsorption system. There are also sludge handling and dewatering facilities for treating the sand filter backwash, the API separator bottoms, and the emulsion breaker bottoms. The filters receive a flow of 1500 to 2000 gal/min containing suspended solids and oil concentrations ranging from 50 to 150 mg/liter. Three filters operating in parallel comprise the sand filter unit. The top layer of the filter media is two and a half feet of anthracite; the bottom layer is a four and a half foot layer of sand. The operation and control systems of the filter unit are described in great detail. The system is fully automated. Hydraulic-operated valves direct the flow to the filters. The control system records flow, indicates differential pressure, and records surge basin levels. The unit was designed for each filter to handle a maximum flow rate of 1000 gal/min. The efficiencies were to be a 77% removal of suspended solids and a 79% removal of oil. Over a three year period, the actual average reductions have been about 60% for both suspended solids and oil. (See also W77-08274) (Kutcher-FIRL)
W77-08273

PERFORMANCE OF DUAL-MEDIA FILTERS--II,
Imperial Oil Enterprises, Ltd., Sarnia (Ontario).
J. C. Kempling, and J. Eng.
Chemical Engineering Progress, Vol. 73, No. 4, p 87-91, April, 1977. 7 fig, 1 tab, 5 ref.

Descriptors: *Filtration, *Oil wastes, *Suspended solids, *Pilot plants, Industrial wastes, Activated sludge, *Waste water treatment, Maintenance.
Identifiers: *Dual media filters, *Refinery wastes.

Two different applications of dual-media filtration systems for refinery effluents are presented and evaluated. In one pilot simulation study, the filters were used to remove the residual biofloc from the secondary treatment effluent of an aerated lagoon. The suspended solids removal was 80%, and the BOD removal reached 50%. Other pilot tests were run for filtering the effluent of an API separator to remove the oil and suspended solids. The Imperial Oil refinery at Sarnia, Ontario, constructed a full-scale filter based on the pilot data. Comparisons are presented of the pilot design estimates and the filter plant after 20 months of operation. The dual-media filter consisted of anthracite on top of a sand layer. Filtration took place in the lower section; filtered water was stored in the upper tank. The filter can treat 6000 gal/min of waste water. Results from the plant showed a 79% reduction in oil, with a feed concentration of 56 mg/liter and a product concentration of 12 mg/liter, whereas the pilot filtration unit showed a 75% reduction, from 33 mg/liter of oil to 8 mg/liter. For suspended solids, the plant showed a reduction of 54%, representing a drop from 43 mg/liter of suspended solids to 20 mg/liter. The pilot unit concentration dropped from 25 mg/liter of suspended solids to 12 mg/liter, or 55%. Thus the full-scale unit compares quite favorably with the pilot. During the 20 months, the filter provided consistent and maintenance-free service, while averaging a combined oil and suspended solids removal of 1.5 tons per day. (See also W77-08273) (Kutcher-FIRL)
W77-08274

TREATMENT OF AQUEOUS CONDENSATES AND EFFLUENTS FROM COKING PLANTS--WITH ALKALI SALTS OF WEAK ACIDS, TO EXPEL AMMONIA.
Netherlands Patent NL 7607-273. Issued February 25, 1977. Derwent Netherlands Patents Abstracts, Vol. Y, No. 10, p D2, April, 1977.

Descriptors: *Patents, *Ammonia, *Waste water treatment, Chemical wastes, Recycling, Industrial wastes.
Identifiers: *Coking plant effluents.

A patent was issued for a process to drive off ammonia from the aqueous condensates resulting from the coking of coal, lignite, bitumen shale and peat. It can also be used to remove ammonia from low temperature carbonization gases. The fluids containing ammonia are combined with low-volatility strong acids and mixed with aqueous solutions of carbonates or sulfides, or their hydrogen compounds, or with cyanides or the polysulfides of alkali metals. With this process, soluble salts of the strong acids are formed. NaOH or KOH solutions can be used as the treatment fluid after they have been used to remove H2S from coke oven gas. The spent sodium hydroxide solution is then pumped to an ammonia stripper; the remaining condensate from the coke oven gas is recycled to the first stage. (Kutcher-FIRL)
W77-08275

IS PH PRETREATMENT NECESSARY,
Wesleyan Univ., Middletown, Conn. Industrial Waste Lab.
J. W. Masselli, N. W. Masselli, and M. G. Burford.
Textile Industries, Vol. 141, No. 4, p 66a, 66c, 67, April, 1977. 1 fig, 6 ref.

Descriptors: *Waste water treatment, *Textiles, *Tannery wastes, *Alkalinity, *Organic compounds, *Treatment facilities, Industrial wastes, Biochemical oxygen demand, Effluents, *Hydrogen ion concentration.
Identifiers: *Pretreatment(Industrial wastes), Cotton mills.

In the treatment of wastes from cotton mills and tanneries which contain alkaline (10-12) pH levels, the method of neutralizing these pH levels by pretreating with organic acids is not recommended. Laboratory experience with highly alkaline textile and tannery wastes indicated that activated sludge processes will automatically normalize influents with pH's between 12 and 13, with no pretreatment needed. Examples are cited of a Cranston Print Works plant in Fletcher, North Carolina, a Warwick, Rhode Island treatment plant, and a New England cotton mill in which pretreatment with organic acids produced no useful benefits, created undesirable odors, did not aid treatability, and increased the costs of the finished goods. An alkaline pH of the plant wastes is desirable due to: the prevention of equipment corrosion; neutralization of acid wastes; prevention of hydrogen sulfide odors; prevention of hydrogen cyanide evolution; emulsification of grease, preventing pipe blockages; and increase in clarification during primary sedimentation. These wastes are automatically neutralized and converted to bicarbonate alkalinity, an excellent buffer for the 6.5 to 9.0 pH range. It was suggested that if problems are expected due to a low BOD/alkalinity ratio, acid might be added directly to the mixed liquor for the simplest and least expensive method of control. (Kramer-FIRL)
W77-08276

PURIFYING BIOLOGICAL EFFLUENT RICH IN CARBOHYDRATES OR PROTEIN--BY ANAEROBIC FERMENTATION SEPARATION, AEROBIC TREATMENT AND THEN SEPARATION.
French Patent FR 2308-598. Issued December 24, 1976. Derwent French Patents Abstracts, Vol. Y, No. 8, p D4, April, 1977.

Descriptors: *Patents, *Biological treatment, *Carbohydrates, *Proteins, Anaerobic conditions, Aerobic treatment, Food processing industry, Industrial wastes, *Waste water treatment, Fermentation, Sludge treatment, Recycling.

A patent was issued for a biological treatment process for aqueous effluents rich in carbohydrates or protein. These wastes are commonly found in sugar, starch, and jam factories. The liquid is first treated during an anaerobic fermentation stage. The methane formed from this phase is removed. The first sludge concentrate, obtained by separation, is recycled for further anaerobic fermentation. The remaining liquor is returned for aerobic treatment. This step is repeated in obtaining a second sludge concentrate. The process is stable, easily operable, and

eliminates problems of sludge settling and residual organic compounds containing nitrogen. (Kutcher-FIRL)
W77-08277

CHARACTERIZATION AND TREATMENT OF TEXTILE DYEING WASTEWATERS,
Crompton and Knowles Corp., Reading, Pa.
R. H. Horning.
Textile Chemist and Colorist, Vol. 9, No. 4, p 24-27, April, 1977. 5 tab, 3 ref.

Descriptors: *Textiles, *Dyes, *Industrial wastes, *Waste water treatment, Adsorption, Pollutant identification, Organic compounds, Color, Heavy metals, Lime.

A study with a threefold purpose was conducted on waste waters from the textile industry. The waste waters were characterized; evaluated for biological oxidation, carbon adsorption, chemical oxidation, and chemical coagulation; and examined for treatability with combination methods. Twenty combinations of fiber class/construction, dye, and application methods were selected as representative for the industry. The wastes were analyzed for cadmium, copper, chromium, lead, phenol, benzidine, and chlorides. The heavy metals levels were low in the tested wastes except where a metal figured in the bath formulation. Benzidine averages are difficult to obtain. Although the results from these tests showed an average value of 11.5 micrograms per liter, in actuality the value is probably much lower. Biological treatment proved very effective in removing BOD5 and it inhibited nitrification for many samples. It was much less effective for TOC removal, indicating the presence of non-biodegradable matter, and not at all effective for color removal. No single treatment effectively removed both TOC and color. Precipitation was tested with lime, alum and ferric iron salts; powdered activated carbon was used for adsorption; for oxidation ozone was used. For waste waters of carbonate alkalinity, lime was useful, allowing the formation of calcium carbonate. Coagulation procedures were best in decolorizing disperse, vat, and sulfur dyes, while carbon was best used for reactive, basic, acid, and azoic dyes. Reactive and basic dyes were easily decolorized with ozone treatment at doses of one gram per liter, but disperse dyes did not respond favorably to this treatment. Tables are presented for all dye classes and treatment methods. (Kutcher-FIRL)
W77-08278

EFFECT OF ACCLIMATION TO LIME-SULFIDE EFFLUENT FROM UNHAIRING CATTLEHIDES ON THE COMPOSITION OF ACTIVATED SLUDGE,
Agricultural Research Service, Philadelphia, Pa. Eastern Regional Research Center.
W. F. Happich, J. E. Cooper, E. H. Bitcover, M. M. Taylor, and J. W. Harlan.
The Journal of the American Leather Chemists Association, Vol. 72, No. 4, p 120-135, April, 1977. 7 tab, 21 ref.

Descriptors: *Activated sludge, *Tannery wastes, *Industrial wastes, Biodegradation, Heavy metals, Microorganisms, *Waste water treatment.
Identifiers: *Lime-sulfide effluent, *Waste analysis.

Experimental processes and results are described for modifying the composition of activated sludge from sanitary wastes to full strength, lime-sulfide unhairing effluent during bio-oxidation. Acclimation is defined as the adaptation and growth of activated sludge microorganisms to and in the lime-sulfide effluent. The methods for harvesting the acclimated-activated sludge and the analytical methods used in the experiment are detailed. Analyses are made of the recovered activated and acclimated-activated sludges for their inorganic composition. The acclimated-activated sludge was analyzed spectrographically. Data are given for the amino acid composition in activated sludge. Acclimated-activated sludge had a protein content of 30 to 36% while activated sludge contained 28 to 32% protein. Acclimation increased ash, inorganic sulfur compounds, and protein sulfur. Free amino acids, which were not present in activated sludge, were found in the acclimated-activated sludge. Lanthionine, a component in the lime-sulfide effluent, could be used as an indicator of the presence of alkali-degraded hair protein. Toxic heavy metal contaminants were absent from the acclimated-activated sludge and because of its protein content, it might be useful as an animal feed supplement; it could also be used as a high-lime fertilizer. (Kutcher-FIRL)
W77-08279

SPLIT-STREAM CHEMICAL TREATMENT (A PATENTED PROCESS BY CHEMLAN COMPANY, INC.) OF TANNING INDUSTRY WASTE WATER,
J. H. Shockcor.
The Leather Manufacturer, Vol 94, No 4, p 12, 15, 16-18, 21-22, 27, 30-31, April, 1977. 1 fig, 3 tab.

Descriptors: *Tannery wastes, *Chemical wastes, *Sludge treatment, Recycling, Flocculation, Oxidation, Suspended solids, *Waste water treatment, Industrial wastes.
Identifiers: *Chappell Process(Tanning wastes), *Split stream chemical treatment.

The Chappell Process, an innovative approach for the chemical-physical treatment of waste water from the tanning industry, is described. Operable in either the batch or continuous flow-through mode, it is based on the split-stream technique and allows for massive sludge recycling. Raw waste is discharged from a receiving tank in two separate streams, one of which receives acid treatment and the other alkaline treatment. Rapid oxidation of dissolved and suspended solids occurs at the pH extremes in each stream. When the streams recombine in a pipe leading to the flocculation tank, the oxygen demand has already been satisfied, and neutralization then takes place. The aluminum used to alter the pH precipitates at this point as an hydroxide and it is recycled for further dissolution in the two streams. The stream flows to tanks for mixing with residual sludge already formed by the process and for precipitation. Whatever sludge is not recycled is removed from the whole system for disposal. (Kutcher-FIRL)
W77-08280

BACTERIAL GROWTH KINETICS IN THE COMPLETELY MIXED ACTIVATED SLUDGE TREATMENT OF FELLMONGERY EFFLUENT,
Rhodes Univ., Grahamstown (South Africa). Dept. of Microbiology.
D. E. Rawlings, and D. R. Woods.
Water Research, Vol 11, No 3, p 281-288, 1977. 9 fig, 1 tab, 17 ref.

Descriptors: *Kinetics, *Activated sludge, *Tannery wastes, *Bacteria, *Waste water treatment, Laboratory tests, Industrial wastes, Mathematical models, Suspended solids.
Identifiers: *Fellmongery wastes.

A kinetic study has been performed for fellmongery lime-sulfide effluent, in which the microbial growth is compared with that of domestic sewage. Fellmongery and tannery waste waters are complex mixtures, characterized by their high (11-13) pH and sulfide (700 to 2000 mg/liter) concentrations. A laboratory scale completely mixed activated sludge (CMAS) reactor with sludge recycle and controlled wasting was used to treat the fellmongery effluent. Effluent quality was significantly affected by varying the sludge age. Microbial growth in the treatment process was described by a mathematical model which may be used to design and operate effluent treatment facilities. Several equations which comprise this model are provided. In the development of the model it was demonstrated that a clear distinction must be made between volatile suspended solids and active volatile suspended solids in order to accurately describe the microbial growth kinetics. (Kramer-FIRL)
W77-08281

AIR FLOTATION OF OILY WASTE WATERS WITH ORGANIC COAGULANTS,
California Univ., Berkeley.
R. G. Luthy.
Available from the University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No 77-4519. PhD Thesis, 1976. 181 p.

Descriptors: *Flotation, *Oil wastes, *Waste water treatment, Flocculation, Pilot plants, Organic compounds, Polyelectrolytes, Costs.
Identifiers: *Refinery wastes.

An attempt was made to identify the conditions for removing emulsified oil from refinery waste waters by using organic coagulants. The emulsion properties affecting oil droplet flocculation and flotation were also studied. The water quality rather than the oil source is the influential factor on oil droplet properties. Tough, interfacial films, or electrical effects, or solid material adsorption at the oil-water interface create stable emulsions. It was demonstrated that a 15 mg/liter dose of 75% charged polydiallydimethylammonium polymer could remove up to 10 mg/liter of oil from API separator effluents. Large oil droplet removal was not affected by underdosing. Oil removal was best when the polymer dose gave a net zero oil droplet charge, in conjunction with efficient polymer bridging between the oil droplets. Good flocculation resulted in good flotation. Although polyelectrolyte treatment is costly, the expense is offset by savings in sludge disposal costs and by the value of the recovered oil. (Kutcher-FIRL)
W77-08282

TAKING ACRES OUT OF POLLUTION-CONTROL PLANS,
Metcalf and Eddy, Inc., Boston, Mass.
R. C. Atwood, W. A. Peterson, and C. W. Bowers.
Textile World, Vol 127, NO 4, p 125-126, April, 1977. 1 tab.

Descriptors: *Textiles, *Biological treatment, *Recycling, *Industrial wastes, *Waste water treatment, Water reuse, Water pollution control, Costs.

Potential cost savings through in-plant modifications and controls for the textile industry are outlined. These include the reduction of process water; the reuse of cooling, printing, and effluent waters; the recovery of several agents; the handling of effluents; and the cleaning of waters. In-plant controls may be the installation of liquid level control devices in tanks and baths, or of flow, pH, and temperature indicators on feed lines and process tanks. Wash and rinse temperatures may be better optimized and reductions may be effected in water consumption by tailoring flow to fabric width. Chemical substitution and reuse can both reduce pollutant concentration and offer savings in process chemical costs. Modifications in effluent handling may be performed in the pretreatment, in-plant, and end-of-pipe phases of treatment. Additionally, equipment is suggested for optimally cleaning the waters, such as trickling filters and rotating biological discs. Other important processes include activated sludge; extended aeration, which is an activated sludge modification; aerobic, anaerobic or aerobic/anaerobic lagooning; and physical-chemical treatment techniques. Such systems have been compared in terms of their treatment of textile effluents and it was shown that chemical coagulation and biological systems were most effective in the removal of suspended solids, BOD, COD, TDS, bacteria, color, pH, metals, and nutrients. By designing

strategies for process-water and chemical consumption, reuse, and treatment to meet the specific needs of the mill facility, effluent requirements should be economically met. (Kramer-FIRL)
W77-08283

ROOT GROWTH, STRENGTH, AND CHEMICAL PROPERTIES OF A HOBSON FRAGIPAN,
Missouri Univ., Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-08285

CHELATING AGENT ANALYSIS BY HIGH SPEED LIQUID CHROMATOGRAPHY,
Missouri Univ., Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-08286

DETECTION OF PHOSPHATE ADSORPTION ONTO COAL HUMIC ACIDS,
Missouri Univ.-Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-08294

NETWORK EVALUATION OF WASTEWATER COLLECTION ECONOMICS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
Jarir S. Dajani.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 082, Price codes: A09 in paper copy, A01 in microfiche. PhD Thesis, June 1971. 183 p. OWRT A-042-ILL(3). 14-31-0001-3513.

Descriptors: Economics, Waste water treatment, Costs, Optimization, Input-output analysis, Evaluation, Networks, Cities, Model studies, Sewers, Treatment facilities, Methodology.
Identifiers: *Network evaluations, *Wastewater collection systems, *Cost functions, Urban development, Cost models.

Urban public services are a significant component of the overall urban system. These services are composed of both nodal (the production and processing functions) and network (the delivery or collection functions) components. Very little is known about their cost functions. Wastewater collection services are used to show how technological relationships and principles of microeconomics can be used to generate cost functions for service networks with a public works content. A wastewater collection network is broken down to the sewerline satisfying a linear demand. Then its economics, application of optimization and inputs and outputs are explored. Cost functions are derived from both hydraulic formulae and cost equations. Optimization, present design methodology and recent developments in network layout and design are then explored. The optimal choice is fitted to a convex programming framework. A 160-acre experimental module is presented as a basis for the development of normative network cost models. Minimum-cost wastewater collection networks were designed and their costs estimated for these theoretical modules. By using relationships between cost, area, population density and treatment plant cost information, items such as; tradeoffs between network and nodal costs, minimum-cost size of total surface area, and the overall service cost functions were exposed. The implications of the different methodologies and models are presented and the conceptual frameworks are outlined. (Gemmell-Illinois)
W77-08331

OPTIMAL LAYOUT AND DESIGN OF STORM SEWER SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
L. W. Mays.
Available from the National Technical Information Service Springfield, VA 22161 as PB-268 049, Price codes: A11 in paper copy, A01 in microfiche. Ph. D. thesis, 1976, 224 p, 48 fig, 21 tab, 3 append, 32 ref. OWRT C-4123(No. 9023) (4). 14-31-0001-9023.

Descriptors: *Optimization, Urban drainage, Environmental engineering, *Dynamic programming, Hydraulics, *Storm drains, *Sewers, *Design criteria, *Model studies, Costs, Pipes, Cities.
Identifiers: *Urban development, Computer applications, *Discrete differential dynamic programming.

An optimization model has been developed for the minimum cost layout and design of storm sewer systems. This model can be used to determine the optimal layout, size, and crown elevations of the sewer pipes and depths of the manholes. The optimization is achieved by using a screening model consisting of two conjunctive phases: a model for the combined layout and design and a supplementary design model for prescribed layouts. The combined layout and design model is an optimization procedure based upon discrete differential dynamic programming (DDDP) which simultaneously varies both the system layout and pipe design. Drainage lines, which are imaginary lines separating manholes for investigation of possible pipe connections, are used to divide the system into stages for optimization. At each stage of the DDDP procedure, a connectivity model, which is formulated as a set-partitioning problem, is solved to determine the minimum cost layout for that stage. The combined layout and design model is an iterative stage by stage procedure resulting in a complete system layout and design after each iteration. When changes in the system layout occur for successive iterations of the combined model, the design model for given layouts is used to compute the optimal design of the previously generated layout by the combined layout and design model. The design model is also an iterative stage-by-stage optimization procedure based upon DDDP. The hydraulics of flow are accounted for by using Manning's equation and peak flows at various manhooles are added to compute flowrates for the connecting downstream pipes.
W77-08334

PROCESS DESIGN OF SINGLE-SLUDGE ACTIVATED SLUDGE SYSTEMS USING NITRATE RESPIRATION,
New York State Dept. of Environmental Conservation, Albany: and Rensselaer Polytechnic Inst., Troy, N.Y.
C. Beer, and L. K. Wang.
New York State Dept of Environmental Conservation, Technical Report No. 50, May 1977, 40 p., 6 fig., 4 tab, 16 ref. Presented at the 49th Annual Meeting of the New York Water Pollution Control Assoc., Jan. 17-19, 1977, New York City.

Descriptors: *Wastewater treatment, *Activated sludge, Performance, *Design, Nitrates, *Respiration, *Denitrification, Nitrogen, *Treatment facilities.
Identifiers: *Nitrate respiration, *Process design.

The flow sheets discussed have two characteristic features: (a) Utilization of nitrates as hydrogen acceptor occurs during part of the process. (b) There is not addition of an external carbon source to bring abut denitrification. Wastewater carbon compounds or the biomass of the sludge or both are used as hydrogen donor. The increased capability of removing nitrogen is one remarkable aspect of the flow sheets discussed, other noteworthy aspects are: better solids removal, better alkalinity control, energy conservation, and the possibility of using the final settler as sludge thickening device.
W77-08336

TREATMENT OF WASTEWATER FROM MILITARY EXPLOSIVES AND PROPELLANTS PRODUCTION INDUSTRY BY PHYSICOCHEMICAL PROCESSES,
Rensselaer Polytechnic Inst. Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
L. K. Wang, W. W. Shuster, R. W. Shade, and T. J. Lynch.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027329, Price codes: A08 in paper copy, A01 in microfiche. Prepared for Army Mobility Equipment R&D Command, Ft. Belvoir, VA, Final Project Report, June 1976. 121 p., 38 fig., 6 tab, 63 ref. RPI-JBA02. DAAG-53-75C-0252.

Descriptors: *Wastewater treatment, Activated carbon, Polyelectrolytes, Coagulation, Filtration, Centrifugation, Adsorption, *Military aspects, Nitrates, Industrial wastes.
Identifiers: *Nitrocellulose-manufacturing wastewater, *Cellulose nitrate.

Laboratory and pilot-plant studies were conducted to investigate the effectiveness of various physical-chemical processes for the separation of nitrocellulose (i.e., cellulose nitrate) from a military wastewater. Special emphasis was placed on in-line filtration (i.e., contact-coagulation-filtration), precoat filtration and conventional multimedia filtration. Three conventional treatment systems were feasible for removing at least 94% of turbidity: (a) using 200 mg/l of Cat-Floc alone as coagulant; (b) using 100 mg/l of Cat-Floc as coagulant and 100 mg/l of Bentonite clay as coagulant aid; and (c) 200 mg/l of Cat-Floc as coagulant and 750 mg/l of powdered activated carbon (Darco S-51) as coagulant aid as well as adsorbent. Another treatment method involving centrifugation was also investigated. Although direct centrifugation of the raw nitrocellulose-manufacturing wastewater could not reduce any turbidity, the combination of chemical coagulation (using cationic polyelectrolyte as coagulant and appropriate material as coagulant aid) and centrifugation could achieve more than 98% of turbidity removal.
W77-08337

INVESTIGATION OF THE EFFECTIVENESS OF POLYMERS IN THE TREATMENT OF NIROCELLULOSE-MANUFACTURING WASTEWATER,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
L. K. Wang, R. W. Shade, W. W. Shuster, and F. Bilgen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A023602, Price codes: A101 in paper copy, A01 in microfiche. Prepared for Army Mobility Equipment R&D Command, Ft. Belvoir, Va., Final Project Report, March 1976. 153 p., 72 fig., 7 tab, 36 ref. RPI-JBA02, DAAG-53-75C-0252.

Descriptors: *Waste water treatment, Military aspects, Activated carbon, Polyelectrolytes, Adsorption, Lime, Coagulation, Filtration, Colloid charge, Chemical precipitation, Nitrates, *Polymers, Industrial wastes.
Identifiers: *Nitrocellulose-manufacturing wastewater, *Cellulose nitrate.

The effectiveness of organic polymers in the treatment of two types of industrial wastewaters has been investigated. The experimental study consisted of initially performing batch coagulation tests followed by continuous filtration runs with the wastewater, using the results obtained in the batch tests. six polymers were used in the experiments to determine optimum type and dosage required for effective turbidity removal. The best method selected for the treatment of wastewater consisted of the addition of 100 mg/l Cat-Floc ca-

tionic polymer and 100 mg/l of powdered bentonite clay to the wastewater in a batch unit and after sedimentation, filtration of the supernatant at a flow rate of 4 gpm/sq ft. This treatment yielded a high quality filtrate with a 99.8% reduction in turbidity.
W77-08338

ROLE OF POLYELECTROLYTES IN THE FILTRATION OF COLLOIDAL PARTICLES FROM WATER AND WASTEWATER,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
W. W. Shuster, and L. K. Wang.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 330, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Army Mobility Equipment R and D Command, Ft. Belvoir, Va., Final Project Report, June 1976, 51 p., 4 fig., 194 ref. RPI-JBA02, DAAG-53-75C-0252.

Descriptors: Waste water treatment, *Water treatment, *Filtration, *Polyelectrolytes, Coagulation, Filters, Colloids.
Identifiers: Multi-media filtration, Colloidal particles.

An extensive review has been made of the literature in connection with the use of polyelectrolytes in the removal of colloidal particles from water and wastewater by mechanisms of filtration. Pertinent literature on the nature of colloidal materials and current theory related to particle interactions and coagulation has been briefly reviewed. Pertinent literature on the nature of colloidal materials and current theory related to particle interactions and coagulation has been briefly reviewed. Physical aspects and the chemical aspects of filtration have been considered. References related to the characterization and behavior of multi-media filters as well as single media filters were included. Particular attention was directed to the review and evaluation of articles related to specific applications of the use of polyelectrolytes in water treatment, and in domestic and industrial wastewater treatment.
W77-08339

FORWARD OSMOSIS EXTRACTORS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3A.
W77-08340

AN ECONOMIC APPRAISAL OF REUSE CONCEPTS IN REGIONAL WATER SUPPLY PLANNING,
Utah State Univ., Logan. Dept. of Economics.
R. Narayanan, B. C. Jensen, A. B. Bishop, and K. S. Lyon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 093, Price codes: A04 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Logan, Publication PRWG123-3, April 1976. 63 p, 6 fig, 7 tab, 6 append. OWRT B-097-UTAH(2), 14-31-0001-4133.

Descriptors: *Water reuse, *Water supply development, Water supply, *Planning, *Recycling, *Utah, Economics, *Regional analysis, Model studies, Mathematical models, Computer models, Risks, Optimization, Water allocation(Policy).
Identifiers: *Salt Lake County(Utah).

Using a conceptual model of a water supply firm, the necessary conditions for production and market efficiency are derived when renovated wastewater is considered as a potential water resource. The nature and extent of the supply augmentation due to recycled reuse is demonstrated using classical optimization techniques. Three stages of short-run supply corresponding to no recycling, partial recycled reuse and complete recycling of all reclaimable water are identified through appropriate Lagrangian multipliers as well as graphical techniques. A mathematical programming model is structured to determine the optimal water resource allocation and pricing policy for Salt Lake County. By maximizing the sum of consumer and producer surplus (the difference between total willingness-to-pay and total cost) economically efficient equilibria are derived. The feasibility of recycled reuse for municipal purposes is examined in a planning context. The impact of higher water quality discharge standards on the attractiveness of water recycling option is studied. To ensure social acceptability of renovated wastewater for culinary purposes, blending restrictions are imposed, which stipulate that the amount of water for reuse be less than a fixed percentage of the water from other sources. The effects of such a constraint on the prices and water allocation are delineated. The hydrologic uncertainty in water supply is treated using stochastic programming techniques. The resulting changes in pricing and allocation policies are discussed.
W77-08347

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-08356

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY PRETREATMENT STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08357

EFFLUENT GUIDELINES AND STANDARDS FOR CANNED AND PRESERVED FRUITS AND VEGETABLES POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08371

THE 1972 WATER POLLUTION CONTROL ACT: UNFORESEEN IMPLICATIONS FOR LAND USE PLANNING,
For primary bibliographic entry see Field 5G.
W77-08373

PUBLIC HEARING REGARDING 180-DAY NOTICE TO THE SANTA FE LAND IMPROVEMENT COMPANY OF VIOLATION OF STATE AND FEDERAL WATER QUALITY STANDARDS FOR THE INTERSTATE WATERS OF THE KANSAS AND MISSOURI RIVERS, HELD AT KANSAS CITY, KANSAS ON 13 JULY 1971.
For primary bibliographic entry see Field 5G.
W77-08381

EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR NEW SOURCES FOR THE BLEACHED KRAFT, GROUNDWOOD, SULFITE, SODA, DEINK AND NON-INTEGRATED PAPER MILLS SEGMENT OF THE PULP, PAPER, AND PAPERBOARD POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08383

FULL SCALE OPERATION OF PLUG FLOW ACTIVATED SLUDGE SYSTEMS,
New York State Dept. of Environmental Conservation, Albany; and Rensselaer Polytechnic Inst., Troy, N.Y.
C. Beer, L. J. Hetling, and L. K. Wang.
New York State Dept of Environmental Conservation, Technical Report No 42, Aug 1975, Presented at the New England Water Pollution Control Association Meeting, Hartford, Conn., October 23, 1974, 45 p. 13 fig, 7 tab, 16 ref. EPA Project 17050 EDL.

Descriptors: *Waste water treatment, *Activated sludge, *Performance, *Operations, *Nitrification, *Denitrification, *Treatment facilities, *Oxidation, Phosphorus, Absorption, Chemical precipitation, Aeration, Nitrogen.
Identifiers: *Phosphorus removal, Waste assimilation(Nitrogen).

Six unit processes are involved in the plug flow activated sludge plant: (a) organic carbon removal by oxidation (substrate respiration); (b) organic carbon removal by assimilation (sludge production); (c) nitrogen removal by denitrification using internal hydrogen donors (H-Donors); (d) nitrogen removal by assimilation (sludge production); (e) phosphorus removal by biological uptake; and (f) phosphorus removal by precipitation, with metal ions. One characteristic feature of the process described is its high sludge production per pound of BOD removal: approximately 0.8 lbs of VSS. Approximately 52% of the nitrogen received in the plant reappears in the sludge wasted. It appears feasible to operate a nitrogen removal process at the comparatively low sewage aeration time of six hours.
W77-08451

RECLAMATION AND USE OF DISTURBED LAND IN THE SOUTHWEST.
For primary bibliographic entry see Field 5G.
W77-08452

AVAILABILITY OF ALUMINUM PHOSPHATE COMPLEXES TO A GREEN ALGA IN VARIOUS CULTURE MEDIA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
J. C. Matheson, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 510, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 119 p, 16 fig, 10 tab, 68 ref, append. OWRT A-075-NC(1). 14-31-0001-4033.

Descriptors: Algae, Assay, *Phosphates, Phosphorus, *Eutrophication, Tertiary treatment, Aluminum, Nutrients, Nutrient removal, *Cycling nutrients, Bioassay, *Chlorophyta, *Waste water treatment.
Identifiers: Algal assay, *Aluminum phosphate, Phosphorus removal, *Selenastrum capricornutum.

The availability of phosphate contained in alum floc as a nutrient for algal growth was assessed in culture conditions that simulated natural waters receiving alum floc overflowing from tertiary wastewater treatment facilities. Potassium salts of phosphate were flocculated with alum and compared in unialgal cultures of Selenastrum capricornutum (Printz) with unflocculated potassium phosphate, a commercially available mixture of variscite and metavariscite (mineral aluminum phosphate), and 'P-free' controls for support of algal biomass. Culture conditions controlled pH within the pH 7-8 range in some media and went higher in others. Media were formulated such that the importance of 'artificial' cultural variables, that is, presence of EDTA and pH buffering systems, and 'real world' variables, that is, thermodynamically determined equilibrium concentrations and flocculation conditions, could be compared relative to one another for their control of

aluminum phosphate complex availability. The algal assay system was a reasonable model of a natural aquatic system with respect to alum-flocculated phosphate availability. Under all culture conditions, alum-flocculated phosphate was largely or entirely available to Selenastrum as a phosphorus source. In tests of the mineral aluminum phosphate mixture, very slow or no growth was observed. This difference in availability probably resulted from more rapid dissolution of phosphate from amorphous 'hydroxo aluminum phosphate' than from the crystalline form, a variable that could possibly be controlled by flocculation conditions and floc aging. (Stewart-NC State)
W77-08496

THE SOLUBILITY OF PARTICULATE PHOSPHORUS IN THE EFFLUENT FROM ALUM TREATMENT OF WASTEWATER AND PHOSPHORUS SOLUTIONS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
B. A. Dempsey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 519, Price codes: A05 in paper copy, A01 in microfiche. M. S. Thesis, May 1975. 67 p, 20 fig, 4 tab, 57 ref. OWRT A-075-NC(2). 14-31-0001-4033.

Descriptors: *Nutrient removal, Cycling nutrients, Phosphorus, Aluminum, Eutrophication, *Tertiary treatment, Algae, Chelation, *Waste water treatment, Solubility.
Identifiers: *Phosphorus removal, *Alum precipitation, Algal growth, Chelating agents, Phosphorus cycling, Alum treatment.

The effluent from alum treated wastewater streams and the decanted supernatant from alum precipitated phosphorus solutions contain a particulate fraction that is made up of aluminum and phosphorus. These naturally suspended complexes were diluted into pH, temperature, and ionic strength controlled receiving waters. In all cases, filterable reactive phosphorus in the receiving water reached a plateau concentration within 24 hours. Diluted effluent from the wastewater stream solubilized less than 10 ug/l filterable reactive phosphorus between pH 6.0 and 7.2. Diluted supernatant from alum-precipitated solutions solubilized greater than 10 ug/l at all pH values. Filterable reactive aluminum concentration was measured in certain experiments, and pKsp's calculated for ALPO4 and AL(OH)3. Effects of other parameters on the solubility of aluminum-phosphorus complexes are reported. (Stewart-NC State)
W77-08500

INVESTIGATION OF COAGULATION - PRECIPITATION AND ULTRAFILTRATION FOR THE REGENERATION OF BRINES IN THE CUCUMBER PICKLE INDUSTRY,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
L. F. Horney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 651, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 50 p, 7 fig, 10 tab, 36 ref. OWRT A-079-NC(1), 14-31-0001-4033.

Descriptors: *Food processing industry, Brine disposal, *Coagulation, *Waste water treatment, Industrial wastes, *North Carolina, Water reuse, *Chemical precipitation.
Identifiers: *Ultrafiltration, Cucumber pickles, Brine regeneration, *Brine reuse, Food processing wastes, Coagulation-precipitation, *Pickle industry.

Brine wastes in the cucumber pickle industry was studied, and regeneration of these wastes for subsequent reuse was considered the most feasible method of treating these wastes. One of the major factors in the reuse of brines is the necessity to remove the softening enzyme, polygalacturonase, syn. pectinase. Two methods of regeneration were studied in detail: (1) chemical coagulation-precipitation with lime and NaOH to pH 11.5 followed by neutralization with acetic acid and (2) ultrafiltration. The former method was tested on 11 different spent brines to determine amounts of chemicals needed and to analyze brine characteristics before and after precipitation. Spent brine and 36-hr brine samples were filtered through a range of ultrafilter pore size in two modes, in series and in parallel, to determine the ultrafilter size necessary for pectinase rejection. PM10 and UM2 gave the best rejection. While both types of treatment remove pectinase activity without affecting the salinity, neither significantly lowered other organic materials as measured by TOC and COD. (Stewart-NC State)
W77-08511

HEALTH CONSIDERATIONS IN USE OF TERTIARY EFFLUENTS,
California Univ., Berkeley. Dept. of Biomedical and Environmental Health Sciences.
For primary bibliographic entry see Field 5F.
W77-08513

STATE OF THE ART IN SEWAGE TREATMENT PLANT CONTROL,
Lund Inst. of Tech. (Sweden).
G. Olsson.
In: Chemical Process Control, Foss, A. S., and Denn, M. M., Editors, AIChE Symposium Series, Vol. 72, No. 159, p 52-77, 1976. 5 fig, 126 ref.

Descriptors: *Reviews, *Waste water treatment, *Treatment facilities, *Automatic controls, Instrumentation, Chemical treatment, Analytical treatment, Monitoring, Computers, Performance, Tertiary treatment, Design criteria, Model studies, Biological treatment, Sludge treatment, Chemical properties, Biological properties, Physical properties, Flow, Biochemical oxygen demand, Dissolved oxygen.

Waste water treatment is a non-profit industry where there is little incentive for designing an optimal cost-effective system. For this reason and because of inherent difficulties in treatment methods, there is a lack of information on the benefits and costs of automatically controlled treatment. Sewage treatment plants are centered on the removal of contaminants which are vastly varied and of such small concentrations that few have measurable levels. This is the major obstacle to designing instrumentation for control purposes. Influent and effluent qualities are measured by BOD, COD, TOC, total phosphorus, nitrogen, suspended solids, trace metals, trace organics, pesticides, and viruses. Selection of relevant information for control and instrumentation is a must, but the lack of dynamic models to determine essential variables places a real limitation on sensors and equipment. Temperature variations from seasonal changes also affect control efforts. The spatial distribution of sedimentation basin concentrates, and the changes in character of biological reactor processes also present control problems. Process design and control system design should be considered in treatment system design; collection systems should be operated so that flow rate or water quality changes can be predicted early and flow to the plant can be controlled. The application of various models for design, flow prediction, and routing were explored, as were current operational practices. Control and monitoring were illustrated through descriptions of the activated sludge process, settler dynamics, dissolved oxygen control, biological systems, water quality systems, phosphorus removal by chemical precipitation, and in-plant computer use. (Collins-FIRL)
W77-08515

CONFIRMATION OF THE SINGLE-STEP MEMBRANE FILTRATION PROCEDURE FOR ESTIMATING PSEUDOMONAS AERUGINOSA DENSITIES IN WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W77-08518

ENTEROVIRUS TYPES IN ISRAEL SEWAGE,
Hadassah Medical School, Jerusalem (Israel).
For primary bibliographic entry see Field 5A.
W77-08519

RAPID AGAR POUR-PLATE TECHNIQUE FOR DETECTION AND ENUMERATION OF FAECAL COLIFORMS IN SEWAGE,
National Environmental Engineering Research Inst., Nagpur (India).
For primary bibliographic entry see Field 5A.
W77-08520

IMPROVED METHOD FOR THE DETERMINATION OF ETHYLENEDIAMINETETRAACETIC ACID IN AQUEOUS ENVIRONMENTAL SAMPLES BY GAS-LIQUID CHROMATOGRAPHY,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5A.
W77-08521

CLAY ADSORPTION TREATMENT OF NON-IONIC SURFACTANTS IN WASTE WATER,
Delware Univ., Newark. Dept. of Civil Engineering.
J. G. Carberry, C. J. Twardowski, and D. K. Eberhart.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 452-459, March, 1977. 11 fig, 4 tab, 11 ref.

Descriptors: *Adsorption, *Clays, *Surfactants, Separation techniques, Physical properties, Chemical properties, Analysis, *Waste water treatment, Evaluation, Particle size.
Identifiers: *Clay adsorption treatment.

Non-ionic surfactant adsorption studies were conducted using clays. Bentonite clays were found to adsorb 10 to 20 times better than activated carbon on a weight basis of surfactant removed per weight of adsorbent. Three clays which were able to remove non-ionics from waste water were Mineral Colloid 103, Accofloc 352, and Bentolite L. Mineral Colloid 103 had the best adsorptive capacity. Higher interaction energies were found for liquid non-ionic surfactants than those predicted for gases. Micelle formation and deposition might account for such large interactions with adsorptive surfaces. Accofloc 352 had the lowest interaction energy and might be the easiest to regenerate. A decrease in adsorptive capacity was found in continous flow studies as compared to determinations from batch isotherm studies. This was partially due to increased bed particle size to allow gravity flow through the column. Mineral Colloid 103 had the largest adsorptive capacity in continuous flow studies. No studies of regeneration of clay surfaces, or economic comparisons of batch treatment or gravity flow through fixed columns were attempted. (Collins-FIRL)
W77-08522

REVERSE OSMOSIS ON SECONDARY SEWAGE EFFLUENT: THE EFFECT OF RECOVERY,
Australian Atomic Energy Research Establishment, Lucas Heights.
R. Wechsler.
Water Research, Vol. 11, No. 4, p 379-385, 1977. 6 fig, 1 tab, 5 ref.

Descriptors: *Reverse osmosis, *Treatment facilities, *Performance, Salinity, Pilot plant, *Sewage treatment, Aeration, Sedimentation, Membrane processes, Chemical oxygen demand, Organic matter, Economics, *Waste water treatment, Australia.

The effects of reverse osmotic recovery on plant performance and product quality was evaluated in a pilot scale municipal waste water reclamation plant in Australia. Raw sewage was comminuted and screened, passed to grit chambers and pre-aeration tanks, moved to primary settling tanks, and passed to a step aeration activated sludge plant where waste sludge was recycled to pre-aeration tanks. The secondary effluent was passed to a canal system. The effluent was passed to the reclamation plant where chemical clarification and reverse osmosis with optional granular carbon polishing took place. The reverse osmosis plant consisted of two macroscopic tubular modules having membranes annealed at 80 and 86 C, respectively. Brine velocity was 120 cubic meters/second under a brine loop pressure of 40 atmospheres, and a temperature of 25 C. Results indicated that the product salt concentration increased as the plant recovery increased. Its organic component concentration did not significantly increase when recovery increased. The flux decline rate did not prohibit recovery if the crystallization of hardness causing substances was prevented. Lime clarification was recommended if recovery was to be reasonably economical. Cleaning by depressurization and sweet water flushing, daily, maintained membrane productivity at 90% of maximum. Cleaning was not affected by plant recovery. It was concluded that the salt concentration tolerated by the product, and not the rate of flux decline or organic matter concentration, limited recovery. Because of the cost of prior treatment steps, it was suggested that reverse osmosis be operated at maximum daily recovery. (Collins-FIRL)
W77-08523

TREATMENT OF HIGH STRENGTH ACIDIC WASTE WATER WITH A COMPLETELY MIXED ANAEROBIC FILTER,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
E. S. K. Chian, and F. B. DeWalle.
Water Research, Vol. 11, No. 3, p 295-304, 1977. 10 fig, 1 tab, 23 ref. EPA 68-03-0162.

Descriptors: *Filtration, *Anaerobic conditions, *Biological treatment, *Alkalinity, Sludge treatment, *Waste water treatment, Filters, Chemical oxygen demand, Suspended solids, Organic matter, Hydrogen ion concentration, Heavy metals, *Filters.
Identifiers: *Mixed anaerobic filters.

High strength acidic waste water was treated with a completely mixed anerobic filter. The waste water was a leachate typical of that in solid waste landfills, containing free volatile fatty acids and complex high molecular weight carbohydrate-like organics. Treatment by the mixed anaerobic filter was successful, and eliminated the costs of buffer solutions needed with plug flow anaerobic filters. Heavy metal toxicity was counteracted by adding sulfides. The system's response to increased organic loading and shockloads was quite good. A hydraulic detention time above 7 days produced high percentages of organic matter removal. Methane gas leaving the unit indicated a low bacterial solids manufacture, accounting for 93% of the COD removed. About 0.12 grams of volatile suspended solids were removed for each gram of COD removed. No nutrient additions were required because of the low solids production and initial anaerobic sludge seeding. (Collins-FIRL)
W77-08524

OXYGEN AERATION AT NEWTON CREEK,
New York State Dept. of Water Resources, New York.
N. Nash, P. J. Krasnoff, W. B. Pressman, and R. C. Brenner.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 388-400, March, 1977. 4 fig, 6 tab. EPA Project 11010 GEV.

Descriptors: *Aeration, *Oxygen, Activated sludge, Treatment facilities, Performance, Sewage effluents, Biochemical oxygen demand, Suspended solids, Microorganisms, Sludge treatment, *Waste water treatment, New York.
Identifiers: *Newton Creek(NY).

Plant-scale tests have indicated that pure oxygen substituted for process air can upgrade overloaded activated sludge plants. This method was further examined at the Newton Creek, New York, modified aeration plant. Over the three-year test period, effluent quality averaged 19 milligrams/liter of both BOD and total suspended solids, at flow rates of 38,200-134,000 cubic meters/day. The equivalent removal efficiencies were 89% for BOD and 86% for suspended solids. Effluent quality was slightly poorer during warm weather, non-filamentous periods, although overall efficiency was slightly greater at those times. During four cold weather periods when fungal organisms proliferated the effluent quality dropped. The predominant fungus that caused recurrent difficulties in winter was identified as Geotrichum. The concentration of filamentous organisms in the system affected process efficiency in a proportional manner. Oxygen consumption averaged 1.0 grams/gram of BOD removed at, or above, design flow rates. At these levels, the power requirement averaged 0.95 kilowatt-hours per kilogram of BOD removed. During filamentous periods, solids production averaged 1.27 grams/gram of removed BOD, and 0.93 grams during nonfilamentous periods. (Collins-FIRL)
W77-08526

AEROBIC DIGESTION OF WASTE ACTIVATED SLUDGE AT LOW TEMPERATURES,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
D. A. Koers, and D. S. Mavinic.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 460-468, March, 1977. 8 fig, 12 ref.

Descriptors: *Sludge digestion, *Aerobic conditions, Temperature, Activated sludge, *Waste water treatment, Sludge treatment, Treatment facilities, Biological treatment, Microorganisms, Biochemical oxygen demand, Oxygen, Hydrogen ion concentration, Chemical properties, Physical properties.
Identifiers: *Aerobic digestion.

A study was conducted on the design and operating criteria of aerobic digestion systems handling activated sludge under cold climate conditions. Comparative data were generated for operation at various low temperatures. A field evaluation of laboratory results was the final part of the study. Study temperatures were 20, 10 and 6 C. Results indicated little difference between continuous and semi-continuous digester operations. The major exception was a volatile suspended solids (VSS) reduction at 5 C with the semi-continuous digester method. There was a good correlation between the product of sludge age and temperature and VSS reduction at 5-20 C. There is little VSS reduction after this product exceeds 250. At low temperatures, a 50-day sludge age results in the maximum VSS reduction of nearly 30%; 5 C is the lowest average monthly digester temperature. Full-scale operations were too variable for steady-state conditions to be established. Mixed liquor BOD was thought to be a promising parameter for measuring digested sludge stability during storage when odor is used as a criterion for stability. Sludge with a BOD5 of less than 9.29 grams/gram of VSS was odor-free after storage at 20 C. Stabilization was achieved at a sludge age of 40 days at 20 C, and at 60 days at 10 C, but not even 80 days achieved sludge stability at 5 C. Cell mass characteristics, measured by TOC, COD, organic nitrogen, and volatile content, was extremely constant for all systems. Biodegradability seemed to decrease with increased sludge age. The basic composition of the sludge cells did not appear to change during aerobic digestion. (Collins-FIRL)
W77-08527

DEWATERING: A NEW METHOD BOWS,
Ecodyne Corp., Kans. Smith and Loveless Div.
J. A. Bell, R. Higgins, and D. G. Mason.
Water and Wastes Engineering, Vol. 14, No. 4, p 33-34, 39-41, April, 1977. 5 fig, 10 tab, 2 ref.

Descriptors: *Dewatering, *Filtration, *Sludge treatment, Equipment, Polyelectrolytes, Performance, Evaluation, Treatment facilities, Polymers, Chemical treatment, Sedimentation, Tertiary treatment, *Waste water treatment.
Identifiers: Gravity pressure filtration, Aerobic digestion.

A gravity-pressure filtration system, or sludge concentrator, has been developed to dewater sludges from various treatment processes and, especially, to take advantage of polyelectrolyte-conditioned sludge characteristics. The concentrator is provided with a sludge feed pump, a polymer system, a sludge conditioning system, and a two-stage dewatering unit. A combination flashmixer-flocculator provides optimum mixing of the diluted polymer and sludge to form large particles prior to gravity dewatering. In the pressure stage, three sets of compression rollers squeeze out more liquid and the dewatered sludge is discharged for final disposal. Sludge volume can be reduced as much as 80%. Models are provided which can process up to 1600 dry pounds of sludge/million gallons in a 40 hour week. Comparisons with vacuum filtration indicated that a 250-square foot vacuum filter would be needed to dewater the same amount of sludge as the larger concentrator model. The vacuum filter does use less polymer material, but this is offset in the concentrator by lower energy requirements. Operating costs are lower with gravity-pressure filtration. Two treatment plants operated at different flows were used for sludge evaluation. In one, a secondary treatment facility, effluent could be discharged or diverted to tertiary treatment with combined flash-mixing, flocculation, clarification and thickening of chemically treated waste. Raw sewage was used in this facility. Secondary effluent was used instead of raw sewage in the same scheme for the second facility. Settling was aided by the addition of anionic polymers. Sludge from biological treatment was evaluated for its dewaterability. In both facilities, effluent quality met acceptable levels for the processes employed. (Collins-FIRL)
W77-08528

ENZYMATIC TREATMENT OF PRIMARY MUNICIPAL SLUDGE WITH TRICHODERMA VIRIDE CELLULASE,
State Univ. of New York at Buffalo. Dept. of Chemical Engineering.
G. V. Cinq-Mars, and J. Howell.
Biotechnology and Bioengineering, Vol. 19, No. 3, p 377-385, March, 1977. 3 fig, 3 tab, 9 ref.

Descriptors: *Sludge treatment, *Biological treatment, Physical properties, Chemical properties, Municipal wastes, *Waste water treatment, Hydrolysis, Sludge digestion, Chemical degradation, Enzymes.
Identifiers: *Trichoderma viride, *Enzymatic treatment.

Experiments were conducted to determine the feasibility of sludge pretreatment before digestion with cellulase in order to reduce cellulose content and viscosity. Pretreatment was either by sterilization at 120 C for 30 minutes, followed by adding 100 ppm merthiolate and homogenizing for 2 minutes, or by heat pasteurization to 95 C and cooling to 50 C. Hydrolytic experiments produced

the following results. Up to 75% of the cellulose was converted, mostly to cellobiose, in 24 hours. Raw primary sludge was changed from a gel-like consistency to a slurry of fine particles amenable to ultrafiltration. Possible rate limiting steps in the conversion of cellulose to methane by anaerobic digestion could be reduced by converting cellulase to soluble reducing sugars before digestion; by making reducing sugars available to allow an increased generation of microbial populations; and by a faster transfer of dissolved products from liquid to gas phase. An economical, self-supporting treatment system might be possible with the use of process filtrate for cellulase, single-cell protein, or alcohol production. (Collins-FIRL)
W77-08529

AEROBIC DIGESTION OF SLUDGES PRECIPITATED FROM WASTE WATER BY LIME ADDITION,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
M. F. Hamoda, and J. Ganczarczyk.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 375-387, March, 1977. 4 fig, 7 tab, 12 ref.

Descriptors: *Aerobic treatment, *Sludge digestion, *Lime, Physical properties, Chemical properties, Treatment facilities, Biological treatment, Evaluation, *Waste water treatment, *Chemical precipitation.
Identifiers: *Aerobic digestion, Chemical treatment.

Laboratory batch and semi-continuous aerobic digestion experiments were performed to examine the behavior of lime-primary sludges precipitated with various lime dosages over an operational pH range. Sludge samples were obtained from a Toronto treatment plant. Results indicated that aerobic digestion of lime-primary sludges was technically feasible, though high lime doses adversely affected digestion process kinetics. The buffering capacity of the digestion system was good. Total alkalinity of the lime-primary sludge did not decrease because of aerobic digestion. However, the primary sludge decreased in alkalinity as aeration time increased. Nitrification was adversely affected in digesters treating lime-primary sludges when lime doses were high. Primary sludges as well as lime-primary sludges bound soluble phosphorus and soluble organic carbon during digestion and released these components during storage. Settling and filtration qualities of the aerobically digested lime-primary sludges were good. Semi-continuous digesters produced sludges with higher oxygen uptake rates, better dewaterability, and higher supernatant quality than those of batch systems. The pollutant content of sludges from semi-continuous systems should not cause serious loading problems if the supernatants are recycled or discharged by treatment plants. A sizable population of stalked ciliates and rotifers was maintained in digesters treating lime-primary sludges. Stabilization of lime-primary sludges requires a 15-day detention period at 20 C, especially if they have initial pH values of 10-12. (Collins-FIRL)
W77-08530

PHYSICOCHEMICAL TREATMENT OF AN AUSTRALIAN MUNICIPAL WASTE WATER,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Technology.
S. Y. Ip, L. O. Kolarik, N. H. Pilkington, W. G. C. Raper, and E. A. Swinton.
Water Research, Vol. 11, No. 2, p 173-180, 1977. 9 fig, 5 tab, 4 ref.

Descriptors: *Australia, *Pilot plants, *Ion exchange, *Resins, Coagulation, Sedimentation, Ammonia, Lime, Infiltration, Activated carbon, Filtration, Water purification, *Waste water treatment, *Treatment facilities, Desalination, Hydrogen ion concentration.
Identifiers: Physicochemical treatment.

A pilot study was conducted to investigate physicochemical treatment (PCT) of waste water; to investigate integration of the 'Sirotherm' partial desalination process; and to test laboratory studies on applying magnetic ion-exchange resins to water purification. The plant uses lime coagulation at pH 11.5 with solids removal by flotation or sedimentation; ammonia stripping; neutralization to pH 10 by carbon dioxide; coagulation of precipitated calcium carbonate by ferric salts; clarification and sand-filtration; surfactant removal by foaming; water neutralization to pH 7; and granular activated carbon treatment. The plant produced a high-quality water from a constant flow of primary settled waste water. Operation was simple and practical. Lime scum flotation was effective with normal flows, but not when the flow was diluted with wet weather infiltration. Sedimentation was considered more reliable. Winter conditions did not substantially affect ammonia stripping, but packing scaling occurred. Granular carbon treatment was effective. Raw sewage treatment was not attempted; nor was operation in a total disposal mode or testing with varying flow rates. A buffer capacity between lime treatment and other stages was suggested. (Collins-FIRL)
W77-08531

BIOLOGICAL TREATMENT KINETICS OF LANDFILL LEACHATE,
Texas Univ. at Arlington. Dept. of Civil Engineering.
T. Palit, and S. R. Qasim.
Journal of the Environmental Engineering Division-ASCE, Vol 103, No EE2, p 353-366, April, 1977. 8 fig, 4 tab, 3 append.

Descriptors: *Leachate, *Landfills, *Kinetics, *Biological treatment, Activated sludge, Nutrients, Sewage treatment, Phosphorus, Sewers, Treatment facilities, *Waste water treatment.

Results are presented of biological treatment studies with landfill leachate. Biological kinetic coefficients were determined for landfill leachate with mean cell residence time as the only variable. Comparisons were made with those of the sanitary sewage. Results indicated that landfill leachate could be treated in an activated sludge plant. Sludge bulking occurred several times during experimentation and could be a serious problem. Additional nutrients may be necessaary to enhance plant performance since leachate contained low concentrations of prime nutrients. Combined leachate and sewage treatment may be beneficial, but further research is needed to determine the optimum mixing ratio. Conventional activated sludge with added phosphorus is an adequate treatment in areas where domestic sewers are not available. (Collins-FIRL)
W77-08532

PROGRESS IN MHI'S INTEGRATED TECHNIQUES FOR ENVIRONMENTAL PROTECTION,
Mitsubishi Heavy-Industries Ltd., Tokyo (Japan). Environmental Technology Dept.
K. Matsumoto.
Technical Review, Vol 13, No 3, Ser. 37, p 173-191, October, 1976. 15 fig, 9 tab.

Descriptors: *Water pollution sources, *Air pollution sources, *Pollution abatement, *Environmental control, Treatment facilities, Water reuse, Sludge treatment, Sludge disposal, Organic matter, Drying, Incineration, Oil wastes, Biological treatment, Denitrification, Filtration, Solid wastes, Liquid wastes, Analytical techniques, Water quality control, Gases, *Waste water treatment.

Results of recent advancements in water and air pollution control technology developed by Mitsubishi Heavy Industries, Limited, are presented. Water pollution control developments included treatment techniques for potable water, industrial water, sewage, night soil, and industrial wastes. Sludge concentrating devices, vacuum filter, centrifugal, and filter press dehydrators, and incinerators were discussed and described, as well as various water reuse schemes. New techniques have been developed to forecast effluent dispersion for preventing water pollution. Denitrification and trickling filter development were discussed with advances in solid wastes treatment. In addition, air pollution control, detection, and abatement were reviewed. (Collins-FIRL)
W77-08533

THE SANITARY LANDFILL LEACHATE CONTROL PLANT IN KOBE.
Technical Review, Vol 13, No 3, Ser. 37, p 273-274, October, 1976. 2 fig, 1 tab.

Descriptors: *Leachate, *Landfills, *Treatment facilities, *Waste water treatment, Water quality control, Soil contamination, Design criteria, Sanitary engineering, Biological treatment, Chemical treatment.
Identifiers: *Kobe(Japan).

A leachate control plant was constructed in Kobe, Japan, to treat leachate containing high amounts of BOD, COD, suspended solids, ammonia, and colored matter. The plant employs a storage dam to create a uniform quality and quantity of leachate for treatment; trickling filter towers for organic matter removal and ammonia nitrogen oxidation; sedimentation and flocculation-sedimentation facilities; denitrification columns; activated carbon adsorption columns; and dewatering processes. Special design considerations include a trickling filter process to avoid difficulties in the biological treatment of long-term landfill leachate, a biological filter process for denitrification which has few operational problems and low maintenance needs, and combined biological and physical-chemical treatment to adjust water quality for economical operation at optimum conditions. (Collins-FIRL)
W77-08534

CHARACTERIZING SLUDGE FOR CENTRIFUGAL DEWATERING,
Duke Univ., Durham, N. C. Dept. of Civil Engineering.
P. A. Vesilind.
Filtration and Separation, Vol 14, No 2, p 115-116, 118, 120, March/April, 1977. 5 fig, 3 ref.

Descriptors: *Dewatering, *Centrifugation, *Sludge treatment, Solid wastes, Equipment, Physical properties, Chemical properties, Waste treatment, *Waste water treatment, Design criteria.

The design of sludge dewatering equipment must depend upon characteristics of the sludge to be treated. Sludge characteristics were described which would enable engineers to specify conditions for the guaranteed performance of the equipment. A procedure was outlined for the measurement of settling properties under high centrifugal forces. Batch settling tests could be performed at high gravitational forces using a desktop centrifuge and a strobe light. Sludge-filled tubes are spun horizontally and the strobe is synchronized with the centrifuge so the height of the slurry-liquid interface can be observed. Settling of the uppermost particle in the slurry can be followed and its velocity calculated. This velocity measurement has the disadvantage of being dependent upon the force imposed, which can be eliminated by using a 'settling coefficient' concept. Other characteristics which indicate the ability of the sludge to be centrifuged include the clarity of the centrate and the ability of the sludge to be moved by the screw conveyor. (Collins-FIRL)
W77-08535

OZONE AND CHLORINE IN WASTE WATER DISINFECTION,
Okayama Univ. (Japan). Dept. of Civil Engineering.
O. Kawara.
Memoirs of the School of Engineering, Okayama University, Vol 11, No 2, p 37-49, January, 1977. 20 fig, 3 tab, 4 ref.

Descriptors: *Disinfection, *Chlorine, *Ozone, Oxidation, Aerobic bacteria, Toxicity, Suspended solids, Sewage effluents, *Chlorination, Biodegradation, *Waste water treatment.

The disinfection efficiency, oxidation power, and effects of ozone- or chlorine-treated secondary effluents on aerobic microorganisms were compared in ozone and chlorine waste water treatment. Disinfection of coliforms required a smaller dosage of chlorine than ozone, but chlorine could not sterilize them as completely, even at high doses, or as quickly, as ozone. Ozone should be used where both disinfection and organic compound removal are desired. Suspended solids are well-decomposed, as are the higher molecular compounds. Chlorine has little effect on these substances. Certain compounds which are conducive to aerobic bacterial growth are easily decomposed by ozone, but not by chlorine. Microbial growth rates were lowest in the control, and increasingly greater in ozone-treated effluents, chlorine-treated effluents, and secondary effluents. Ozonation increased biodegradability and chlorination decreased it. It was concluded that chlorination is an effective process when effluents do not contain high amounts of suspended solids and their removal is not the major desired result. (Collins-FIRL)
W77-08536

UNSTRATIFIED-BED FILTRATION OF WASTE WATER,
Iowa Natural Resources Council, Des Moines.
M. F. Dehab, and J. C. Young.
Journal of the Environmental Engineering Division-ASCE, Vol. 103, No. EE1, p 21-36, February, 1977. 11 fig, 4 tab, 2 append. EPA Project 17030 DKG.

Descriptors: *Filters, *Suspended solids, *Performance, *Filtration, Air, Flocculation, Design, Water purification, Analysis, Physical properties, Separation techniques, *Waste water treatment.
Identifiers: *Unstratified-bed filtration, Backwash characteristics.

An investigation was conducted to determine the suspended solids removal and backwash characteristics of single-medium unstratified-bed filters and to determine the effect of media grain size and type on performance and backwash characteristics. Comparisons were made with dual-media filters. It was found that the unstratified-bed filters with the same effective size medium used as in the top layer of dual-media filters would provide the same effluent quality and run length as the dual-media filters. Use of these filters with combined air-water wash allows a larger filter medium size than that of dual or multimedia filters. In-depth filtration is improved with larger sized filter mediums, and solids capture capacity is increased, as is the run length. Suspended solids removal is not significantly reduced by increasing media size from 1 millimeter to 2 millimeters at filtration rates of 5-10 meters/hour. Filter bed depths above 914 millimeters produce no effective increase in effluent quality with filter mediums of an effective size of 1.3-1.5 millimeters. Backwash rates for effective cleaning of these filters are less than what is needed to fluidize the medium. Solids removal from the filter during backwash using air and water required nearly 4 cubic meters of water per square meter of filter area for backwash rates of 18.75-37.5 meters/hour. Combined air and water treatment during backwash improved the washout of large flocculated solids from the space above the filter bed, and eliminated mudball formation. Media loss during this last operation is significant unless appropriate design and operating control measures are used. (Collins-FIRL)
W77-08537

CHLOROBIPHENYLS AND PCB'S: FORMATION DURING CHLORINATION,
Georgia State Univ., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-08538

IMPROVED GALVANIC DISSOLVED OXYGEN SENSOR FOR ACTIVATED SLUDGE,
Fischer and Porter Co., Warminster, Pa.
For primary bibliographic entry see Field 5A.
W77-08539

EFFECTS OF HIGH ORGANIC LOADING ON MIXED PHOTOSYNTHETIC WASTE WATER TREATMENT,
Cape Town Univ. (South Africa). Dept. of Chemical Engineering.
S. Miller, A. Abeliovich, and G. Belfort.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 436-440, March, 1977. 2 fig, 4 tab, 14 ref.

Descriptors: *Organic loading, *Organic matter, Loads(Forces), *Photosynthesis, Dissolved oxygen, Bacteria, Temperature, Hydrogen ion concentration, Detergents, Biodegradation, Municipal wastes, Hospitals, Algae, Oxidation lagoons, Aerobic conditions, Biochemical oxygen demand, Carbon, Suspended solids, Nitrogen, Water purification, *Waste water treatment.
Identifiers: Hospital wastes.

Hospital and domestic sludge was studied to determine the effect of high organic loading on mixed photosynthetic waste water treatment. The major inhibitors in hospital effluents on algal growth in treatment ponds are most likely to be detergents, solvents, and antibiotics. Tests were run to establish whether the greater carbon supplies and lower pH variation resulting from using sludge outweighed the disadvantage of decreased light penetration. Temperature, pH, dissolved oxygen, photosynthesis, and respiration rates were recorded daily. Results showed the more alkaline hospital sludge to have a lower buffering capacity than domestic sludge. Little pH variation was found in the mixed photosynthetic system. There was evidence that appreciable algae growth was possible with hospital effluents after the bacteria had adapted to environmental conditions. Respiration rates decreased continuously in reactors with sludge added. Dissolved oxygen proved a good indicator of the state of the system. Oxygen levels were high at high pH where carbon limitation might be evident. Sludge biodegradation, usually anaerobic, results in significant carbon losses in the form of CH4 and CO2. The tests showed that a greater algal yield without impairment of water quality can be expected in photosynthetic system with high organic loading. (Collins-FIRL)
W77-08540

WHAT LIES AHEAD FOR PAC,
Culp, Wesner, El Dorado Hills, Calif.
G. L. Culp, and A. J. Shuckrow.
Water and Wastes Engineering, Vol. 14, No. 2, p 67-72, 74, February, 1977.

Descriptors: *Activated carbon, Costs, *Cost comparisons, Municipal wastes, *Waste water treatment, Polymers, Dewatering, Organic matter, Hydrogen sulfide, Activated sludge, Physical properties, Chemical properties.
Identifiers: Granular activated carbon, *Powdered activated carbon.

The development and use of powdered activated carbon were discussed. Granular activated carbon has found wider use because efficient regeneration systems for powdered activated carbon are lacking. Several advantages of the powdered carbon are: a significantly lower price; more rapid equilibration with soluble waste water organics; less capital investment; easily changed dosages; less head loss; and easy avoidance of hydrogen sulfide formation problems. Cost estimates of various treatment systems indicated that independent physical-chemical (IPC) systems, with either granular or powdered carbon, were not cost competitive with conventional activated sludge for BOD removal in municipal use when only secondary treatment was necessary. Granular carbon IPC systems were cost comparable to activated sludge followed by coagulation and filtration at carbon doses of 1500 pounds/million gallons. It was slightly less expensive at doses of 750 pounds/million gallons. Powdered carbon was not cost competitive with granular carbon. It has higher capital and labor costs, higher fuel requirements, and requires polymer conditioning for dewatering. Determining the minimum carbon dosages compatible with single clarifier-combined sludge handling systems would yield economically favorable results. (Collins-FIRL)
W77-08541

CONSTRUCTION AND MAINTENANCE COSTS OF SEWER SYSTEMS (BAU- UND BETRIEBSKOSTEN VON KANALISATIONSANLAGEN),
For primary bibliographic entry see Field 8A.
W77-08542

APPLICATION OF CORRUGATED SHEET SPRAYERS FOR WATER PURIFICATION (DIE ANWENDUNG VON WELLBAHNRIESLERN IN DER WASSERAUFBEREITUNG),
For primary bibliographic entry see Field 5F.
W77-08543

DEWATERING MACHINES (ENTWASSERUNGSMACHINEN),
K. C. Shin.
Wasser, Luft und Betrieb, Vol 21, No 3, p 137-141, 1977. 8 fig, 3 tab, 3 ref.

Descriptors: *Dewatering, *Equipment, *Sludge treatment, Filters, Centrifugation, Filtration, Separation, Treatment facilities, Performance, *Waste water treatment.

The principal types of waste water sludge dewatering equipment used currently and their general characteristics are described. Centrifuges, belt filters, and chamber filter presses represent the most common means for dewatering sludge. Centrifuges can be used for any size waste water treatment plant because they are available for a wide range of throughput capacities. Chamber filter presses, which have separating efficiencies, are especially suitable for use in large-capacity waste water treatment facilities. Belt filters are used for treatment plants of small to medium capacity. S type filter belt presses can reach separation efficiencies as high as 99%. (Takacs-FIRL)
W77-08544

USE OF OXYGEN IN ACTIVATED SLUDGE PLANTS (UTILIZZAZIONE DELL'OSSIGENO ALLO STATO PURO NEGLI IMPIANTI A FANGHI ATTIVI),
Florence Univ. (Italy). Facolta di Ingegneria.
L. Masotti.
Inquinamento, Vol 19, No 1, p 64-72, January, 1977. 6 fig, 1 tab, 16 ref.

Descriptors: *Oxygenation, *Activated sludge, *Adsorption, *Cryogenics, Dissolved oxygen, Treatment facilities, Temperature, Aeration, Nitrogen, Air, Automation, Maintenance, Water purification, *Waste water treatment.
Identifiers: Pure oxygen activated sludge treatment, Liquid oxygen.

Pure oxygen activated sludge treatment processes are replacing aerated systems because of the latter's weaknesses in transferring oxygen from the atmosphere to the liquid medium. In a pure oxygen system, the oxygen is infused in concentrated form into the liquid. As a result, the quantity of transferred oxygen is 6.4 times greater than in aerated system. Large quantities of dissolved oxygen (6-8 mg/liter) can be present in the activated sludge without significantly affecting the oxygen transfer yield; in an aerated system, the maximum quantity of dissolved oxygen is 2-3 mg/liter. A pure oxygen system can achieve a 90-95% utilization of the dissolved oxygen compared to 5-6% in an aerated system. The success of a pure oxygen activated sludge system is based on its capacity to produce oxygen. There are two oxygen production processes, the classic cryogenic process and the molecular sieve adsorption process. The former uses the distilled fraction of air, thus producing liquid oxygen and nitrogen at very low temperatures. While the yield of almost pure oxygen is excellent, the process is complex and only used in large purification plants. The molecular sieve adsorption process is simple, completely automatic, and requires minimal maintenance. Air is pressurized through a sieve containing a granular substance which adsorbs carbon dioxide, nitrogen and water, and lets the residual gas, very rich in oxygen (90%), pass through. The process operates at room temperature and at a fairly low pressure. (Waltner-FIRL)
W77-08545

DETERMINATION OF BOD AFTER FREEZING WATER SAMPLES (BESTIMMUNG DES BSB NACH EINFRIERUNG DER WASSERPROBEN),
For primary bibliographic entry see Field 5A.
W77-08546

AN ESTIMATION OF THE EFFICIENCY OF A WASTE WATER TREATMENT PLANT, AS MEASURED BY SEVERAL PARAMETERS INCLUDING LIPID BIODEGRADATION (ESSAI D'EVALUATION DE L'EFFICACITE D'UNE STATION D'EPURATION A L'AIDE DE PLUSIEURS PARAMETRES DONT LA BIODEGRADATION DES LIPIDES),
Lyon Univ. (France). Toxicology Lab.
P. Chambon, M. Pierson, E. Pattee, J. Vial, and R. Chambon-Mougenot.
La Tribune du Cebedeau, Vol 30, No 398, p 2-7, January, 1977. 2 fig, 2 tab, 7 ref.

Descriptors: *Treatment facilities, *Evaluation, *Performance, *Biological treatment, *Lipids, Analysis, Biochemical oxygen demand, Chemical oxygen demand, Detergents, Biodegradation, *Waste water treatment.

Lipids, BOD, COD, detergents, and CH2 content in inflow and outflow were used to estimate the waste water treatment efficiency of a biological discs system. C12 and C18 were dominant compounds revealed by the analysis of the lipidic fraction. These compounds were eliminated to a considerable extent. It was found that the biodegradability of a chemical class is best appreciated when specific parameters are chosen. The time of sampling is more important at the inflow than at the outflow of a plant because mean values are always recorded at the outflow. (Collins-FIRL)
W77-08548

POLYETHYLENE SEWER FORCE MAIN TAKES VARYING PRESSURES.
For primary bibliographic entry see Field 8G.
W77-08549

SEWAGE PUMPING STATION BUILT TO HANDLE FUTURE SYSTEM DEMANDS,
Topeka Water Pollution Control Dept. Kans.
For primary bibliographic entry see Field 8C.
W77-08550

THE PROTECTION AND REPAIR OF UNDERGROUND PIPELINES FOR WATER AND SEWAGE,
For primary bibliographic entry see Field 8G.
W77-08551

POST-TENSIONED SEWER RIVER CROSSING.
For primary bibliographic entry see Field 8E.
W77-08552

PLAIN-END PIPE 'COLLARS' PROBLEM SEWER CONNECTIONS,
For primary bibliographic entry see Field 8G.
W77-08553

IDEAS APLENTY-BUT STILL SEWERS FACE CASH NEGLECT.
For primary bibliographic entry see Field 8G.
W77-08554

SEABED SEWERS FOR HONG KONG,
Watson (J. D. and D. M.) (Hong Kong).
For primary bibliographic entry see Field 5E.
W77-08555

CONCRETE BUCKET DISTRIBUTES CRUSHED BEDDING EVENLY ON SEWER JOB.
For primary bibliographic entry see Field 8F.
W77-08556

AEROBIC TREATMENT OF LIQUID WASTES--WITH OXYGEN CONCENTRATION MEASURED AND USED TO CONTROL PUMP SPEED USED TO FORCE LIQUID THROUGH VENTURIS.
Netherlands Patent NL 7608-692. Issued February 8, 1977. Derwent Netherlands Patents Abstracts, Vol. Y, No. 8, p D7, April 1, 1977.

Descriptors: *Patents, *Aerobic treatment, *Oxygen, *Pumps, Liquid wastes, Reservoirs, Dissolved oxygen, Sewage effluents, Sedimentation, Equipment, Industrial wastes, Performance, *Waste water treatment.

A patent was issued for an aerobic treatment process for liquid wastes. The waste flows through a reservoir and a portion is removed and reinjected, with added air, into the reservoir. This creates a horizontal aerated liquid flow. A device, sensitive to the liquid oxygen concentration, controls the speed of the pump which forces the liquid through the ejectors to maintain a determined dissolved oxygen level. Liquid from the reservoir flows out and up through tube settlers above the level of the ejectors. The process may be applied to sanitary and industrial waste liquids. Power needs are lowered and a maximum efficiency is obtained. (Collins-FIRL)
W77-08557

MECHANICAL SURFACE AERATOR FOR EFFLUENT PURIFICATION--HAS THE LIQUID SCOOPED BY THE CURVED ELEMENTS AND EJECTED INTO THE AIR ABOVE,
P. N. Chumachenko, G. I. Papkov, and V. F. Kostenko.
Soviet Patent SU 508-485. Issued August 6, 1976. Soviet Inventions Illustrated, Vol. Y, No. 9, p D3-D4, April 12, 1977. 1 fig.

Descriptors: *Patents, *Aeration, *Equipment, Water purification, Performance, Domestic wastes, Industrial wastes, Oxygen, Liquid wastes, *Waste water treatment.

A patent was issued for an aerator to be used in the biochemical purification of water. The device consists of a vertical shaft with curved elements mounted at angles to each other, and a mechanical drive. Inlets and outlets are placed about the rotational direction of the shaft. Rotation of the elements occurs as the liquid passes through. The liquid is then ejected into the air above the liquid level for aeration. This saturates the liquid with oxygen; additional mixing and aeration take place on the side plane of the curved element. Aeration effectiveness is very independent of level variations in the aeration tank. (Collins-FIRL)
W77-08558

BREAKING DOWN SOLID AND LIQUID WASTE TO FORM A FERTILIZER--BY INOCULATION WITH SELECTED FUNGI AND FERMENTATION.
For primary bibliographic entry see Field 5E.
W77-08559

SLUDGE COLLECTOR AND LIGHT LIQUID, SEPARATOR--FROM SEWAGE WITH TWO TANKS IN SINGLE HOUSING AND COVER.
French Patent FR 2309-677. Issued December 31, 1976. Derwent French Patents Abstracts, Vol Y, No 9, p D9, April, 1977.

Descriptors: *Patents, *Sludge treatment, *Liquid wastes, *Equipment, Oil wastes, Pumps, Sewage effluents, Water reuse, *Separation techniques, *Waste water treatment.

A patent was issued for a process to collect sludge and to separate settled materials from light liquids. The apparatus is installed in a common covered housing. Contaminated water enters the inlet and settled material is placed in the collector as the liquid moves over the overflow and under a partition into the separator. Light materials float upwards and water passes under the partition. A pump evacuates buildups of separated matter. Light liquids are removed through one pipe and sludge through another. Water is recycled for jet injection to break up the floating light materials; the collector and separator are washed by water. Separated materials can be removed by a pump as needed. (Collins-FIRL)
W77-08560

CLEANING OF SEWAGE SLUDGE SYSTEM.
Australian Patent 480,414. Issued February 17, 1977. Australian Official Journal of Patents, Trade Marks, and Designs, Vol 47, No 5, p 387, February, 1977.

Descriptors: *Patents, *Sludge treatment, *Cleaning, Pumps, Piping, Separation, Oxidation, Heat exchangers, *Waste water treatment, Equipment, *Sewage sludge.

A patent was issued for a sludge system cleaning process. The process involves a high pressure pump connected to a sludge source, and piping from the pump to a heat exchanger, a reactor, a separator, and an oxidized sludge tank. A cold water source separated from the sludge source has a separate pipe leading to the pump. The sludge line to the pump is closed and the cold water line is opened. The cold water is directed through the heat exchanger, by-passing the reactor, to isolate the hot reactor contents from the system. Afterwards, the cold water line is closed, the sludge line is opened, and the reactor is returned to the system. Sludge blockage is removed by cold water flowing through the heat exchanger in the reverse direction of sludge flow during normal operation. The blocking material is flushed through a previously closed drain line. (Collins-FIRL)
W77-08561

SCREENING APPARATUS FOR REMOVAL OF SOLIDS--FROM SEWAGE WITH ROTATING SCREEN AND VERTICAL LIFT FOR RESIDUES.
French Patent FR 2308-599. Issued December 24, 1976. Derwent French Patents Abstracts, Vol Y, No 8, p D5, April, 1977.

Descriptors: *Patents, *Separation techniques, *Solid wastes, *Filtration, Equipment, Sewage effluents, Mechanical engineering, Sewage treatment, *Waste water treatment, Waste treatment.

A patent was issued for a screening apparatus to remove solids from sewage. Sewage flows through a cylindrical screen with a vertical axis and solids are retained on the external face, separating them from the flow. The screen is either fixed or rotated by motor. A second screen, of vertical rods, is located to the side of the first one. The rods extend above the level of flow and a hydraulic ram moves a lifting plate up and down. This plate colleects solids which remained on the second screen and pushes them into a compression chamber. The first screen has scraper and the process is continuous. (Collins-FIRL)
W77-08562

BOC BLOWS BUBBLES IN DIRTY BATH WATER,
B. Appleton.
New Civil Engineer, No 229, p 19, February, 1977.

Descriptors: *Sewers, *Oxygen, *Sewage effluents, *Biological treatment, Biochemical oxygen demand, Capital costs, Oxygenation, Sedimentation, Suspended solids, Temperature, Flocculation, Performance, Filters, *Waste water treatment, Injection.
Identifiers: Effluent quality control.

The British Oxygen Company (BOC) and the Wessex Water Authority have developed an oxygen injection system for sewers which improves final effluent quality by 30-60%. Previously used for hydrogen sulfide control, oxygen injection in this application can reduce capital expenditures. Microbial activity is induced in the final sewer section to reduce BOD of raw sewage. Biological treatment is enhanced as is the settleability of the oxygenated sewage. An injection rate of 45 kilograms/hour produced a small residual dissolved oxygen concentration at the delivery end of the main and improved the final effluent to 21 milligrams/liter of suspended solids and 19 milligrams/liter of BOD. Flocculation is improved, and filter performance is greatly enhanced by the reduced biological loading. Pump efficiencies, however, were decreased by an average of 8% because of a delay in reaching steady-state conditions. Performance was reduced in winter due to the temperature-sensitive biological activity in the sewers, but it was within the effluent ranges required. (Collins-FIRL)
W77-08564

MICHIGAN TREATMENT PLANT ACHIEVES ZERO DISCHARGE, IRRIGATES CROPLAND,
Water and Sewage Works, Vol. 124, No. 3, p 42-44, March, 1977. 2 tab.

Descriptors: *Tertiary treatment, *Treatment facilities, Domestic wastes, Industrial wastes, Oxidation lagoons, Irrigation, Lakes, Organic matter, Nutrients, Flow, Crops, Growth rates, Soil types, Biochemical oxygen demand, Maintenance, Costs, *Waste water treatment.
Identifiers: Paw Paw(MI), Zero discharge.

Paw Paw, Michigan, has built a sewage treatment plant which has met the EPA goal of zero discharge by 1985. The community treats domestic and industrial wastes in facultative lagoons, then retains it in an artificial lake up to six months. The final wastes are applied as crop irrigation water. There is no bulk sludge to handle since almost all organic substances are naturally reduced. Revenue estimates for the irrigation program have been as high as $450 per acre. The water is rich in nitrogen, phosphorus, and other nutrients. Sanitary sewers are tightly sealed from community storm sewers. Domestic flow averages 0.39 mgd and industrial flow averages 0.16 mgd. This system has provided 95-98% BOD removals and 80-89% suspended solids removals. System design is for a discharge of2-3 inches per week for the entire treatment area, but flows are to be changed in consideration of soil types, natural rainfall, and the growth stage of each crop. The system was designed to absorb shocks and has treated BOD loadings of 7500 pounds without trouble. It was designed to handle a 4000 pound BOD loading. The system quickly dispels odor problems. Maintenance requirements and operational costs are reasonably low. (Collins-FIRL)
W77-08565

HIGH CAPACITY WASTE WATER TREATMENT SYSTEM,
Mixing Equipment Co., Inc., Rochester, N. Y.
Paper Trade Journal, Vol. 161, No. 2, p 46, March, 1977. 1 fig.

Descriptors: *Waste treatment, *Activated sludge, Equipment, *Aeration, Biochemical oxygen demand, Suspended solids, Nitrification, Phosphorus, Chemical treatment, Concrete construction, *Waste water treatment.
Identifiers: *Lightnin treatment system.

The Lightnin high capacity treatment system was introduced in the United States from Canada. For activated sludge applications, a mechanical aerator, surface or submerged, produces a flow to recycle settled sludge from an integral clarifier. The process handles flows from thousands to millions of gallons per day, and easily handles biological shock loads. It features common wall concrete construction and satisfied BOD and solids regulations for secondary treatment at wide BOD loading ranges and concentrations up to 3,000 milligrams/liter. The process can operate at MLSS concentrations of 2,000-12,000 milligrams/liter or higher. Phosphorus is removed by adding chemicals directly to the aeration basin and nitrification is easily achieved. There are minimum sludge handling costs, no submerged diffusers have to be cleaned, and there are no underwater bearings on the clarifier mechanism. (Collins-FIRL)
W77-08566

AERATORS CONTROL LIFT STATION ODOR AND CORROSION,
Mullins (W. H.), Inc., San Antonio, Tex.
For primary bibliographic entry see Field 5G.
W77-08567

SUSPENDED SOLIDS MEASUREMENT GIVES IMPROVED CONTROL,
Instruments (H. F.) Ltd., Bolton (Ontario).
For primary bibliographic entry see Field 5A.
W77-08568

TRENDS IN SMALL SEWAGE TREATMENT PLANTS,
Treatment Plant Contracts Ltd., Hounslow (England).
O. A. Goulden.
Effluent and Water Treatment Journal, Vol. 17, No. 1, p 37-38, January, 1977.

Descriptors: *Treatment facilities, *Septic tanks, *Aeration, Tertiary treatment, Municipal wastes, Domestic wastes, Economics, *Waste water treatment, Filtration, Biological treatment, Legislation, Costs.
Identifiers: *Great Britain.

Developing trends in small sewage treatment plants were delineated for the British nation. Six trends are of major importance. These include a growing septic tank market, the requirement of many water authorities that filter beds be used as well, a rise in maintenance costs, the increase in sophisticated treatment systems, the failure of various 'high technology' aeration tanks to produce capital and operational cost savings, and new sewage rates introduced by the government. These trends have become important because of the assumption that Britain would benefit from small privately owned plants in many ways. They are economical and produce multiple discharges of treated effluent into subsoils rather than a massive outfall from a major septic tank and filter bed and soakaway. Various economic considerations would require that treatment plants have a life of 30 years or more. This is not yet true of advanced treatment plants. A septic tank plus filter bed and soakaway for up to 15 people, and a biological filter bed for 15-1000 people fulfills this requirement. A full-time attendant and advanced technology are valid for installations for more than 1,000 people. This appears to be the best program until operational and maintenance costs for advanced treatment facilities can be achieved. (Collins-FIRL)
W77-08569

S. W.'S SLUDGE INCINERATION SCHEME,
For primary bibliographic entry see Field 5E.
W77-08570

CHLORINE COMBINING WITH SEWAGE,
Water and Waste Treatment, Vol. 20, No. 2, p 18, February, 1977.

Descriptors: *Chlorination, *Sewage treatment, Treatment facilities, Toxicity, Bacteria, Disinfection, Industrial wastes, Pollution abatement, Monitoring, *Waste water treatment, Chemical reactions, Analysis, *Chlorine, *Polychlorinated biphenyls, Canada.
Identifiers: *Chlorinated biphenyls.

The Ontario Ministry of the Environment is investigating the possiblility that toxic substances are being created from the chemical reaction of industrial wastes and the chlorine used in sewage treatment. The formation of chlorinated biphenyls can be an especially serious problem. Laboratory tests have produced these substances in ways which might be similar to what occurs during sewage treatment, but there is no evidence of chlorinated biphenyl production under actual conditions. PCB levels in the area of 40 sewage treatment plants have been monitored for two years, because of their potential cumulative risks. The production of chloroform is another worry of those concerned about chlorine treatment. The production of such toxic or carcinogenic agents has been a theoretical drawback to the extremely beneficial use of chlorine for seage and drinking water. To avoid the possible dangers of using chlorine, ozone is being considered as an alternative treatment method. (Collins-FIRL)
W77-08571

EVERYTHING FROM A PIPE FILTER TO A TURNKEY PROJECT,
Water and Waste Treatment, Vol. 20, No. 2, p 23-24, February, 1977.

Descriptors: *Sewage treatment, *Treatment facilities, Tertiary treatment, Sanitary engineering, Reverse osmosis, Desalination, Water purification, Equipment, Filtration, Disinfection, *Waste water treatment.
Identifiers: Middle East.

The Sewage Treatment Division of Paterson Candy International, Limited, has undertaken the task of designing conventional and advanced treatment facilities and equipment for appliation in Middle Eastern nations. It has contracted many projects for water treatment to potable quality for use in boreholes, trailer and skid-mounted treatment facilities for the military, swimming pool purification plants, and pre-fabricated facilities for small residential/industrial applications. It has much experience with desalination by reverse osmosis, chemical water treatment, sewage treatment, and water sterilization. (Collins-FIRL)
W77-08572

KOWLOON SEWAGE TREATMENT AND DISPOSAL,
Effluent and Water Treatment Journal, Vol. 17, No. 2, p 94, February, 1977.

Descriptors: *Sewage treatment, *Sewage disposal, Water pollution sources, Pollution abatement, Industrial wastes, Domestic wastes, Design, Treatment facilities, Piping, Separation, Equipment, Planning, Urban areas, Asia, Waste water treatment.
Identifiers: *Hong Kong.

Various feasibility studies and investigations were conducted by the Hong Kong Government to develop treatment schemes as alternatives to ocean disposal of sewage and industrial wastes. A two-year study included float tracking and current measurement; determination of salinity and water temperature; and evaluation of the extent of pollution as expressed by dissolved oxygen levels and coliform bacteria counts. Sediment and bottom mud conditions were also studied. Design studies were conducted to develop treatment facilities in various areas of Hong Kong. Development will be carried out in two stages, at a cost of HK$520 million. A facility for North West Kowloon was suggested with interception of sewage and industrial wastes and conveyance by underwater pipeline to a treatment works on reclaimed land. The treatment works will have a main pumping station, and facilities for grit removal and fine screening. Screening and degritted sewage will be discharged by a new outfall and diffuser to the main harbor current stream. Added stages will include another interceptor and sewage and sludge treatment. Construction will have to survive typhoons and be such that shipping activities and harbor traffic will not be interruped. This will probably be achieved by enclosing trunk sewers in immersed tubes. The completion of stage one is projected for 1980. (Collins-FIRL)
W77-08573

SEWAGE WORKS IS ABOVE GROUND LEVEL,
Water and Waste Treatment, Vol. 20, No. 2, p 13-14, February, 1977.

Descriptors: *Treatment facilities, *Sewage treatment, Costs, Flows, Industrial wastes, Water districts, Design, Piping, Corrosion control, Monitoring, Engineering structures, *Waste water treatment, Construction.

Normanton, Yorkshire, England, has replaced an inadequate treatmnet plant with one using the latest techniques. A regional facility, to handle increased industrial and housing development, is being constructed in two phases. The completed facility will be able to handle sewage for a population of 58,000, and would cost about 3.5 million pounds. Differences from other advanced systems include the pumping of all flows to the head of the works, and above ground treatment units. The sedimentation tank water level is about 3 meters above ground, allowing all associated pipe work to be placed in a covered gallery on the hipper end of the tank. This protects the pipes from the environment and provides workmen with a good work area. The piping is of ductile iron and flanged design. The versatility of this piping allowed the creation of a neat and endurable pipe system immune to accidental damage and extremely reistant to internal corrosion. Push-button operation of the de-sludging valves aid checking of sludge consistency through a sight glass. Sedimentation tank feed ports are designed to diffuse the flow an entry to establish early solids settling. These ports are made of glass-fiber reinforces plastic to ensure a long trouble-free life. (Collins-FIRLL)
W77-08574

OXYGEN SYSTEM ACTIVATED SLUDGE PROCESS.
Effluent and Water Treatment Journal, Vol 17, No 2, p 83, February, 1977. 1 fig.

Descriptors: *Oxygenation, *Sludge treatment, Aeration, *Activated sludge, Aerobic conditions, Oxygen, Gases, Oxygen demand, Design, Suspended solids, Treatment facilities, *Waste water treatment, Tertiary treatment.
Identifiers: *UNOX system.

Development of the UNOX activated sludge treatment process has eliminated many of the drawbacks of traditional activated sludge treatment. The negative aspects included the need for large aeration tanks and land areas, odor problems from open tanks, and rapid effluent quality declines at loadings greater than design. Most of the problems were traced to a shortage, or transient shortage of dissolved oxygen. The use of pure oxygen provides a healthier, more efficient process. The UNOX system uses about 90% of the oxygen gas fed into it. This gas and activated sludge and sewage are contacted in multi-stage reactors. A near four-fold efficiency increase resulted from the use of pure oxygen. On-site oxygen supply can be accomplished by a pressure swing adsorption oxygen generator. The process maintains a DO of 2-8 milligrams/liter, creating an optimum environment for activated sludge. This allows the system to operate at high mixed liquor suspended solids concentrations with a more active biomass per unit volume. Because of this, retention times can be 25-50% less than in conventional plants. The system can easily respond to changes in load and can be adapted to existing activated sludge systems. Sludge production is less and can be treated for direct application to land. The plant requires less land than conventional systems and avoids most of the objectional features of them. (Collins-FIRL)
W77-08575

INCINERATION SOLVES TOUGH WASTE PROBLEMS.
For primary bibliographic entry see Field 5E.
W77-08576

TRAVELLING GRATE-TYPE FILTRATION SYSTEM USES PULVERIZED COAL TO LOWER BOD OF WASTEWATER.
Water and Pollution Control, Vol 115, No 3, p 38, March, 1977.

Descriptors: *Filtration, *Biochemical oxygen demand, *Coal, Equipment, Organic matter, *Waste water treatment, *Filters, Suspended solids, Liquid wastes, Heavy metals.

A traveling grate-type filtration system was developed to lower BOD loads of organic pollutant waste water, using pulverized coal. BOD is reduced to under 2 ppm and heavy metal ions are reduced by more than 90%. A revolving cylinder serves as the settling tank. Waste water and precipitation accelerators are introduced at the same time. Waste water passes from the bottom opening of the tank to a sump tank and then to the coal filter bed. After pollutant absorption, the coal is removed for disposal by a rake arm, along with suspended solids and other contaminants which settled out of the waste stream. Treated water is fed to a sprinkling filter bed for biochemical treatment to lower organic content. (Collins-FIRL)
W77-08577

PROSPECTS STRONG FOR WASTE WATER OXYGENATION,
W. J. Storck.
Chemical and Engineering News, Vol 55, No 13, p 17-18, March, 1977.

Descriptors: *Oxygenation, *Waste water treatment, *Treatment facilities, *Aeration, Oxygen, Biochemical oxygen demand, Municipal wastes, Sludge, Costs, Equipment.

Oxygen aeration of waste water is becoming more attractive as waste water treatment is more strictly regulated. It can double treatment capabilities without necessitating a vast expansion of facilities. In addition, it could provide greater BOD removal, sludge digestion, and nitrification. There is the promise of greater removal efficiencies with lower operating costs than air aeration, though capital costs are greater. However, a section of P.L. 92-500 calls for 75% federal financing of eligible capital costs, and some state governments offer various subsidies. Oxygen aeration systems reduce air pollution in the form of odors and virus contaminants. Sludge disposal problems are reduced by the production of a denser, low-volume sludge. Improvements in oxygen production and modular construction are also considered to be advantages of this system. (Collins-FIRL)
W77-08578

EFFLUENT EMPHASIS UNDERLINES ENVIRONMENTAL EFFORT AT ENPOCON,
R. Wood.
Environmental Protection Survey, p 11-13, February, 1977. 3 fig.

Descriptors: *Water purification, Liquid wastes, *Flotation, *Aeration, *Electrolysis, *Chlorination, *Flocculation, *Oxygenation, Oxygen, Pumps, Waste disposal, Equipment, Incineration, Sludge disposal, Pollution abatement, Polymers, Chemical treatment, Gases, *Waste water treatment.

Various waste effluent treatment methods were demonstrated at an English exhibition. A packaged dissolved air flotation plant was shown which was fabricated of steel to eliminate the time, costs, and land usage required for concrete tanks or lagoons built on site. The effluent is pumped from a wet well to a holding tank, with air introduced upstream from the pump. The air is in solution until it reaches the flotation cell in the coagulation chamber where it is released as tiny bubbles. The resultant float is removed by a scraper arm and placed into a sludge hopper. The effluent is removed and recycled. A system employing electrolytic treatment with flotation was claimed to reduce operating costs by as much as 50% when compared with air flotation. Chlorination units were also displayed. There was an 8,000 ppd liquid chlorine evaporator and a high capacity chlorinator, as well as one based on the use of solid tablets of a mixture of calcium hypochlorite and 1,3,4,6 tetrachloroglycoluril. A pure oxygen waste water treatment system and a submersible aerator were other units shown. Solutions to disposal problems were seen in a thermal sludge drying system which produced a pelletized material, and in incineration unites. (Collins-FIRL)
W77-08579

SEWAGE SLUDGE DISINFECTED BY ELECTRON-BEAM BOMBARDMENT.
Compost Science, Vol. 18, No. 1, p 24, January-February, 1977.

Descriptors: *Sludge treatment, *Disinfection, *Irradiation, Heavy metals, Sludge disposal, Equipment, Bacteria, Viruses, Treatment facilities, *Waste water treatment, Sewage sludge, Water treatment.

An irradiation process was developed for the disinfection of sludge. Greater restrictions on sludge disposal have spurred interest in this sludge treatment for the destruction of odor, bacteria, and viruses. Electron-beam bombardment is being tested by the Massachusetts Institute of Technology and the University of New Hampshire at a Deer Island, Massachusetts, facility. Sludge water with 2-5% solids is treated in a 4 foot-wide, 2 millimeter-deep stream. This facility treats 100,000 gallons of sludge per day. A commercial facility equivalent to the test facility would require an initial investment of $500,000 and an annual operating budget of nearly $130,000. (Collins-FIRL)
W77-08580

SLUDGE DEWATERING PRESS.
For primary bibliographic entry see Field 5E.
W77-08581

FLUID BED FOR SEWAGE SLUDGE BURN UP,
For primary bibliographic entry see Field 5E.
W77-08582

1.17 MILLION (POUND) WORKS AND SEWAGE SCHEME COMPLETED AT MARKET RASEN.
Surveyor, Vol. 149, No. 4423, p 32, March, 1977.

Descriptors: *Treatment facilities, *Sewage treatment, Construction, Pumps, Sedimentation, Filtration, Sludge treatment, Dewatering, Water reuse, *Waste water treatment, Sewers.
Identifiers: Anglian Water Authority(England).

A treatment facility was constructed in England at a cost of 1.17 million pounds. The plant was constructed to handle flows up to 130 liters/second daily. Excess flows are discharged to a river by screw pump. Flows pass through a grit trap, a comminutor, a flow recorder, and then are divided between two sedimentation tanks. The effluent is next divided at the dosing tanks and passed to filter beds where recirculation occurs. Modified alternating double filtration will be added later. After filtration, the effluent is discharged to humus tanks, and finally into a river. (Collins-FIRL)
W77-08584

AUTOMATIC CONTROL OF WHITLINGHAM SEWAGE TREATMENT WORKS NORWICH,
B. L. Thurley.
Process Biochemistry, Vol. 12, No. 1, p 26, 28-29, January/February, 1977. 1 fig.

Descriptors: *Automatic controls, *Monitoring, *Treatment facilities, Sedimentation, Activated sludge, Computers, Flow, Filtration, Sludge treatment, Sludge digestion, Sludge disposal, *Waste water treatment, *Sewage treatment.
Identifiers: Norwich(England).

A digital computer was used to provide automatic control for a treatment facility consisting of existing facilities and 'in construction' extensions. The apparatus controls flow rate through the duty screen and operates a standby screen during Detritor scraper and grit rake operation; it also controls the flow to activated sludge and percolating filter plants, sequences the de-sludging process, and initiates the cleaning of flume float wells. A complete alarm-monitoring program is included in the computer controls. Ultrasonic sensors measure solids content to determine sludge withdrawal during primary sedimentation. Minimum head loss is maintained during activated sludge treatment, as is a predetermined dissolved oxygen concentration. The computer also controls the amount of sludge wasting, and monitors and integrates the amount passed to waste. Computer control is used with the two filtration systems employed: single filtration/recirculation, and single filtration/alternating double filtration. The sludge treatments involved are the automatic feed of sludge to primary digestion tanks, and displacement into secondary digestion tanks and filter pressing. Sludge
W77-08585

FILTERS AND SLUDGE DRYING BEDS,
Water and Waste Treatment, Vol. 20, No. 2, p 35, 38, February, 1977.

Descriptors: *Filters, *Drying, *Sludge treatment, Clay pipes, Sewers, Hydrogen sulfide, Conduits, Temperature, Drainage, Chlorides, Design criteria, Construction materials, Equipment, *Waste water treatment.
Identifiers: *Sludge drying beds.

Naylor Brothers, Limited, in England, has marketed sludge bed floor tiles in the Middle East. The tiles, used for drying sludge, facilitate drainage and help ventilation to aid drying of the under-side of the sludge cake. Cost savings in construction are another advantage because the tiles replace layers of graded media. Filter tiles also aid the drainage of effluent from biological filters and provide basal aeration. Vitrified clay piping is used in the area to reduce hydrogen sulfide formation which can result from high temperatures, and low sewage dilution in sewers, and from flat gradients. These products are resistant to damage from chlorides and sulfates in Middle Eastern soils. (Collins-FIRL)
W77-08586

HISTORY AND DEVELOPMENT OF THE OXIDATION DITCH,
R. S. Denton.
Process Biochemistry, Vol. 12, No. 1, p 3-6, January/February, 1977. 1 fig, 2 tab, 14 ref.

Descriptors: *Oxidation lagoons, History, *Aeration, *Oxygenation, Liquid wastes, Sludge, Biochemical oxygen demand, Equipment, Sewage treatment, Nitrification, Industrial wastes, Domestic wastes, Waste water treatment.
Identifiers: *Oxidation ditches.

The oxidation ditch, developed in 1953, became one of the most satisfactory sewage and industrial waste treatment methods. The system originally operated on an intermittent, fill and draw, principle. Continuous operation systems were later employed, using either a separate final settlement tank or a divided leg, with each section acting as a final settlement tank. This is known as a split ditch. The basic design is a continuous ditch with trapezoidal cross-sections. Oxygenation, circulation, and ditch content mixing is accomplished by aeration rotors. After aeration, the mixed liquor passes to a settlement tank, and the settled sludge is returned to the ditch. At least twice the amount of dissolved oxygen needed for BOD removal is provided, allowing the sludge mineralization and nitrification. These operations are completely mixed systems. High BOD loads are easily absorbed with no adverse effects on effluent quality. The advantages of this treatment method include: the production of a well-stabilized, low-quantity activated sludge but no primary sludge; system flexibility for loads and temperature; low construction and maintenance costs; low noise levels; and easy adaptation to sites. Severe under- and over-loading/aeration, excessive shock loading, nutrient deficiency, and raw sewage septicity and temperature can contribute to problems of poor settling and compaction, or can create an activated sludge with large amounts of filamentous organisms. Incorrect operation will also lead to these problems. An optimal sludge age of 20 days was recommended for operating oxidation ditches. (Collins-FIRL)
W77-08587

MODUFLEX SEWAGE TREATMENT PLANTS PROVIDE THE ANSWER TO GROWTH,
Water and Pollution Control, Vol. 115, No. 4, p 36, 38, 39, April, 1977. 1 fig.

Descriptors: *Treatment facilities, *Design, Water quality control, Water purification, Growth rates, Human population, Equipment, Costs, Design criteria, Capital costs, Concrete construction, Biological treatment, Chemical treatment, *Waste water treatment, *Sewage treatment.
Identifiers: *Moduflex system.

Unpredictable accelerations and decelerations of population growth rates create excessive or less than optimum flows that diminish sewage treatment plant performance. Smaller facilities have a smaller margin of allowable flow variation than larger ones. The Moduflex system was created as a solution to this problem. Modular concrete units can service 5 to 300 homes by progressive enlargement of the plant. Enlargement by unit addition and rearrangement of piping allows continued use of the original installations. The basic system is biological treatment with phosphorus removal, filtration, and nitrogen removal if desired. Unit processes include screening, comminution grinding, activated sludge treatment, chlorination, phosphorus removal by chemical treatment, secondary sedimentation, sludge digestion, and denitrification. When a community needs a full-scale treatment plant, the units may be disconnected, relocated, or sold. The manufacturer will contract to repurchase units, and will provide maintenance and monitoring under contract. (Collins-FIRL)
W77-08588

SODIUM BICARBONATE CAN SETTLE MANY WASTE WATER PROBLEM UPSETS,
Church and Dwight Co., Inc., Piscataway, N.J.
N. Barber.
Pollution Engineering, Vol. 9, No. 4, p 57-59, April, 1977. 1 fig.

Descriptors: *Bicarbonates, *Anaerobic digestion, *Aerobic treatment, Treatment facilities, Hydrogen ion concentration, Methane, Carbon dioxide, Microorganisms, Equipment, Alkalinity, Nitrification, Sedimentation, Physical properties, Chemical properties, Biochemical oxygen demand, Odor, *Waste water treatment.
Identifiers: *Sodium bicarbonate.

Sodium bicarbonate has been used by engineers to prevent equilibrium disturbances in sewage treatment plants, It was used as a buffer to maintain the desired acid/alkali ratio for maintenance of an optimum environment for microbial growth. In anaerobic systems, sodium bicarbonate can control pH, increase methane production, increase biodegradation rates, precipitate toxic metals, and aid solids concentration. It was also substituted for lime and other alkalis in aerobic processes, where it was able to control pH and alkalinity, enhance nitrification, improve BOD reduction, reduce or eliminate odors, enhance settling characteristics, and pretreat industrial wastes. (Collins-FIRL)
W77-08589

ICI EFFLUENT SYSTEM TO BE USED IN ESSEX.
Environmental Health, Vol 85, No 2, p 43, February, 1977.

Descriptors: *Treatment facilities, Domestic wastes, Industrial wastes, Biological treatment, Separation, Economics, Environmental control, Municipal wastes, *Waste water treatment, Costs, Sewage treatment.
Identifiers: *ICI Deep Shaft Effluent Treatment System, Anglian Water Authority(England).

The Anglian Water Authority, England, has approved the construction of a treatment facility using the ICI Dept Shaft Effluent Treatment System. Mixed domestic sewage and industrial effluent will be treated. Completion of the system, involving biological treatment and solids separation stages, is estimated for the summer of 1977. Costs are expected to be about 650,000 pounds. Wastes are circulated in a sunken shaft, treatment is accelerated, space is save, energy needs are reduced, and no odor is produced. Economical installation and a lessened environmental impact are the results of these advantages. (Collins-FIRL)
W77-08590

REMOVING SOLUBLE METALS FROM WASTE WATER,
A. V. Metzner.
Water and Sewage Works, Vol 124, No 4, p 98-101, April, 1977. 2 fig.

Descriptors: *Metals, *Toxicity, *Industrial wastes, Municipal wastes, Pollutants, Waste treatment, Sludge treatment, Water pollution sources, Physical properties, Chemical properties, Recycling, Oxidation-reduction potential, Separation techniques, Sulfides, Chemical reactions, Sedimentation, Filtration, Ion exchange, Membrane processes, *Waste water treatment.
Identifiers: *Soluble metals waste removal.

Soluble metal removal from waste water is necessary before process water can be discharged to municipal sewer systems or recycled. Five basic processes exist for metal removal: chemical oxidation and reduction, precipitation with clarification and/or filtration, evaporation, ion exchange, and membrane processes. Oxidation and reduction may be used to remove chromium and cyanides. Metals can be precipitated either as hydroxides or sulfides. Iron is commonly removed through precipitation. Chemical displacement and granular media filtration are effective treatment methods. Evaporation may be cost efficient, depending on the processing objectives and is useful for metal recovery. Evaporative wastes are crystalline and reduce sludge handling costs. Ion exchange is employed for metal finishing bath purification, demineralization of flows for recycling, polishing effluents following primary treatment, and recovering methods. They, and in particular, reverse osmosis, are used primarily for recycling water and recovering or concentrating solubles. Only 75% of the effluent from this process is a purified product. The remainder must be treated further before discharge. (Collins-FIRL)
W77-08591

RELIABLE PH MEASUREMENT WHEN EFFLUENT CONDITIONS GET TOUGH,
Electrofact, Plymouth, Minn.
For primary bibliographic entry see Field 5A.
W77-08592

THE TRIALS AND TRIBULATIONS OF TREATMENT WORKS IN LOWER TRENT.
Surveyor, Vol 149, No 4424, p 33, March, 1977.

Descriptors: *Treatment facilities, *Performance, *Water quality standards, Sewage effluents, Biochemical oxygen demand, Filters, Biological treatment, Filtration, Humus, Hydraulic design, Dewatering, Sedimentation, *Waste water treatment.
Identifiers: Severn-Trent Water Authority(England).

Investigations into problematic treatment facilities in the Severn-Trent Water Authority district, England, were reported. The first involved a medium-sized works which produced a poor quality effluent. It was found that BOD and suspended solids values were growing worse. The rectangular filter media were large and flat, and surface film growth had developed at the centers only. BOD maxima were found when the distributor was at the ends of the bed. Additional filter capacity was required and suggested remedies included using existing beds in a new filter and replacing the old media with new. Tests are being conducted to determine the effectiveness of these suggestions. The second facility was, again, experiencing difficulties of poor effluent. Hydraulic overloading of humus tanks was the problem. Trial solutions included using storm water tanks as secondary humus tanks, and recirculating the unsettled filter effluent. Both methods were successful. Reduction of hydraulic loads to the humus tanks reduced upward flow rates, improved solids removal, and positively affected settling characteristics of the treated suspension. At another plant, effluent problems seemed to be caused by the use of dewatering concentrators, which treated fibrous materials, on an effluent containing much fine material. Effluent quality improved when a belt press was used to replace the concentrator. (Collins-FIRL)
W77-08593

HORSHAM'S SEWAGE WORKS,
Water and Waste Treatment, Vol. 20, No. 3, p 23, March, 1977.

Descriptors: *Humus, *Filters, *Treatment facilities, Pumping plant, Construction, Dewatering, Construction materials, Concrete, Water purification, *Waste water treatment, *Filtration.
Identifiers: Horsham(England).

A sewage treatment plant is being constructed in Horsham, England, which will include four humus tanks and filter beds. Design capacity is for a population of 95,000. A single wide cutting was made in which the 25.9 meter diameter humus tanks and the ADF pumping station were built. It will be possible to install four additional tanks. A segmented shutter formed the outer ring of the humus tank bases and stiff concrete was used for the sloping bases. The tank walls were made of a steel shutter. Precast concrete was used for the effluent collection channels and the supporting columns. Additional treatment facilities include sedimentation tanks, biological filters, humus tanks, pumping stations, storm tanks, and sludge dewatering equipment. (Collins-FIRL)
W77-08595

PRE-TREATMENT IN THE SEWER,
Water and Waste Treatment, Vol. 20, No. 3, p 15, March, 1977.

Descriptors: *Sewers, *Oxygen, Hydrogen sulfide, Water quality control, *Sewage treatment, Aerobic conditions, Biochemical oxygen demand, Performance, Organic matter, *Waste water treatment, Testing, *Pre-treatment(Water).

Pretreatment of sewage by sewer oxygenation was tested. The Wessex Wat er Authority in England and a supplier of treatment components developed the system which involves the injection of oxygen into sewers at a pumping main. About one ton of oxygen is injected per day to treat aerobic conditions within the sewer in order to allow microbial activity for reducing the organic pollution load. Final effluent was improved by 30-60% after treatment in a plant which exhibited previous overlaoding. Costs for sewer oxygenation were substantially lower than construction costs for added conventional treatment facilities. (Collins-FIRL)
W77-08596

PLANT CAPACITY TO INCREASE,
Public Works, Vol. 108, No. 4, p 108, April, 1977.

Descript : *Treatment facilities, *Oxygen, Performance, *Aeration, *Oxidation lagoons, Water purification, Reinforced concrete, Maintenance, Pumps, Water pollution control, *Waste water treatment, New Jersey.
Identifiers: Wayne(NJ).

A pure oxygen treatment system is being installed at a treatment plant in Wayne, New Jersey, to increase treatment capacity by nearly 80%. A model 100 F30 module is to be placed in two aeration basins. Capacity will be increased from 1 to 1.8 mdg, while only one-third of the existing aeration basin volume will be used. The remaining volume will be used to double the clarification capacity. In the F30 system, a free-fall oxygenation technique creates a turbulence which mixes oxygen and waste water. Oxygen is mixed and dissolved in a turbulent waste water fall zone within a reinforced concrete module. Because the pump is the only moving part, maintenance of the system is minimal. (Collins-FIRL)
W77-08597

PERFORATED, VITRIFIED CLAY PIPE USED IN PEORIA FACILITIES,
For primary bibliographic entry see Field 8G.
W77-08598

OXYGEN INJECTION FOR BATH'S SEWERS,
Water Services, Vol. 82, No. 973, p 129, March, 1977.

Descriptors: *Oxygenation, *Sewers, Water quality, Costs, Testing, Hydrogen sulfide, Aerobic treatment, Biochemical oxygen demand, Temperature, Biological treatment, Microorganisms, *Water purification, *Waste water treatment, *Sewage treatment.
Identifiers: Bath(England).

Bath, England, had been the site of sewer oxygenation testing to investiage the pre-treatment of sewage. The system has effectively improved treatment plant final effluent between 30 and 50%. The works previously operated under a 40% overload. The system, with an injection plant and oxygen, would cost about 19,000 pounds annually, whereas added conventional plant extensions would cost more than 500,000 pounds. With the injection of one ton/day of oxygen at the pumping station, aerobic conditions are created which last throughout the main. This aids microbial activity on sewer walls and in the main body to break down some of the organic pollution load. This load radically changes after primary settlement. Improved settling and sludge treatment have been shown. Summer operation is more effective because of higher temperatures and low river flows. (Collins-FIRL)
W77-08599

HIGHER GAS YIELDS AND REDUCED RETENTION TIMES OBTAINED FROM ANAEROBIC DIGESTER,
Water Services, Vol. 82, No. 973, p 171-172, March, 1977.

Descriptors: *Gases, *Anaerobic digestion, *Sludge treatment, Heat transfer, Water purification, Pumps, Equipment, Filters, Sewage effluents, *Waste water treatment.

A Nash liquid ring vacuum compressor was used to improve the performance of an anaerobic sludge digester at an English treatment plant. The digester, with a capacity of 610,000 gallons, has its contents heated and agitated by units mounted on its exterior wall. Digesting sludge enters the bottom of the heating and mixing units under its own head pressure. Pressurized sludge gas is ued to push sludge up and to inject it back into the digester top. Rising sludge passes through hot water jackets which heat the sludge. Inadequate gas pressure or volume will neither lift the sludge by the required head nor maintain the required flow rates. Heat transfer and/or agitation of the digester contents will thus be negatively affected. This will in turn have a negative effect on sludge digestion and gas production. The liquid ring vacuum compressor was selected because it provides low-cost production of needed pressure and flow rate for good digester operation, reduced maintenance costs and down time with a minimum of wear on parts, and can provide 10 years of trouble-free operation before overhaul is necessary. The unit has provisions for complete shutdown if pressure falls below a pre-set level. Operation may be continuous or automatically controlled. Comparision of two six-month periods, before and after installation, indicated improved operation. Retention time was reduced from 30.5 to 27.6 days even though a 10.8% more slud was handled. Feed sludge solids content and average ambient temperatures varied little. Gas production increased by 6.47% until gas flow meters were installed; afterwards, increases up to 29.9% were recorded probably because of better mixing of the digest contents. This pump can also be applied to rotary vacuum filters and can be used to supply oil-free air for sub-surface aeration needs. (Collins-FIRL)
W77-08600

5E. Ultimate Disposal Of Wastes

RECLAMATION OF ANTHRACITE COAL REFUSE USING TREATED MUNICIPAL WASTEWATER AND SLUDGE,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W77-08189

SOURCES, CHARACTERISTICS AND TREATMENT AND DISPOSAL OF INDUSTRIAL WASTES CONTAINING HEXACHLOROBENZENE,
TRW Systems and Energy, Redondo Beach, Calif.
For primary bibliographic entry see Field 5D.
W77-08265

EFFECT OF DIP ON THE STORAGE OF FRESH WATER (OR THE DISPOSAL OF WASTE) IN A SALINE AQUIFER,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-08288

A QUANTITATIVE STUDY OF ORGANIC CARBON DECOMPOSITION AND NITROGEN TRANSFORMATIONS IN SEWAGE SLUDGE-SOIL SYSTEMS,
Rutger - The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 5B.
W77-08291

PERSISTENCE OF MYCOBACTERIUM BOVIS BCG IN SOIL AND ON VEGETABLES SPRAY-IRRIGATED WITH SEWAGE EFFLUENT AND SLUDGE,
Public Health Service, Cincinnati, Ohio. Div. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-08525

THE SANITARY LANDFILL LEACHATE CONTROL PLANT IN KOBE.
For primary bibliographic entry see Field 5D.
W77-08534

SEABED SEWERS FOR HONG KONG,
Watson (J. D. and D. M.) (Hong Kong).
A. F. Short.
The Consulting Engineer, Vol. 41, No. 4, p 47, 50, April, 1977.

Descriptors: *Sewers, *Construction, *Planning, Pollution abatement, Outfalls, Waste disposal, Treatment facilities, Waste water treatment, Tunneling.
Identifiers: North West Kowloon(Hong Kong).

The planned system of submarine interceptor sewers for Hong Kong was described. The system was planned to replace direct discharge to the ocean, which has caused deterioration of beaches and local waters. Rapid population increases and industrial development have made the recommended waste disposal system necessary. Oxygen levels of the city's harbor had been falling below 50% saturation. The proposed scheme uses an interceptor sewer to collect wastes from the three main North West Kowloon drainage areas and convey them to a new treatment site. Treated effluents will be discharged into the harbor's main tidal stream. The interceptor sewer would be a twin circular sewer that crosses the harbor to the treatment site. Interceptor and outfall sewers to the treatment works will be gravity sewers. A main pumping station with degritting and coarse and fine screening facilities will lift sewage to ground level and on to treatment. A high rate biological filtration system with settlement and recirculation is to be employed, and a twin outfall with diffusers will be used for effluent discharge. Sludge treatment will involve heated anaerobic digestion in covered digesters for circulation and gas collection. Sludge disposal will be by ocean dumping. Investigations are continuing for development of underwater construction by tunneling and immersed tube techniques. The treatment facility is to be constructed on reclaimed land and the entire system must be able to withstand the worst extremes on weather, such as typhoons. (Collins-FIRL)
W77-08555

BREAKING DOWN SOLID AND LIQUID WASTE TO FORM A FERTILIZER--BY INOCULATION WITH SELECTED FUNGI AND FERMENTATION.
Netherlands Patent NL 7608-433. Issued February 2, 1977. Derwent Netherlands Patents Abstracts, Vol. Y, No. 8, p D5, April 1, 1977.

Descriptors: *Patents, *Solid wastes, *Liquid wastes, *Fertilizers, *Fungi, *Fermentation, Metals, Aeration, Domestic wastes, Industrial wastes, Microorganisms, Recycling, Waste water treatment.

A patent was issued for a process to transform solid and liquid wastes, which are compressed or comminuted, into fertilizer. Ferrous metals are removed and the material is fermented at room temperature and inoculated with fungus, yeast, or mold. Milling and mixing after inoculation distributes the fungi through the material. It is then placed in a closed aerobic area. This method can be used to treat solid domestic waste and sludge from either domestic or industrial waste water treatment. Various feedstocks may be treated by this process. The resultant product is stable and has properties resembling natural manure. (Collins-FIRL)
W77-08559

SEWAGE DISPOSAL SYSTEM.
Australian Patent 478,238. Issued November 25, 1976. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol 46, No 44, p 4320, November, 1976.

Descriptors: *Patents, *Sewage disposal, Equipment, Waste treatment, Sewage treatment, Hydraulic engineering, *Waste disposal, Mechanical engineering, Waste water treatment.

A patent was issued for a sewage disposal system. It is composed of a main frame positioned at a selected above-ground level with at least one vertical shank secured to it that penetrates the ground to a chosen depth. An underground disposal tunnel is formed by an axially elongate foot attached to a plow at the shank's lower end. Servomechanisms vary the cross-sectional area of the tunnel during operation. A dispensing port is at the end of the flow path for sewage discharge into the tunnel. (Collins-FIRL)
W77-08563

S. W.'S SLUDGE INCINERATION SCHEME,
Water and Waste Treatment, Vol. 20, No. 2, p 14-15, February, 1977.

Descriptors: *Incineration, *Sludge disposal, Treatment facilities, Planning, Design, *Sludge treatment, *Waste water treatment, Engineering structures, Activated sludge, Water districts.
Identifiers: South West Water Authority(England).

A sludge treatment and incineration plant has begun operation in the South West Water Authority district of England. The plant treats a sewage flow of nearly 1 mdg from a population of about 20,000. The plant was designed for a population of 50,000 and provisions have been made for future duplication. Financial considerations have placed rural portions of the treatment system in limbo. The pumping station has a 520 kw diesel generator to allay power failures. (Collins-Firl)
W77-08570

KOWLOON SEWAGE TREATMENT AND DISPOSAL,
For primary bibliographic entry see Field 5D.
W77-08573

INCINERATION SOLVES TOUGH WASTE PROBLEMS.
Modern Power and Engineering, (Toronto, Canada), Vol 71, No 3, p 40, March, 1977.

Descriptors: *Incineration, *Waste treatment, *Waste disposal, Industrial wastes, Pollution abatement, Municipal wastes, Gases, Combustion, Oxidation, Economics.

Incineration is considered one of the best avenues for handling wastes. Advantages of the method include: weight reduction, volume reduction, sterile residues, and production of recoverable heat. The necessary performance requirements for the application of incineration are an ability to consume a wide variety of materials, adequate pollution controls, compatible operating and capital costs for the system, high disposal capacity per square foot of floor area, and adequate ash residue removal. The operation of a large incinerator for a short time is most economical and disposal of very hazardous materials only is economical for operations below 300 pounds/hour. Air pollution control is often a considerable cost factor. Improved incineration technology includes thermal incineration for gaseous wastes, direct-flame fume incinerators, slagging pyrolysis, and suspension burning of finely divided materials in a vortex furnace chamber. Continued development and design revisions will make incineration a more economically sound treatment method. (Collins-FIRL)
W77-08576

SLUDGE DEWATERING PRESS.
Industrial Wastes, Vol. 23, No. 2, p 17, March-April, 1977.

Descriptors: *Dewatering, *Sludge treatment, Equipment, Sedimentation, Industrial wastes, Municipal wastes, Flocculation, Polyelectrolytes, Waste water treatment, Separation techniques.

Dry-solids cakes can be made with a sludge dewatering press from dilute sludge produced by the sedimentation of industrial and municipal waste water processes. There are three stages: draining of sludge pre-flocculated with a polyelectrolyte; low-pressure pressing of the sludge between the drainage screen and a pressing screen, and pressing by a series of decreasing diameter perforated rollers with increase pressure gradually; and, finally, sustained high-pressure pressing by a series of one inch-wide belts which press the sludge against a perforated roller. (Collins-FIRL)
W77-08581

FLUID BED FOR SEWAGE SLUDGE BURN UP,
D. Martin.
Environmental Protection Survey, p 27, February, 1977.

Descriptors: *Incineration, *Sludge disposal, *Treatment facilities, Sedimentation, Separation, Filtration, Equipment, Oxidation, Sludge treatment, Oxygen, Temperature, Pumps, Dewatering, Pollution abatement, Operation and maintenance, *Waste water treatment, Sewage sludge.
Identifiers: Esher(England).

The sludge incinerator plant at Esher, England, burns organic matter within a fluid bed of sand.

Components of the installation are a mechanically raked screen, a detritor to remove grit, a primary sedimentation facility, biological filters, humus tanks, micro-strainers, and an oil-fired incinerator. Mechanical moving parts are not used so maintenance problems due to mechanical failure are avoided. A fail-safe system is employed to avoid mishaps from power failures. The fluid bed is a mixture of sand and gases in suspension, making an ideal environment for the thermal oxidation of sludge. Flexible feed pipes are used for the sludge to allow easy handling of blockages. Operation is on a continuing rather than batch basis. Dewatering is conducted by vacuum filtration and the pumps are reliable, accept liquid carryover and soft solids, are resistant to corrosion, have a cooling effect on explosive gas, and scrub dirty gas. Little maintenance is required for the pumps. The plant has lower odor levels than usual, clean stack gas, and an absence of ash. (Collins-FIRL)
W77-08582

TRENCHING SLUDGE MAY BE SAFE.
Water and Wastes Engineering, Vol 14, No 4, p 17, April, 1977.

Descriptors: *Sludge disposal, *Trenches, Water pollution, Treatment facilities, Testing, Nitrogen, Heavy metals, Sludge digestion, Cadmium, Copper, Nickel, Zinc, Lead, Chlorides, Nitrates, Ammonium compounds, Waste water treatment.

Experiments involving the trenching of sludge have revealed no significant groundwater contamination. Digested and undigested sludge was placed in two-foot deep trenches. The levels of nitrate, chlorides, and ammonium were not considered hazardous. Sludge trenching is being used by the Washington Suburban Sanitary Commission, District of Columbia. Trencing is effective for small plants treating less than one mgd sewage flows or serving cities with 10,000 people. Other tests showed lower nitrogen levels for undigested than for digested sludge. Both sludges had been in trenches for four years. Nitrogen levels for both sludge types were significantly lower after trenching than before the operation. It may be possible for economic savings to result from the elimination of the digestion process since undigested sludge also has lower levels of heavy metals than digested sludge. (Collins-FIRL)
W77-08594

5F. Water Treatment and Quality Alteration

STATES NEED FREEDOM TO INNOVATE (COMMENT ON PL 92-500).
Kansas Dept. of Health and Environment, Topeka.
For primary bibliographic entry see Field 6E.
W77-08119

LET'S HAVE ACHIEVABLE 'SAFE' DRINKING WATER,
Illinois State Environmental Protection Agency, Springfield. Div. of Public Water Supplies.
For primary bibliographic entry see Field 5G.
W77-08127

APPARATUS FOR CONTINUOUS LIQUID-LIQUID EXTRACTION OF WATER WITH A SOLVENT,
Aktiebolaget Tellusond, Goteborg (Sweden). (Assignee).
B. O. Josefsson, and M. Ahnoff.
U.S. Patent No. 3,996,140, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 284, December 7, 1976.

Descriptors: *Patents, *Chemical wastes, *Water treatment, *Water pollution treatment, Water quality control, *Separation techniques, Organic compounds, Polychlorinated biphenyls, Solvents, Solvent extraction, *Waste water treatment.

The increasing concentration of chemicals in waterways necessitates substantially continuous supervision of the content of certain chemicals such as oil and chlorinated hydrocarbon, particularly polychlorinated biphenyls (PCB). Since these chemicals occur in very small quantities, it has so far been difficult to develop a sufficiently reliable and robust apparatus suitable for operation at a sampling point in waterways or at sea. The object of this invention is to provide an apparatus which can be used for field work. It should also be possible to use the apparatus immersed below the surface of the water for separation in situ. The apparatus for extracting dissolved substances from water comprises an extraction vessel. A mixing container, open at the top is placed in the lower portion of the extraction vessel and contains stirring means. The extraction vessel contains a desired quantity of solvent. The water is added in a continuous flow and is mixed with the solvent. The lighter solvent phase rises to the top of the apparatus, while the heavier water phase is continuously withdrawn through an annular space between the mixing container and the wall of the extraction vessel. (Sinha-OEIS)
W77-08264

ROLE OF POLYELECTROLYTES IN THE FILTRATION OF COLLOIDAL PARTICLES FROM WATER AND WASTEWATER,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W77-08339

FLUORIDE ANALYSIS OF WATER-TREATMENT-PLANT SLUDGES,
Auburn Univ., Ala. Dept. of Civil Engineering.
W. H. Duke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 091, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, December 1974, 62 p, 10 fig, 5 tab, 47 ref, 1 append. OWRT A-043-ALA(1).

Descriptors: *Sludge, *Fluorides, *Measurement, Dilution, *Distillation, Distribution system, *Water treatment, *Aluminum, Treatment facilities, Pollutant identification.
Identifiers: Rapid mix, *Fluoride analysis.

A method for fluoride analysis of sludges was developed and verified using laboratory-prepared alum sludge. The developed method was then used to measure fluoride concentrations in sludges from selected water treatment plants. Inititally, three methods of fluoride measurement were considered: the alizarin visual method, the SPADNS method, and the electrode method. Since none of the methods was directly applicable to the determination of fluoride in sludge, several modifications were made. These modifications included dilution, acidification and distillation. Pretreatment of the sludge sample by distillation and the analysis of the fluoride content of the distillate by the conventional electrode method was determined to be a valid method for measuring fluoride concentrations in sludges. The effects on the distillation process of aluminum accumulation in the distillation reagent, the size of the sample to be distilled, and the aluminum concentration in sample were investigated. An aluminum accumulation of less than 184 mg and an aluminum concentration in the sample of less than 300 mg/l were determined not to interfere with fluoride recovery. A 100.0 ml sample size was also determined to yield the best results. Sludge samples from water treatment plants in which fluoride is added in the rapid mix and sludge samples from water treatment plants in which fluoride is added following filtration were analyzed for fluoride. The addition of fluoride in the rapid mix results in high fluoride concentrations in the sludge and an aluminum carry-over to the distribution system.
W77-08342

BACTERIOLOGICAL POLLUTION IN THE DRINKING-WATER OF JORDAN,
Ministry of Health, Amman (Jordan). Dept. of Bacteriology.
For primary bibliographic entry see Field 5B.
W77-08454

HEALTH CONSIDERATIONS IN USE OF TERTIARY EFFLUENTS,
California Univ., Berkeley. Dept. of Biomedical and Environmental Health Sciences.
R. C. Cooper.
Journal of the Environmental Engineering Division-ASCE, Vol. 103, No. EE1, p 37-47, February, 1977. 2 tab, 45 ref.

Descriptors: *Water reuse, *Public health, Toxicity, Bacteria, Viruses, Animal parasites, Chemical wastes, Inorganic compounds, Organic compounds, *Tertiarytreatment, *Waste water treatment, Water treatment.

Hazards to human health which might result from the reuse of highly treated waste effluents have two major sources, biological agents and chemical agents. These biological agents may be bacterial, viral, or parasitical in nature. Salmonella and Shigella are the most important enteric pathogenic bacteria encountered. Enteroviruses, adenoviruses, reoviruses, and the agent of infectious hepatitis are potentially the most important viruses involved. Many intestinal parasites are associated with waste water but the incidence of their occurrence is not well established. Inorganic or organic chemical agents may be either acutely or chronically toxic to populations. The analysis of chemical agents is more difficult, and they arise from a wider range of sources than biological agents. They are both natural and man-made. Another problem is the uncertainty concerning the fate of chemicals in water, which depends upon their stability and their biotransformation to more toxic forms. Other concerns involve the effects of water hardness and the impact of trace organics. Developments in analysis, epidemiologic studies, and treatment must become more definitive before extensive waste water reuse can be applied with guarantees of health safety. (Collins-FIRL)
W77-08513

POLLUTION INDICATOR BACTERIA ASSOCIATED WITH MUNICIPAL RAW AND DRINKING WATER SUPPLIES,
Ontario Ministry of the Environment, Rexdale. Lab. Service Branch.
For primary bibliographic entry see Field 5A.
W77-08516

APPLICATION OF CORRUGATED SHEET SPRAYERS FOR WATER PURIFICATION (DIE ANWENDUNG VON WELLBAHNRIESLERN IN DER WASSERAUFBEREITUNG),
G. Nagel.
GWF-Wasser/Abwasser, Vol 118, No 3, p 103-109, 1977. 14 fig, 1 tab, 4 ref.

Descriptors: *Water purification, *Aeration, *Spraying, Iron, Manganese, Separation, Performance, Oxygen, Carbon dioxide, Gases, Equipment, Pollutants, *Water treatment, Water quality control, Waste water treatment.
Identifiers: *Corrugated sheet sprayers.

Results are presented of field experiments with corrugated sheet sprayers used to aerate raw potable water for the removal of iron and manganese. At an air-to-water ratio of 1:1, optimal results were obtained at flowthrough rates of 600-1,000 cu m/hr per sq m. The new process has the advantage of

providing for adequate oxygen concentration in the water without causing supersaturation or excessive loss of CO2. This is because the water passes through a special degassing section after going through the aeration section. Test runs for several months showed no clogging in spite of considerable iron and manganese concentrations of up to 2.8 mg/l and 0.5 mg/l, respectively. (Takacs-FIRL)
W77-08543

SEWAGE SLUDGE DISINFECTED BY ELECTRON-BEAM BOMBARDMENT.
For primary bibliographic entry see Field 5D.
W77-08580

5G. Water Quality Control

REORGANIZING POLLUTION CONTROL IN THE U.K.
Wessex Water Authority, Bristol (England).
R. Toms.
Water Spectrum, Vol 8, No 1, p 23-28 (Spring-Summer 1976). 1 map, 2 chart, 8 photo.

Descriptors: *Pollution abatement, *Water quality control, Foreign countries, *Research facilities, Organizations, Population, Water supply, Sewage treatment, Waste treatment, Biological treatment, Effluents, Management, Tidal waters, Rivers, Sampling, Water policy, Water demand, Eutrophication, Inspection.
Identifiers: Corporations, Centralization, *United Kingdom, *Wessex Water Authority(Eng).

The United Kingdon reorganized its total concept of pollution control under a new corporate management image in 1974. The Water Act of 1973, which became effective April 1, 1974 established a Welsh National Water Development Authority and nine regional water authorities to cover all of England. The act combined wastewater collection, sewage treatment, river and water resources management, treatment and supply of public and industrial water, and included fisheries and water recreation as integrated components of a comprehensive management system under the control of a single authority. The 1974 Control of Pollution Act extends the powers of the regional authorities to all discharges into estuaries and the sea, and from boats. All consents, details of samples and any subsequent action taken by a water authority will be made available for public scrutiny. The quality of water supplies has been given a high priority. Water research has been taken over by the newly formed Water Research Centre. Although the improved coordination possible under this new corporate management structure already appears to be more effective, several more years will be necessary to complete the settling out process. (Martin-Florida)
W77-08111

STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR THE EXPLOSIVES MANUFACTURING POINT SOURCE CATEGORY (PROPOSED RULES),
Environmental Protection Agency, Washington, D.C.
Federal Register Vol 41, No 47, p 10186-88, March 9, 1976.

Descriptors: *Explosives, *Federal Water Pollution Control Act, *Industrial wastes, *Effluents, *Water quality standards, Water pollution, Discharge(Water), Legislation, Administrative agencies, Regulation, Governments, Management, Monitoring, Water policy, Water pollution control, Water pollution sources.
Identifiers: *Environmental Protection Agency(EPA), *National Environmental Policy Act, *Point source discharges, *Manufacturing operations, Effluent limitations, Effluent guidelines.

Under the Federal Water PollutionControl Act (FWPCA), the Administrator of the Environmental Protection Agency (EPA) is required to establish effluent limitations and guidelines for existing sources of effluents, standards of performance and pretreatment standards for new sources, and pretreatment standards for existing sources, by certain dates as set by the Act. The Act requires that as of July 1, 1977, the effluent limitations for point source discharges must be within standards achievable for the best practicable control measures and practices as defined by the Administrator pursuant to section 304(b) of the Act. This proposed rule deals with both military and commercial explosives manufacturing point source discharges. Standards of performance are proposed for the manufacture of explosives subcategory under Subpart A of the rule and for the explosives load, assemble, and pack plants subcategory under subpart C of the rule. Comments on all aspects of the proposed regulation and suggestions as to alternative approaches that might better satisfy the detailed requirements of the Act are solicited by the EPA. (Sloan-Florida)
W77-08113

LEADVILLE MINE DRAINAGE TUNNEL ACT OF 1976.
For primary bibliographic entry see Field 6E.
W77-08115

IRRIGATED AGRICULTURE: NONPOINT AND POINT SOURCE WATER POLLUTION,
S. J. Hadeed.
Journal Water Pollution Control Federation, Vol 48, No 9, p 2116-19, September, 1976.

Descriptors: *Agricultural runoff, *Irrigation, *Irrigation efficiency, *Water permits, Irrigation water, Tailwater, Irrigation effects, Surface runoff, Leaching, Salinity, Water conveyance, Water pollution sources, Water conservation, Seepage control, Silviculture.
Identifiers: *Point sources, *Nonpoint sources, *Tailwater recovery.

Irrigated agriculture results in point source pollution (discharges from any conveyance) and nonpoint source pollution (unconfined discharges). The primary cause of nonpoint source pollution is undefined surface runoff from irrigated agriculture. Nonpoint source pollution problems vary from region to region. In the West, leaching causes increased water salinity. In the Central States, feedlot runoff increases water nutrients. The Environmental Protection Agency (EPA) has recently proposed regulations to expand its permit authority over all point sources in concentrated feedlot operations, agriculture and silviculture. Agricultural nonpoint sources are still largely unregulated. The National Commission on Water Quality (NCWQ) has proposed to Congress a series of plan to control irrigation-related water pollution including salinity alleviation projects, better water delivery systems such as lined canals to minimize seepage losses during diversion, and better farm water management techniques such as tail water recovery or recycling to conserve supply and increase water-use efficiency. The EPA studies in the Upper Colorado River Basin show that cost-effective technology is rapidly becoming available to control pollution from irrigated crop production. (Denker-Florida)
W77-08116

OPERATION AND IMPACT OF NPDES IN REGION II, PART I,
Environmental Protection Agency, New York. Caribbean Construction Grants Branch.
W. J. Muszynski, and T. J. Olenik.
Water and Sewage Works, Vol. 123, No. 5, p. 62-65, May, 1976, and No. 6, p. 93-95, June, 1976.

Descriptors: *Federal Water Pollution Control Act (FWPCA), *Legislation, *Permits, *Municipal wastes, *Discharge(Water), Regulation, Legal aspects, Water treatment, Water law, Effluents, Political aspects, Pollutants, Discharge(Water), Financial feasibility, Administration, Water policy, Grants, Government finance, Economics, Treatment, Sewage treatment, Financing, Governmental interrelations.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, National Pollution Discharge Elimination System, Combined flow, Economic impact, Sewage management, Municipal dischargers.

In establishing the National Pollutant Discharge Elimination System (NPDES) permit program Congress has created an instrument for enforcement of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. In Region II, one of the largest and most important sections in terms of municipal dischargers, problems encountered by NPDES have centered around the funding issue, the pretreatment of industrial wastes, combined flow, and the lack of discharge information. To qualify for a permit, an existing treatment plant must meet standards dictated by the Environmental Protection Agency (EPA). These requirements are generally more stringent than previously required under state programs. Some provisions, however, are made for issuance of permits with special conditions for plants that do not meet current standards. The NPDES program has had significant economic impact, illustrated by reference to specific cases. From the study of Region II, it is apparent that many municipal dischargers will not meet the July 1, 1977 deadline. However, the success of the NPDES program should not be measured strictly in terms of this deadline. Instead the program should be judged by its effect on the grant program, increased efficiency of existing plants, and the collection of more reliable data. (Petruff-Florida)
W77-08117

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 REACH POLLUTING ACTIVITIES OCCURRING ABOVE MEAN-HIGH WATER LINE (COMMENT ON U. S. V. HOLLAND).
Florida State University Law Review, Vol 2, No 4, p 799-806, Fall 1974.

Descriptors: *Federal Water Pollution Control Act, *Navigable waters, *Rivers and Harbors Act, *Permits, Wetlands, Tidal waters, Tidal effects, Federal government, Water pollution control, Dredging, Tidal marshes, Judicial decisions, Estuaries, Estuarine environment, Federal jurisdiction.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Fill permits.

The 1972 Amendments to the Federal Water Pollution Control Act (FWPCA) as interpreted by a 1974 case, U. S. v. Holland, give the federal government greater authority to regulate the issuance of fill and dredge permits. First, Holland expands the definition of 'navigable' waters to include 'all waters of the U. S.'. Formerly, under the Rivers and Harbors Act (RHA), fill permits were only required for navigable waters which did not include wetlands, marshes, and small feeder streams. The definition of 'navigable waters' in the Amendments encompasses these bodies. Second, it redefines the boundaries of navigable water. Under the RHA, the boundaries were affixed at the mean average high water mark for coastal waters and the mean high tidal line for bays and estuaries. Under the Holland interpretation the Amendments extend federal authority over water pollution beyond the mean high tidal line to the highest normal tide line. The net effect is that the federal government can now prevent the entry of pollutants into any navigable waters when they are discharged from any point source. The impact of Holland may be limited by the Corps of Engineers' disagreement with the decision, since the Corps is responsible for issuing dredge and fill permits. (Denker-Florida)

W77-08118

STATES NEED FREEDOM TO INNOVATE (COMMENT ON PL 92-500).
Kansas Dept. of Health and Environment, Topeka.
For primary bibliographic entry see Field 6E.
W77-08119

U.S. ENVIRONMENTAL PROTECTION AGENCY ENVIRONMENTAL RESEARCH OUTLOOK FY 1976 THROUGH 1980 (REPORT TO CONGRESS).
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 6G.
W77-08120

TOWARD CLEANER WATER IN THE PACIFIC NORTHWEST AND ALASKA--THE NATIONAL WATER PERMIT PROGRAM.
Environmental Protection Agency, Seattle, Wash. Public Affairs Office.
(1975), 15 p.

Descriptors: *Water permits, *Regulation, *Administrative agencies, *Pacific Northwest U.S., Legal aspects, Water law, State governments, *Alaska, Oregon, Idaho, Pacific coast region, Pacific Ocean, Toxins, Pollutants, Water pollution, Water pollution control, Federal Water Pollution Control Act, Water pollution treatment.
Identifiers: *National Pollutant Discharge Elimination System, *National Water Permit Program, *Federal Water Pollution Control Act Amendments of 1972.

Region X of the Environmental Protection Agency (EPA) produced this pamphlet to inform the citizens of the four states in the region (Alaska, Idaho, Oregon, and Washington) of the functions of the National Pollutant Discharge Elimination System (NPDES), which is referred to as the National Water Permit Program. As part of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972, the NPDES is administered by the EPA in cooperation with state environmental agencies. The program requires that any person or organization discharging pollutants into waters of the United States must have a permit spelling out terms and timetables for the elimination of pollution. Approximately 2500 permits have been issued in the four states since the inception of the program in 1972. As a result, Biochemical Oxygen Demand pollutants are scheduled to be reduced by 85 percent and suspended solids by 63 percent as of 1977. The federal government bears 75 percent of the capital investment for treatment of sewerage facilities; states and communities are responsible for the balance. Industrial waste treatment costs must be borne by the industries themselves. (Sloan-Florida)
W77-08121

FEDERAL CONTROL OVER WETLAND AREAS: THE CORPS OF ENGINEERS EXPANDS ITS JURISDICTION,
W. F. Schneider.
University of Florida Law Review, Vol 28, No 3, p 787-800, Spring 1976.

Descriptors: *Federal Water Pollution Control Act, *Federal jurisdiction, *Landfills, *Navigable waters, *Wetlands, Standards, Permits, Pollutants, Water pollution control, Water quality control, Non-navigable waters, Dredging, Jurisdiction, Federal government, Pollution abatement.
Identifiers: *Interstate commerce, *Fill and dredge permits, National Pollution Discharge Elimination System, Fill operations, Fill permits.

Under the Federal Water Pollution Control Act (FWPCA) it is illegal to discharge any pollution into the waters of the United States without a permit. The responsibility for overseeing the permit system is delegated to the Environmental Protection Agency (EPA). Fill and dredge activities are also included within the scope of the FWPCA since destruction of a waterway can be as environmentally disruptive as pollution. Authority to administer the fill and dredge permit system lies with the United States Army Corps of Engineers. Historically, the Corps' jurisidication has been limited to only navigable waterways but a recent court decision (U. S. v. Holland) removed that limitation. The Holland court did not define 'waters of the United States' but instead held that the commerce clause of the Constitution was the only limitation on the Corps' jurisdictional power. Recent cases have concluded that the Corps' jurisdication extends over wetlands and to the mean high water mark as the boundary for navigable coastal water. In a legal memorandum, the EPA set guidelines for the Corps in implementing the National Pollution Discharge Elimination System (NPDES) permit program. The memo states that EPA will have jurisdiction over all waters affecting interstate commerce. (Denker-Florida)
W77-08123

GOVERNMENTAL INTEREST IN PROTECTING BEACH FROM ENVIRONMENTAL DAMAGE THROUGH OVERUSE OUTWEIGHS DUE PROCESS RIGHT TO BATH NUDE,
For primary bibliographic entry see Field 6E.
W77-08124

OIL AND WATER--A NEW LOOK AT THE UNIFORMITY DOCTRINE,
For primary bibliographic entry see Field 6E.
W77-08125

LET'S HAVE ACHIEVABLE 'SAFE' DRINKING WATER,
Illinois State Environmental Protection Agency, Springfield. Div. of Public Water Supplies.
I. M. Markwood, and V. Randolph.
Water and Sewage Works, Vol 122, No 5, p cover, 4, 89, (May 1975). 1 photo.

Descriptors: *Illinois, *Regulation, *Potable water, *Water quality standards, *Monitoring, Water supply, State governments, Administration, Maintenance, Design, Economic impact, Water, Water purification, Water treatment, Legislation, Public health.
Identifiers: *Administrative regulations.

The State of Illinois strongly favors legislation which will assume safe drinking water. Finding that certain aspects of the proposed interim primary regulatons will interfere with progress toward that goal, the State opposes those aspects. The regulations are deficient in three general areas: (1) the classification of all water supplies under the same requirements; (2) reliance on monitoring alone to determine whether a water system is safe; (3) failure to leave monitoring administration to the state's discretion. Illinois believes regulations should depend more on design and maintenance than on monitoring. In addition, the economic burdens imposed on many small businesses to achieve a standard equal to public water supplies is unfair. Furthermore, the state feels that the value of the testing requirements must be weighed against the economics of taking the test in order that the best use will be made of the money available for upgrading water supplies. (Rieck-Florida)
W77-08127

PL 92-500: PHOENIX V. THE EPA,
Arizona State Water and Sewer Dept., Phoenix.
A. F. Vondrick.
Water and Wastes Engineering, Vol 12, No 6, p 52-54, 58, 60 (June 1975).

Descriptors: *Municipal wastes, *Federal Water Pollution Control Act, *Arizona, *Pre-treatment(Water), Waste water(Pollution), Construction, Discharge(Water), Industries, Industrial wastes, Coliforms, Local governments, Treatment facilities, Municipal water, Regulation.
Identifiers: *Effluent limitations, *Construction Grant Program, *Discharge Permit Provisions, Industrial cost recovery, Phoenix(Ariz).

Municipal conflicts with federal bureaucracy in striving to accomplish pollution control have become classic confrontations. Phoenix, Arizona, for example, is caught in a web of frustration created by the directives of the Federal Water Pollution Control Act (FWPCA). For more than forty years the city has treated and recycled wastewater plant effluents. Despite its history of local water pollution control, pre-dating federal regulation, Phoenix has been lumped with other cities for which the Environmental Protection Agency (EPA) prescribes rules to abate pollution. The major problems with FWPCA rules and regulations center around two areas: the construction grant program and the National Pollution Discharge Elimination System (NPDES). More specifically, criticism is aimed at forcing industries with their own pre-treatment facilities to be subjected to industrial cost recovery. Further criticism questions the validity of fecal coliform as an index to determine secondary treatment efficiency. Instead of painting every locality with the same broad brush, the regulations augmenting the FWPCA should be reasonably interpreted in a flexible manner to avoid arbitrary, and somewhat irrational, regulation. Local circumstances should be considered with success being measured by the elimination of pollution and not merely by compliance with the rules. (Rieck-Florida)
W77-08128

ENVIRONMENTAL PROTECTION THROUGH THE COMMON LAW,
Calgary Univ. (Alberta). Faculty of Environmental Design.
For primary bibliographic entry see Field 6G.
W77-08133

COMPLIANCE WITH THE PROVISIONS OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED IN 1972.
For primary bibliographic entry see Field 6E.
W77-08153

NEW WATER LEGISLATION--DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION,
Wyoming Univ., Laramie. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-08188

THE EFFECT OF AERATION OF WATER JET SPREADING,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 8B.
W77-08197

EFFECTS OF PH AND INORGANIC CARBON CONCENTRATIONS UPON COMPETITION BETWEEN ANABAENA FLOS-AQUAE AND SELENASTRUM CAPRICORNUTUM,
Maine Univ., Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W77-08200

WATER ALLOCATION AND PRICING FOR CONTROL OF IRRIGATION-RELATED SALINITY IN A RIVER BASIN,
California Univ., Los Angeles. Dept. of Engineering Systems.
C. R. Scherer.
Water Resources Research, Vol. 13, No. 2, p 225-238, April 1977. 10 fig, 5 tab, 49 ref. OWRT B-170-CAL (4).

Descriptors: *Water allocation(Policy), *Water quality control, *Salinity, *Irrigation, *Dynamic programming, *Economic efficiency, Optimization, Water districts, Water rights, Pricing, Control, River basins, Downstream, Agriculture, Decision making, Operations research, Legal aspects, Hydraulics, Equations, Water yield, Watersheds(Basins), Constraints, Mathematical models.
Identifiers: Benefit maximization, Western United States.

The optimal allocation of water to sequential irrigators is considered with emphasis on downstream salinity damages caused by salt-concentrating mechanisms inherent in irrigated agriculture. Outlined is a physical hydrosalinity model that characterizes multi-irrigation district rivers and is used to develop a dynamic programming framework for the efficient allocation of water among districts. The focus is upon returns (maximization of net benefits) to farmers as a function of quantity and quality of water diverted and upon developing an operational model on which a viable water rights pricing scheme could be based. The allocation is achieved using the dynamic programming framework with decision variables of amount diverted, land irrigated, and amount of irrigation canals lined. This framework is used to investigate a scheme whereby water is purchased and held for downstream use solely as a dilutant. The basis is established in principle for an operational water rights market where all purchasers are financed by downstream beneficiaries. this framework would facilitate discovery of reallocations that are Pareto superior to existing allocations and computation of the individual purchase offer that must be made to each district to compenstate it for acreage withdrawn from irrigation under these new allocations in order to reduce salintiy impact on the downstream users. Four example solutions are presented. Probably, better resolution of salinity management problems will evolve if trade-offs and 'efficiency forntiers' are correctly perceived. (Bell-Cornell)
W77-08213

SORPTION AND FLOW OF CARBON DIOXIDE AND SOME HYDROCARBONS IN A MICROPOROUS CARBON MEMBRANE,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-08232

METHOD OF DISPERSING OIL IN WATER,
Imperial Chemical Industries Ltd., London (England). (Assignee).
P. G. Osborn, P. F. Nicks, and M. G. Norton.
U.S. Patent No. 3,996,134, 7 p, 6 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 282, December 7, 1976.

Descriptors: *Patents, *Oil spills, Oil Pollution, *Water pollution sources, *Water pollution control, Dispersion, Chemical compounds, Resins.
Identifiers: *Oil slicks.

One method of disposing of an oil slick is to disperse the oil in water as fine and stable droplets which are then less of a hazard to bird and marine life and which are more readily broken down by microbiological action. For dispersion to be effective, however, it is necessary to use a very efficient dispersing agent which has long lasting action so that the oil droplets do not readily re-agglomerate to a slick. This invention provides a method of dispersing oil slicks which is efficient and in which the dispersed oil droplets do not readily coalesce. The method is not limited to this one use but can be used in secondary oil recovery and tar-sand oil recovery. It comprises contacting the oil and water with an alkyd resin in which one component of the resin is the residue of a water-soluble polyalkylene glycol such as a polyethylene glycol. (Sinha-OEIS)
W77-08260

PUMP-FILTER FOR BILGE WATER,
P. Jakubek, and K. Biswanger.
U.S. Patent No. 3,996,136, 13 p, 12 fig, 2 tab, 14 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 283, December 7, 1976.

Descriptors: *Patents, Water pollution, *Water pollution treatment, Oil pollution, *Oily water, Water quality control, Separation techniques, Filtration, Equipment.
Identifiers: *Bilge water treatment.

The polluted liquid is fed into a separation chamber in the bottom of a two-part housing where it undergoes a preseparation so that the liquid pollutant rises to the top of the liquid in this separation chamber. A pump has its intake connected to this separation chamber at a lower region and has its output connected to an upper compartment of a compensation chamber above the separation chamber and subdivided into this upper compartment and a lower compartment by a filter. The liquid passes vertically down through this filter in the compensation chamber and is then withdrawn in a highly pure state from the lower compartment. The pump is only operated when the liquid level in the separation chamber is above a predetermined minimum level.
W77-08261

BIOCHEMICAL TRANSFORMATION AND DETOXIFICATION OF MERCURY IN AQUATIC ENVIRONMENT,
Georgia Univ., Athens. Dept. of Food Science.
For primary bibliographic entry see Field 5C.
W77-08289

DETECTION OF PHOSPHATE ADSORPTION ONTO COAL HUMIC ACIDS,
Missouri Univ.-Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-08294

27TH NORTHWEST FISH CULTURE CONFERENCE.
For primary bibliographic entry see Field 2I.
W77-08309

DIFFUSE AGRICULTURAL POLLUTION: THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS,
Wisconsin Univ. Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W77-08329

ECONOMIC IMPACTS OF CONTROLLING WATER QUALITY IN AN IRRIGATED RIVER BASIN,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
G. H. Pfeiffer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 113, Price codes: A13 in paper copy, A01 in microfiche. PhD Thesis, 1976. 273 p, 18 fig, 60 tab, 105 ref, 3 append. OWRT B-059(WASH)(1). 14-31-0001-5125.

Descriptors: Irrigation, *Return flow, Water quality control, *Irrigation efficiency, *Economic impact, River basins, Pollutant abatement, *Washington, Environmental control, *Water temperature, Sediment transport, Costs, Nitrates, Nitrogen.
Identifiers: *Yakima River basin(Wash), *Sediment loss, *Nitrate nitrogen, *Non-point pollution sources.

The nature of non-point discharges of effluents into the environment makes direct control of environmental quality impossible. Economic theory suggests, however, that efficient pollution abatement is possible by controlling the use of those inputs functionally related to environmental degradation rather than controlling the effluents themselves. Water quality degradation caused by irrigation return flows is an example of the effects of non-point discharges which can only be controlled by restrictions on input use. The objective of this study was to examine the economic impacts of policies affecting agriculture which would improve water quality in the Yakima River. The Yakima River Basin is an intensively cultivated river basin in which the major user of river water is irrigated agriculture. Three environmental quality parameters were identified for evaluation: nitrate nitrogen concentration in the river, water temperature in the river, and annual sediment lost for farms in the Basin. The results show that substantial improvements in environmental quality in the Yakima River are possible, but only at significant social and producer costs. These costs must be compared with the benefits of improved environmental quality in order to determine appropriate abatement policies and water quality standards.
W77-08332

METHODOLOGY AND DATA FOR ANALYZING QUANTITY, QUALITY AND ECONOMIC ASPECTS OF MINIMUM STREAMFLOWS, APPENDICES, VOLUME 2,
Washington Univ., Seattle. Dept. of Economics.
J. A. Crutchfield, B. W. Mar, J. W. Crosby, III, and J. F. Orsborn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 065, Price codes: A14 in paper copy, A01 in microfiche. Washington Water Research Center, Pullman, Dec 1975. 303 p. OWRT B-037-WASH(2). 14-31-0001-3349.

Descriptors: *Methodology, *Water quality, *Water supply, *Economics, Flow, *Low flow, Minimum flow, Water allocation(Policy), Competing uses, *Legal aspects, Preferences(Water rights), *Washington, *Water conservation, Recreation, Aesthetics.
Identifiers: *Instream flow.

The study was undertaken to develop methodologies for establishing the legally prescribed minimum flows and levels in streams and lakes in the State of Washington. As more states attempt to preserve their natural resources through the enactment of legislation, their efforts provide a valuable experience record. But, in establishing 'minimum' or 'base' flows in streams for the protection of natural values, the development of methodology to apply the laws has not been accomplished and is of particular concern to both state and federal agencies. The overal objective of this study has been to develop methods for analysis of the quantity, quality and economic factors associated with the establishment of low-flow criteria for conservation, recreation and aesthetic purposes. Volume 1 of this report (see W74-07847) was prepared to describe various aspects of the problems associated with the establishment under law of minimum streamflows for preservation of instream values. Volume 2 provides more detailed information and data on those aspects.
W77-08349

CHANNELIZATION: ENVIRONMENTAL, GEOMORPHIC AND ENGINEERING ASPECTS,
North Carolina Univ. at Charlotte. Dept. of Geography and Earth Science.
For primary bibliographic entry see Field 8D.
W77-08352

THE IMPORT - EXPORT CLAUSE AND CONTROL OF OIL POLLUTION: REGULATORY FEE IMPOSED PURSUANT TO THE POLICE POWER,
P. J. Lipscomb.
Boston University Law Review, Vol 54, No 3, p 610-36, May 1974.

Descriptors: *Maine, Oil pollution, *Oil spills, *Consitutional law, Shore protection, Coasts, Harbors, Water pollution sources, Legislation, Legal aspects, Environmental control, Federal government, Public health, State jurisdiction, Ships.
Identifiers: *Hazardous substances(Pollution), Supertankers, Marine environment, Absolute liability.

The Maine Legislature enacted the Oil Discharge Prevention and Pollution Control Act of 1970 in recognition of the fact that, as the only East Coast state capable of accommodating the increased traffic of oil supertankers, the risks of oil spills on Maine's shores are likely to increase. Under the Act, the state's oil terminals are required to purchase a license, the cost of which is directly related to the number of barrels of oil transferred over water. The fund thus created covers the cost of oil spill clean-up operations and damage awards to private parties, with the state recouping these costs from the terminals involved based on an absolute liability provision. The validity of the statute was challenged by terminal operators, and the question of whether the Maine high court properly held the fee to conform to the Import - Export Clause of the Constitution is the subject of this case comment. The author, however, postulates while it is a direct levy, it should be considered valid, because it is not a revenue measure, but is enacted pursuant to the state's police power to protect the public welfare. (Jones - Florida)
W77-08354

EPA FOCUSES ON MUNICIPAL ENFORCEMENT,
For primary bibliographic entry see Field 6E.
W77-08355

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS,
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol. 41, No. 238, p. 53930-38, December 9, 1976.

Descriptors: *Federal Water Pollution Control Act(FWPCA), *Lumbering, *Waste water treatment, *Water quality standards, *Regulation, Standards, Administrative agencies, Federal government, Chemicals, Industrial wastes, Toxicity, Effluents, Costs, Economic impact, Water quality control, Pollutants, Public health, Pollution, Pulp and paper industry, Wood wastes.
Identifiers: *Administrative regulations, *Timber products processing.

The Environmental Protection Agency (EPA) has promulgated in interim final form effluent limitations and guidelines for existing sources and standards of performance for new sources for the timber products processing point source categories. The EPA has received and commented upon statements from the public-at-large concerning the proposed regulations. The Commissioner expects no adverse economic effect for any member of the timber processing subcategory other than the wood preserving subcategories as a result of the regulations. Specific pollutants curtailed by the regulations include phenolic, COD and oil. Practices and procedures suggested to reduce the quantity of effluents include the elimination of equipment and piping leaks, the minimization of spills by the use of good housekeeping techniques, recovery and reuse of contaminated water, and segregation of contaminated and uncontaminated water streams. The estimated expense for control of waste water pollutants is a $138,500 capital cost and a $52,480 annual cost. (Moorhouse-Florida)
W77-08356

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY PRETREATMENT STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 242, p 54850-54, December 15, 1976.

Descriptors: *Federal Water Pollution Control Act(FWPCA), *Metals, *Aluminum, *Copper, *Waste water treatment, *Water quality standards, Regulation, Standards, Administrative agencies, Federal government, Cadmium, Zinc, Chemicals, Water quality control, Pollutants, Economic impact, Pollutions, Costs, Effluents, Toxicity, Industrial wastes.
Identifiers: *Administrative regulations, *Nonferrous metals manufacturing.

The Environmental Protection Agency (EPA) has established effluent limitations and guidelines in interim final form for the nonferrous metals manufacturing point source category. The public were afforded an opportunity to respond and the EPA has summarized their comment. The director anticipates that the economic effects of these regulations will be minor. Copper and aluminum compose the major industries in the nonferrous metals manufacturing category. Type of product, raw waste load, type of manufacturing process and treatability of waste water were all considered in determining the standards. Wastewater pollutants sought to be curtailed by these standards are pH, COD, zinc, copper, cadmium, chloride, ammonia, and oil and grease. Technology suggested in order to reduce toxic effluents included settling and grease traps as well as in-plant reuse and recycle waste water processes. (Moorhouse-Florida)
W77-08357

TOXIC POLLUTANT EFFLUENT STANDARDS FOR BENZIDINE.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 42, No 8, p 2617-21, January 12, 1977.

Descriptors: *Federal Water Pollution Control Act(FWPCA), *Chemical industry, *Water quality standards, Regulation, Standards, Chemicals, Industrial wastes, Effluents, Costs, Monitoring, Water quality control, Public health, Federal government, Legislation, Pollutants, Water pollution control, Environmental effects, Administrative agencies, Cost-benefit analysis, Textiles, Water pollution sources, Navigable waters.
Identifiers: *Carcinogens, *Benzidine, Administrative regulations.

Pursuant to section 307(a)(2) of the Federal Water Pollution Control Act (FWPCA) of 1972, the Environmental Protection Agency (EPA) proposed toxic pollutant effluent standards for the chemical benzidine. The regulations establish effluent standards for all manufacturers of benzidine and benzidine-based dyes and the principal users of benzidine-based dyes who discharge directly into navigable waters. Standards are proposed for both existing and new sources. The principal applicator categories, and those which are covered in the EPA's standards, are manufacturers of paper goods, leather goods and textile goods who use benzidine-based dyes in their processes. Despite objections over the cost of monitoring from chemical manufacturers, the EPA believes the cost of mass balance monitoring is quite small. No evidence was introduced at the hearings to the contrary. Whatever minimal costs there may be would appear to be justified in order to insure that the industry continues to comply with the EPA's effluent standards for benzidine. This would assure the requisite protection of human health from exposure to this proven carcinogen is being provided. (Rieck-Florida)
W77-08359

EFFLUENT GUIDELINES AND STANDARDS FOR FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, NITRIC ACID SUBCATEGORY.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 11, p 2386-88, January 16, 1976.

Descriptors: *Fertilizers, *Nitrogen compounds, *Ammonium compounds, *Agricultural chemicals, Water pollution sources, Water pollution, Administrative agencies, Federal government, Effluents, Industrial wastes, Liquid wastes, Waste water(Pollution), Regulation, Ships, Gases, Nitrogen, Ammonia, Organic compounds.
Identifiers: *Administrative regulations, *Effluent limitations.

The Environmental Protection Agency (EPA) has amended 40 CFR 418 concerning the Fertilizer Manufacturing Point Source Category. Previous regulations for the nitric acid subcategory of the fertilizer manufacturing point source category required no discharge of process wastewater pollutants into navigable waters. As a result, twelve fertilizer manufacturers joined in a petition for judicial review of the nitrogen fertilizer regulations. The companies demonstrated a need for a leaks and spills amendment to the regulations. The EPA rejected such an approach and instead amended the regulations to allow limited discharges from the sources that were identified. Shipping losses are excluded from the new regulations. Good housekeeping, prompt and regular maintenance, and careful operations will tend to minimize the losses from shipping. (Moorhouse-Florida)
W77-08360

SOVEREIGNTY AND THE CONTROL OF WATER POLLUTION,
D. G. Lehv.
Environmental Affairs, Vol 2, No 2, p 421-43 (Fall 1972).

Descriptors: *Massachusetts, *Governmental interrelations, *Local governments, *State governments, Legal aspects, Governments, Administration, Legislation, Government finance, Regulation, Water law, Pollution, Costs, Taxes, Financing, Judicial decisions, Penalties(Legal), Waste water(Pollution).
Identifiers: Mandamus, Sovereignty, Police power, Fines.

Grafton, Massachusetts, by its refusal to appropriate funds for the construction of a municipal sewage treatment facility has clearly demonstrated the need for different methods of judicial and administrative enforcement of state directives. That waste treatment and other facets of pollution control are within the scope of the police power of the state is uncontested. The conflict arises when the exercise of that power contravenes municipal determinations. Massachusetts courts have long recognized the superiority of the state in such conflicts. The existing judicial remedies of civil contempt, criminal contempt, and criminal prosecution have proven ineffective. Imposition of fines is one alternative. However, Grafton ignored a $2000 fine. The issuance of a writ of mandamus is unlikely, since construction of municipal facilities is a discretionary duty. Another alternative would be to treat the municipality as a judgment-debtor of the state. Thus mandamus could compel the levying of taxes for payment of the debt, or city funds could be sequestered. Cities may be immune to these methods, however. Perhaps the only viable remedy is legislative enactment of a general law providing for the creation of autonomous sewer authorities whenever municipalities refuse compliance with state orders to abate pollution. (Moorhouse-Florida)
W77-08366

LEGAL CONTROL OF CONSUMPTIVE WATER USE IN PENNSYLVANIA POWER PLANTS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Office of Enforcement.
For primary bibliographic entry see Field 3E.
W77-08368

PROPOSED EFFLUENT GUIDELINES AND STANDARDS FOR IRON AND STEEL MANUFATURING,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 61, p 13015-30, March 29, 1976.

Descriptors: *Effluents, *Steel, *Iron alloys, *Structural steel, *Iron, Metals, Iron compounds, Administrative agencies, Regulation, Federal government, Wastes, Water pollution sources, Industrial wastes, Liquid wastes, Waste water(Pollution), Waste water disposal, Heavy metals, Metallurgy.
Identifiers: *Administrative regulations, *Effluent limitations.

The Environmental Protection Agency (EPA) has proposed effluent limitations for existing sources, standards of performance and pretreatment standards for new sources and pretreatment standards for existing sources concerning the iron and steel manufacturing point source category. Specific operations affected hereby are the hot forming-primary subcategory, the hot forming-section subcategory, the hot forming-flat subcategory, the pipe and tube subcategory, the pickling-sulfuric-acid-batch and continuous subcategory, the pickling-hydro-chloric-acid-bath and continuous subcategory, the scale removal-kolene and hydride subcategory, the wire pickling and coating subcategory, the continuous aldaline cleaning subcategory. The proposed regulations are in accordance with the goal of the best practicable control technology available by July, 1977. (Moorhouse-Florida)
W77-08370

EFFLUENT GUIDELINES AND STANDARDS FOR CANNED AND PRESERVED FRUITS AND VEGETABLES POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 75, p 16272-86 April 16, 1976.

Descriptors: *Federal Water Pollution Control Act, *Canneries, *Water quality standards, *Regulation, *Waste water treatment, Standards, Administrative agencies, Federal government, Water pollution sources, Water pollution control, Effluents, Industrial wastes, Water quality control, Industrial plants, Industrial production, Industrial water, Economic impact, Biochemical oxygen demand.
Identifiers: *Administrative regulations, *Effluent limitations, Effluent guidelines, Point sources(Pollution), Pretreatment standards(Effluent).

The Environmental Protection Agency has established final regulations setting guidelines and standards for effluent limitations for the canned and preserved fruits and vegetables point source category. Significant changes from the proposed regulations include a more accurate and representative characterization of raw waste loads, a revision of the industry subcategorization and an easing of discharge limitations due to new data regarding treating systems. Limitations are established controlling the quantities of BOD5, and TSS and the quality of pH which may be discharged by fruit processing plants, vegetable processing plants and specialty foods processing plants. Specialty products include baby food, potato chips, ethnic foods, jams and jellies, mayonnaise, soups, and tomato-starch-cheese canned specialties. The EPA has summarized the comments made on the regulations by members of the canned and preserved fruits and vegetables industries and has responded there to. (Moorhouse-Florida)
W77-08371

THE 1972 WATER POLLUTION CONTROL ACT: UNFORESEEN IMPLICATIONS FOR LAND USE PLANNING,
A. B. Federman.
The Urban Lawyer, Vol 8, No 1, p 140-55 (Winter 1976).

Descriptors: *Waste water treatment, *Land use, *Sewage treatment, *Federal Water Pollution Control Act, Grants, Interceptor sewers, Sewage, Sewerage, Land development, Land management, Financial feasibility, Costs, Government finance, Financing, Local governments, Federal government, Political aspects, Planning, Long-term planning, Projections, Project planning.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Environmental impact statement.

Title II of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) provides for grants for sewage treatment systems. Upon approval by the Environmental Protection Agency (EPA), areas having a substantial water quality control problem can receive up to 75 per cent of the cost of a regional treatment project. Encouraging areawide plans has had adverse effects on local land use control. Requiring that plans anticipate needs over a twenty year period has led to unnecessarily large and extensive sewage systems. Although the EPA has been reluctant to consider these implications of the FWPCA, there are three alternatives by which the EPA could influence local land use planning: (1) withold all funds for interceptor construction; (2) change the 75 percent grant to a matching formula; or (3) limit reserve capacity in a system to a specific fraction of initial flow. While the first alternative would result in more realistic population projections it could lead to decreased regionalization. The second alternative provides no control over the configuration of interceptors. Full 75 percent financing of a limited capacity system with additional capacity locally financed would provide a workable solution. Furthermore, local participation in planning stages could be increased by requiring public hearings and environmental impact statements exploring the adverse impact of expanded sewage treatment systems. (Moorhouse-Florida)
W77-08373

REPORT ON WATER RESOURCES PROBLEMS OF WESTERN COLLIER COUNTY, FLORIDA AS AFFECTED BY THE GAC CORPORATION'S CANAL SYSTEM IN ITS GOLDEN GATE DEVELOPMENT PROJECT,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-08380

PUBLIC HEARING REGARDING 180-DAY NOTICE TO THE SANTA FE LAND IMPROVEMENT COMPANY OF VIOLATION OF STATE AND FEDERAL WATER QUALITY STANDARDS FOR THE INTERSTATE WATERS OF THE KANSAS AND MISSOURI RIVERS, HELD AT KANSAS CITY, KANSAS ON 13 JULY 1971.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 924, Price codes: A04 in paper copy, A01 in microfiche. Transcript of Proceedings (1971), 70 p.

Descriptors: *Rivers and Harbors Act, *Environmental effects, *Sewage disposal, *Sewage treatment, *Administrative decisions, Kansas, *Missouri River, Missouri, Administration, Administrative agencies, Ultimate disposal, Sewage, Sewers, Disposal, Environmental control, Public health, Waste treatment, Wastes, Waste water disposal, Waste disposal, Water quality control.
Identifiers: *Kansas River.

Discharge of untreated sewage into a navigable river is in violation of the Federal Water Pollution Control Act and the 1899 Rivers and Harbors Act. In June 1971 the Administrator of the Environmental Protection Agency (EPA) notified the Santa Fe Land Improvement Company of Amarillo, Texas, that its operations located on and discharging effluent into the Kansas River constituted violations of the established state and federal water quality standards. In an effort to solve the problem, an informal public hearing was held involving the EPA, representative of Kansas Department of Health, and Department of Boulevards, Parks and Streets, the City Attorney for Kansas City, Kansas, and, Santa Fe Land Improvement Company. The parties agreed that they would cooperate in arriving at a remedial schedule by which Santa Fe would connect its sewers to those of Kansas City. Hopefully this joint effort will solve the pollution problem and avoid costly litigation. If the matter is not satisfactorily resolved by voluntary action, an abatement action may be brought against Santa Fe pursuant to the Federal Water Pollution Control Act. (Josepher-Florida)
W77-08381

ENVIRONMENTAL LAW-APPLICATION OF THE REFUSE ACT OF 1899 TO CONTINUAL INDUSTRIAL DISCHARGES IS UPHELD WITHOUT FORMALIZED PERMIT PROCEDURES,
J. J. Burton, Jr.
Emory Law Journal, Vol 23, p 281-92 (1974). 78 ref.

Descriptors: *Judicial decisions, *Water pollution control, *Water permits, *Law enforcement, Industrial wastes, Navigable rivers, Pollution abatement, Legal aspects, Permits, Water law, Legislation, Navigation, Pennsylvania, Federal government, Industrial plants, Water pollution sources, Penalties(Legal), Legal review, Regulation.
Identifiers: *Navigation obstructions, *Refuse Act of 1899, Defenses, Reliance, Corps of Engineers, Water Quality Act of 1965, Federal Water Pollution Control Act Amendments of 1972, Monongahela River.

In United States v. Pennsylvania Industrial Chemical Corp. (PICCO) the United States Supreme Court held that the absence of a formal regulatory permit program does not preclude prosecution for violation of the Refuse Act of 1899. However, relevant evidence of defendant's reliance on a limited construction of the statute by the agency responsible for its administration must be admitted. The Refuse Act has been subject to various interpretations. In 1966 the Supreme Court expanded the scope of the Act to include prohibition of all pollutant discharges into navigable waters regardless of their effect on navigation. The Court subsequently held that more modern legislation did not supercede or limit the Refuse Act. However, the Corps of Engineers, charged with administration of the Act, failed to accept the broader duty to control all pollution of navigable waters and acted only on navigation-impeding discharges. Since the restrictive interpretation given the Act by the Corps was not clearly erroneous, reliance on the administrative construction of the statute presented a viable defense. In the instant case, PICCO asserted that they had relied on the Corps' interpretation of the statute. The government contended that judicial precedent and recent publicity provided notice of the correct construction. The Supreme Court found that exclusion of reliance evidence was error. The Court thus opened the door to judicial battles over this defense, and substantially undercut the recently acquired strength of the Refuse Act. (Moorhouse-Florida)
W77-08382

EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR NEW SOURCES FOR THE BLEACHED KRAFT, GROUNDWOOD, SULFITE, SODA, DEINK AND NON-INTEGRATED PAPER MILLS SEGMENT OF THE PULP, PAPER, AND PAPERBOARD POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 40, No 173, p 41300-25, September 5, 1975. 75 tab.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Sulfite liquors, *Wood wastes, *Chemical wastes, *Federal Water Pollution Control Act, Administrative decisions, Administrative agencies, Regulation, Effluents, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control.
Identifiers: *Federal Water Pollution Control Act(FWPCA) Amendments of 1972.

Pursuant to the authority of the Federal Water Pollution Control Act (FWPCA), the Environmental Protection Agency (EPA) hereby gives advance notice of intent to promulgate effluent limitation guidelines for existing sources and standards of performance and pretreatment for new sources in the bleached kraft, groundwood, sulfite, soda, deink and non-integrated paper mills segment of the pulp, paper and paperboard point source category. The proposed regulations divide the point source category into 11 distinct subcategories: dissolving kraft, market kraft, BCT kraft, fine kraft, papergrade sulfite, dissolving sulfite, GW-chemi-mechanical, GW-thermo-mechanical, GW-CMN papers, GW-fine papers, soda, deink, NI fine papers, NI tissue papers and NI tissue FWP. For each subcategory limitations are set representing the reduction attainable through use of best available technology and through use of best available technology economically achievable. Where applicable, guidelines for use of wet woodyard operations are separately stated. Each sub-category also contains pretreatment and performance standards for new sources. (Comer-Florida)
W77-08383

OIL SPILLS AND SPILLS OF HAZARDOUS SUBSTANCES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
Oil and Special Materials Control Division, March 1975. 29 p, 32 ref, 57 photo.

Descriptors: *Oil pollution, *Regulation, *Oil spills, Hazards, Disasters, Water pollution sources, Oil, Oil industry, Oil wastes, Legal aspects, Environmental effects, Water law, Remote sensing, Penalties(Legal), Law enforcement, Planning, Oily water, Cleaning.
Identifiers: *Hazardous substances(Pollution), *Administrative regulations.

The primary objective of the Environmental Protection Agency's (EPA) oil and hazardous substance spill program is to protect water quality through the prevention of spills. Various measures have been taken by the EPA to prevent spills and minimize their impact on the environment. Recognizing that the causes of oil spills are many, the EPA has published oil pollution prevention regulations requiring a Spill Prevention and Countermeasure (SPCC) Plan. The plan is flexible and functions under EPA guidelines. It requires owners and operators to prepare oil spill prevention plans, which must be certified by a Professional Engineer. As a guide the EPA has published a list of hazardous polluting substances. Should spills still result, the EPA is prepared to impose civil penalties. The EPA is continuing its investigations into methods for cleaning up spills. Some methods discussed include: Procedures for cleaning up slow-moving water; water soluble hazardous substances; and oily sand. Spill surveillance devices such as modern remote sensing systems are being used to quickly detect oil spills. Several recent spectacular spills are identified and discussed. (Hadoulias-Florida)
W77-08385

AMERICAN FROZEN FOOD V TRAIN ('GUIDELINES' AND 'EFFLUENT LIMITATIONS' FOR THE POTATO PROCESS INDUSTRY PURSUANT TO THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972).
For primary bibliographic entry see Field 6E.
W77-08386

AMERICAN PETROLEUM INSTITUTE V ENVIRONMENTAL PROTECTION AGENCY (CHALLENGE TO EPA STANDARDS FOR REFINERIES UNDER THE FWPCA AMENDMENTS OF 1972).
For primary bibliographic entry see Field 6E.
W77-08394

OHIO LIQUID DISPOSAL, INC V DAWE (DEFINING 'WATERS OF THE STATE' WITHIN WATER POLLUTION CONTROL STATUTE).
For primary bibliographic entry see Field 6E.
W77-08401

CITY OF YORK V. PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES (DELEGATION OF AUTHORITY UNDER THE PENNSYLVANIA WASTE MANAGEMENT ACT).
For primary bibliographic entry see Field 6E.
W77-08403

WATER RESOURCES COMMISSION V. CONNECTICUT SAND AND STONE CORPORATION (JUDICIAL REVIEW OF ADMINISTRATIVE FACTUAL DETERMINATION).
For primary bibliographic entry see Field 6E.
W77-08404

THE RATIONALE FOR ATTEMPTING TO DEFINE SALT MARSH MOSQUITO-BREEDING AREAS IN GALVESTON COUNTY BY REMOTE SENSING THE ASSOCIATED VEGETATION.
Lockheed Electronics Co., Houston, Tex.
For primary bibliographic entry see Field 4A.
W77-08428

APPLICATION OF EREP, LANDSAT AND AIRCRAFT IMAGE DATA TO ENVIRONMENTAL PROBLEMS RELATED TO COAL MINING,
Earth Satellite Corp. Washington, D. C.
For primary bibliographic entry see Field 5A.
W77-08429

REMOTE SENSING APPLICATIONS IN THE INVENTORY AND ANALYSIS OF ENVIRONMENTAL PROBLEMS,
Environmental Protection Agency, Warrenton, Va. Environmental Photographic Interpretation Center.
For primary bibliographic entry see Field 5A.
W77-08438

FOX CHAIN OF LAKES INVESTIGATION AND WATER QUALITY MANAGEMENT PLAN,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2H.
W77-08442

A STUDY OF COOLING INITIALLY UNIFORM AND THERMALLY STRATIFIED LAYERS OF WATER,
Purdue Univ. Lafayette, Ind. School of Mechanical Engineering.
M. Behnia.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 123, Price codes: A07 in paper copy, A01 in microfiche. Master of Science Thesis, December 1975. 123 p, 39 fig, 46 ref, 2 append. OWRT A-029-IND(11).

Descriptors: *Water cooling, *Water temperature, *Convection, Thermal conductivityy, *Thermal radiation, *Thermal stratification, Thermal pollution, Model studies, Evaporation, Water pollution.
Identifiers: Mach-Zehnder Interferometer.

A laboratory study is described of the cooling of initially uniform and thermally stratified layers of water by convection, evaporation, and radiation. Temperature measurements were made with a Mach-Zehnder interferometer and the flow field was visualized by electro-chemical dye. A lake was simulated in a 40 x 25 x 10 cm cell. Thermal stratification was induced by tungsten lamps in parabolic reflectors which produced collimated incident radiation flux. For the uniform temperature cell, water descended by free convection to a depth of 10-25 cm. The cooling rate had a decisive influence on the frequency of the descending parcels of cooler water. Mixing motion occurred near the surface in the thermally stratified cell. The motion had an initial regular roll pattern, but as cooling continued, the roll pattern in the convective layer deteriorated into motion similar to that observed during cooling of an initially uniform temperature layer of water. A model was developed to predict the dynamics of the convective layer. The numerical solution to the model equation was found to agree better with the experimental data than alternatives based on the closed form analytical solution using a constant average surface heat flux.
W77-08444

SELECTIVE WITHDRAWAL AND HEATED WATER DISCHARGE: INFLUENCE ON THE WATER QUALITY OF LAKES AND RESERVOIRS PART I - SELECTIVE WITHDRAWAL,
Wisconsin Univ. -Madison. Dept. of Civil and Environmental Engineering.
P. L. Monkmeyer, J. A. Hoopes, J. C. Ho, and G. R. Clark.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 237, Price codes: A05 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, 1977. 69 p, 20 fig, 47 ref. OWRT B-080-WIS(8), 14-31-0001-3550, 14-31-0001-3850.

Descriptors: Hydraulics, *Impoundments, *Stratified flow, *Withdrawal, *Destratification, *Water quality, *Model studies, *Heated water, Discharge(Water), Lakes, Reservoirs, Hypolimnion, Forecasting.
Identifiers: *Selective withdrawal, Bottom withdrawal.

A variety of methods have been proposed to improve the water quality of lakes and reservoirs. This work is directed toward the overall improvement of water quality in a reservoir through the removal of the poor quality, hypolimnetic water. In particular, theoretical and experimental investigations on selective withdrawal of a viscous, non-diffusive, linearly-stratified fluid from the bottom and intermidiate depths of a reservoir have been carried out. The governing differential equations which describe planar and axisymmetric withdrawal are derived. In the case of bottom withdrawal a momentum integral technique that retains inertial effects is employed. This is in contrast to the intermediate axisymmetric withdrawal case, where a non-inertial similarity approach is used. In each case, theoretical horizontal velocity profiles are obtained together with expressions for

the thickness of the layer of hypolimnetic water withdrawn. Expressions are also derived in each case to predict the quality of the water withdrawn. Laboratory experiments are described; the results obtained verify the theoretical predictions reasonably well. Procedures for predicting the withdrawal layer thickness and discharged water quality in an actual reservoir are discussed.
W77-08447

RECLAMATION AND USE OF DISTURBED LAND IN THE SOUTHWEST.
University of Arizona Press, Tucson, Thames, J.L., ed., 1977. 63 fig, 42 tab, 654 p. $8.50.

Descriptors: *Reclamation, *Environmental effects, *Irrigation systems, *Mine wastes, *Strip mine wastes, *Southwest US, Mining, Irrigation, Water resources, Land use, Sprinkler irrigation, Irrigation efficiency, Hydrology, Wastes, Water pollution sources, Strip mines.
Identifiers: Trickle irrigation, Drip irrigation.

This volume is the result of a symposium on reclamation and land use in the Southwest, held January 1975 at the University of Arizona, Tucson. Its purpose is to contribute to an understanding of the constraints, alternatives and techniques in the reclamation of lands disturbed by mining and to present the latest results of major research efforts. The 33 articles by several authors are concerned with various facets of reclamation, including the advantages and disadvantages of the sprinkler system and drip or trickle irrigation as an effective way to facilitate revegetation of problem areas. Also discussed is use of water by the mining industry and the effects on the environment. (Jamail-Arizona)
W77-08452

WATER QUALITY IN THE TEXAS COASTAL BASINS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 5B.
W77-08465

RESPONSE OF OAT AND SPINACH TO SEWAGE SLUDGE APPLICATION IN SOIL,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 5C.
W77-08495

DESIGN OF A WATER QUALITY MONITORING NETWORK,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W77-08497

PREDICTION MODELS OF REAERATION RATE FOR MOUNTAIN CREEKS,
Utah State Univ. Dept. of Civil and Environmental Engineering.
K. D. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 581, Price codes: A08 in paper copy, A01 in microfiche. M. S. Thesis, 1975. 138 p, 5 fig, 5 tab, 2 append. OWRT B-095-UTAH(2). 14-31-0001-4132.

Descriptors: Dispersion, Dissolved oxygen, *Mathematical models, Mixing, *Reaeration, Turbulence, *Utah, Model studies, Water pollution sources, Path of pollutants.
Identifiers: *Summit Creek(Utah), Smithfield(Utah), Reoxygenation, *Mountain creeks.

Reaeration process studies were conducted on a mountain creek and a large laboratory flume. The method of evaluating the dispersion coefficient, mean velocity, and reaeration coefficient for both creek and flume consisted of finding these values for a deoxygenated portion of the flow containing a conservative tracer (dye). The deoxygenated slug is measured as it moves downstream and the three values are best fit in the analytical solution of the longitudinal dispersion equation which dynamically describes the flow of the dispersing slug in the stream. The best fit was acomplished by using the method of least squares in which the sum of squares of the differences between and dissolved oxygen and dye concentrations calculated from the dispersion equation and those obtained from the actual measurements is minimized. A reaeration coefficient prediction model of general form was developed. The model is composed of two dimensionless parameters which were determined from the dissolved-oxygen balance equation. The model parameters were evaluated specifically for the mountain creek and laboratory flume. A comparison of this model with existing models revealed that most existing models are incomplete in form. Inclusion of the dispersion coefficient in the reaeration coefficient model improved the prediction accuracy.
W77-08501

PROGRESS IN MHI'S INTEGRATED TECHNIQUES FOR ENVIRONMENTAL PROTECTION,
Mitsubishi Heavy-Industries Ltd., Tokyo (Japan). Environmental Technology Dept.
For primary bibliographic entry see Field 5D.
W77-08533

DESIGN AND OPERATION OF RAIN RETENTION BASINS (ENTWURF UND BETRIEB VON REGENRUCKHALTEBECKEN),
For primary bibliographic entry see Field 8A.
W77-08547

AERATORS CONTROL LIFT STATION ODOR AND CORROSION,
Mullins (W. H.), Inc., San Antonio, Tex.
W. H. Mullins.
Water and Sewage Works, Vol. 124, No. 3, p 75, March, 1977.

Descriptors: *Aeration, Wells, *Odor, *Corrosion control, Sewage treatment, Organic matter, Solid wastes, Hydrogen sulfide, Performance, Color, Dissolved oxygen, Biochemical oxygen demand, Trickling filters, Treatment facilities, Equipment, Effluents, Waste water treatment.
Identifiers: Lift stations, Wet wells.

A preaeration process for the control of odor and corrosion at lift stations was described. Aerators with self-priming centrifugal pumps mix atmospheric oxygen with raw sewage to reduce organic solids to macroscopic size, to free solids from embedded and clinging gas particles, and to float suspended grease. Approximately 1,100 gallons of raw sewage can be circulated per minute. Recirculation from the wet well back to the first upstream manhole eliminates the release of hydrogen sulfide from raw sewage into the wet well. Upstream recirculation carries a raw sewage DO that varies from 4 to 6 milligrams/liter. Raw sewage color is changed from black to a foamy light tan. In addition to controlling odor and corrosion, this system also caused only grease to float on the surface of the primary clarifier; its effluent was relatively clear. The primary clarifier consistently removed 90-95% of settleable solids and 65-70% of BOD. The high degree of grease removal benefits the trickling filter secondary system of the treatment plant. BOD reduction between raw sewage at the lift station and at the plant varied from 10 to 20% depending on the time of day samples were taken. (Collins-FIRL)
W77-08567

OIL-FLUSHED TOILETS GAIN,
For primary bibliographic entry see Field 3D.
W77-08583

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

IMPLEMENTATION OF AN OPTIMIZATION MODEL FOR OPERATION OF A METROPOLITAN RESERVOIR SYSTEM,
Southern Methodist Univ., Dallas, Tex. School of Engineering and Applied Science.
For primary bibliographic entry see Field 4A.
W77-08211

WATER AND ENERGY SYSTEMS: A PLANNING MODEL,
Illinois Univ., at Urbana-Champaign. Inst. for Environmental Studies.
E. D. Brill, Jr., S. G. Velioglu, and R. W. Fuessle.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12902, May 1977, p 17-32. 4 fig, 3 tab, 22 ref. OWRT B-o92-ILL(3).

Descriptors: *Water resources develment, *Alternative planning, *Optimization, *Economic efficency, *Energy, *Linear progamming, *Water supply, *Watet allocation(Policy), Constraints, Evaluation, Demand, Electric power, *Illinois, Poweplants, Equations, Mathematical models, Operations research, *Regional analysis.
Identifiers: *Regional planning, Cost minimizaon, Screening model, Sensitivity analysis, Pipeline gas, Systems engineering.

In regions where energy facilities place major demands on the water resources, it is desirable to plan the development of these systems with an understanding of their interrelationships. Described is a mathematical model of these interlocking systems. The major model components are the supply and demand points for water, electrical power, and pipeline gas that is produced from coal. The model allocates water to the various demands and locates energy facilities by subregions. Linear programming is utilized to evalute the model which is designed for preliminary screening purposes. The objective function is to minimize the sum of the site-dependent supply costs of water and the transportation costs for water, coal, electricity, and gas. An application of the model in Illinois demonstrates the utility of sensitivity analysis and parameterization techniques for examining trends and tradeoffs for alternative regional plans. The example also demonstrates the interrelated nature of the water resources and energy systems and demonstrates the potential impact of a large new coal-conversion industry on water resources. (Bell-Cornell)
W77-08212

WATER ALLOCATION AND PRICING FOR CONTROL OF IRRIGATION-RELATED SALINITY IN A RIVER BASIN,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 5G.
W77-08213

MINIMIZING COSTS IN WELL FIELD DESIGN IN RELATION TO AQUIFER MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W77-08214

NETWORK EVALUATION OF WASTEWATER COLLECTION ECONOMICS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-08331

OPTIMAL LAYOUT AND DESIGN OF STORM SEWER SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-08334

A SIMULATION OF AN IRRIGATION SCHEDULING MODEL WHICH INCORPORATES RAINFALL PREDICTIONS,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-08343

INPUT-OUTPUT MODELING IN WATER RESOURCES SYSTEM PLANNING,
Colorado State Univ. Fort Collins. Dept. of Civil Engineering.
D. W. Hendricks, and R. W. DeHaan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 064, Price codes: A06 in paper copy, A01 in microfiche. Environmental Engineering Technical Report No. 3, November 1975. 92 p, 29 fig, 13 tab, 32 ref, 3 append. OWRT B-115 COLO(1), 14-31-001-5060.

Descriptors: *Input-output analysis, *Model studies, Planning, *Economics, *Water supply, *Water demand, *Colorado, Imported water, Agricultural water, Municipal water, *Future planning(Projected).
Identifiers: *South Platte River basin(Colo), *Water resources systems.

Principles of input-output modeling of economic systems are adapted to the description of a water resource system. The major sectors of supply and demand are identified, such as 'native surface water flows,' 'imported water,' 'agriculture,' 'municipal.' These sectors were disaggregated further into specific water transferring entities, such as particular streams, geographical regions of the agricultural sector, specific cities, etc. This resulted in an 81 x 80 matrix, displayed on a magnetic board. From this the distribution of available supplies is seen on the rows from each supply source. How each demand entity satisfies its needs is seen as the sum of the entries for the respective column. From this an entire water resources system is displayed at once. This was done for the year 1970 for the South Platte basin. The model can aid in planning for future years by imposing the future total demands for each water demand entity (as the bottom row entries). From this, alternatives for satisfying these demands can be seen.
W77-08346

AN ECONOMIC APPRAISAL OF REUSE CONCEPTS IN REGIONAL WATER SUPPLY PLANNING,
Utah State Univ., Logan. Dept. of Economics.
For primary bibliographic entry see Field 5D.
W77-08347

MULTIPLE OBJECTIVE PLANNING: SMALL WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-08350

6B. Evaluation Process

CITIZEN PARTICIPATION IN COMPREHENSIVE WATER RESOURCES PLANNING,
Massachusetts Univ., Amherst. Inst. for Man and Environment.
M. O. Ertel, and S. G. Koch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 665, Price codes: A06 in paper copy, A01 in microfiche. University of Massachusetts Water Resources Research Center, Publication No. 77, August 1976, 103 p, 1 fig, 5 tables, 48 ref, 3 append. OWRT-B-044 Mass (1). 14-31-0001-5082.

Descriptors: *Social Participation, Planning, *Comprehensive Planning, Project planning, Decision-making, River basin development, *River basin commission, *Attitudes, *Social impact, Social values.
Identifiers: *New England River Basins Commission, *Citizen participation, *Public participation.

The research focused on documentation of the impact of citizen participation upon the planning recommendations of three Level B Studies of the New England River Basins Commission and an evaluation of the participatory strategies utilized to secure that participation. The documentation and evaluation were obtained through a detailed examination of Study documents, personal observations and interviews, and survey research. The major conclusion is that a professionally directed and designed program of public participation does play a significant role in the development of comprehensive plans that are responsive to public needs and opinions. Such programs, and certain identified elements in particular, also have a demonstrable effect upon resultant public approval of the planning recommendations. The importance of financial commitment to the direction of public participation programs, both through provision of a staff with responsibility and skills for such direction and of other supporting resources, is further illustrated by a selective review of the public participation programs of all six River Basin Commissions. (Lefferts - Massachusetts).
W77-08105

INVENTORY OF COLORADO'S FRONT RANGE MOUNTAIN RESERVOIRS,
Colorado State Univ., Fort Collins. Dept. of Recreation Resources.
R. Aukerman, W. T. Springer, and J. F. Judge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 669, Price codes: A08 in paper copy, A01 in microfiche. Colorado State University, Environmental Resources Center, Information Series No 23, May 1977. 159 p, 17 fig, 1 tab, 5 ref. OWRT B-132-COLO(2). 14-34-0001-6062.

Descriptors: *Colorado, *Reservoirs, *Recreation, Surveys, Decision making, Planning, Management, *Water demand, *Water utilizzation, Land use, Data collections, Water resources development.
Identifiers: *Front Range Mountain Reservoirs(Colo).

This inventory is an in-depth look at the characteristics of one of Colorado's most valuable resources–its front range high mountain water reservoirs. These reservoirs are storage and control points within a complex delivery system of water for agricultural, industrial, and municipal users. However, in more recent years, other water users have placed increasing demands on the water. As recreation, fish and game, pollution control and others have become recognized as highly important uses of the water, decisions on water allocation have become increasingly more complex. Limited water supply in combination with increasing water demands dictate that intelligent decisions be made on efficienct multiple use of scarce water resources. Colorado is presently entrenched in this difficult decision process. It is essential that those who must make and implement these decisions have accurate, readily available information on the water resource which is being considered. Therefore, this inventory has been undertaken to provide a single core of accurate and current reservoir data for decision making, planning and management. It is expected that all levels of government (federal, state and local) with water and land use planning and management responsibilities will find these data helpful.
W77-08107

COMPUTERIZED PLANNING SYSTEM FOR NUCLEAR POWER PLANT EVALUATION,
Krannert Graduate School of Management, Lafayette, Ind.
R. H. Bonczek, C. W. Holsapple, and A. B. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 663, Price codes: A02 in paper copy, A01 in microfiche. (1976). 23 p, 5 fig, 9 ref. OWRT C-7005(6202)(1).

Descriptors: *Decision making, *Data storage and retrieval, *Social aspect, *Adoption of practices, Attitudes, *Indiana, Evaluation, *Planning, Environment, Networks, *Nuclear powerplants.
Identifiers: *Data management systems, *Generalized planning system, Socio-technological issue.

A computerized system is described for information storage and query processing adapted to complex socio-technological issues. The system is referred to as GPLAN (Generalized Planning System) and can accommodate both qualitative (verbal) and quantitative data. The issue illustrated is the construction of a nuclear power plant, and involves interdisciplinary research and planning. The system's outstanding features are the utilization of the network variety of data base, the selective retrieval of any configuration of data from a particular network structure, automatic execution of any desired application program from a standard or special library of applications, user interface with a data base and applications by submitting English-like, non-procedural queries, and generality which allows tailoring to specific applications and provides a basis for integration of planning and research activities. The system is general and can be used for a wide variety of socio-technological issues which involve complex data relationships. (Wiersma-Purdue)
W77-08108

DISCRIMINANT ANALYSIS OF CHARACTERISTICS DETERMINING ACCEPTANCE OR REJECTION OF NUCLEAR POWER,
Krannert Graduate School of Management, LaFayette, Ind.
C. Holsapple, and A. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 664, Price codes: A02 in paper copy, A01 in microfiche. (1976). 13 p, 1 fig, 1 tab, 3 ref. OWRT C-7005(6202)(2).

Descriptors: *Nuclear powerplants, *Social aspects, *Attitudes, Nuclear energy, Decision making, *Indiana, Environment, Model studies.
Identifiers: Linear discriminant models, *Discriminant analysis.

This study utilizes the linear discriminant model to analyze demographic and attitudinal data concerning the construction of a nuclear power facility at the Bailly site in northern Indiana. The objective is to ascertain the extent to which various respondent characteristics are useful in distinguishing among respondent attitudes (opposed, in favor, unsure) toward the Bailly project. Examination of reduced space characteristics leads to an interpretation of its two dimensions as respondent uncertainty and respondent resistance. The largest

contributor (positive) to uncertainty was a divorced or separated marital status; the greatest contributor (negative) to resistance was home ownership. Both of these respondent characteristics were significant in the univariate sense. A particularly striking trend was the reliance of the opposed group upon electronic media as the source of most local news, whereas the other two groups tended to rely most heavily on newspapers.
W77-08109

THE NATIONAL CONFERENCE ON WATER.
For primary bibliographic entry see Field 6E.
W77-08131

RECREATIONAL USE OF TEXAS RIVERS--RECOMMENDATIONS FOR ADOPTION OF THE TEXAS PUBLIC RIVERS ACT,
For primary bibliographic entry see Field 6E.
W77-08134

UNIVERSITY PUBLIC SERVICE PROGRAMS AS THEY RELATE TO WATER RESOURCES MANAGEMENT IN WISCONSIN,
Wisconsin Univ. Extension, Madison. Inland Lake Demonstration Project.
For primary bibliographic entry see Field 6E.
W77-08209

WATER AND ENERGY SYSTEMS: A PLANNING MODEL,
Illinois Univ., at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6A.
W77-08212

IMPROVING INSTITUTIONAL ARRANGEMENTS FOR WATER DEVELOPMENT IN THE STATE OF WASHINGTON: DEVELOPMENTAL AND ENVIRONMENTAL TRADE-OFFS AND CONSTRAINTS,
Washington Univ., Seattle. Inst. of Governmental Research.
For primary bibliographic entry see Field 6E.
W77-08284

CLASSIFICATION AND TEST OF PUBLIC PARTICIPATION CONCEPTS APPLIED TO LOCAL RESOURCE PLANNING,
Wisconsin Univ. Madison. Dept. of Landscape Architecture.
W. T. Lamm.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 007, Price codes: A10 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 196 p, 42 refs. OWRT A-055-WIS(2), 14-31-0001-4050.

Descriptors: *Evaluation, *Testing procedures, *Resources, *Decision making, *Regional development, *Social participation, *Wisconsin, Planning.
Identifiers: Dunn(Wisc), Dane County(Wisc), *Public participation.

An analysis of resource problem definition and solution is provided in terms of concepts about how the public participates in expressing and defining environmental and resource problems and influencing the actions taken. These concepts are traced from their philosophical and theoretical bases, through considerations of the planning process, and finally to discussions of several contemporary participation techniques and communication methods. A proposed planning research methodology is described, using the previous discussions as a guide for its rationale and use. In what manner information can be organized and presented, as well as the type of information that is generated by a specific technique, namely, Target Technique, are also demonstrated.
W77-08295

RECSAD: A COMPUTER PROGRAM FOR RECREATION PLANNING,
Oklahoma State Univ., Stillwater. Dept. of Geography.
S. W. Tweedie, and R. D. Hecock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 913, Price codes: A04 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, (1976). 65 p, 6 ref, append. OWRT B-026-OKLA(2), 14-31-0001-3928.

Descriptors: *Recreation demand, Recreation, *Computer programs, *Planning, *Demand, Evaluation, Simulation analysis, Attitudes.

A computer program (RECSAD: RECreation Supply And Demand) has been described which is believed to have some utility for planners. The program is designed to afford users flexibility with respect to availability of data, preferred assumptions about recreationist behavior, and locally relevant planning strategies. Program outputs include measures of available opportunities, peak demand, latent demand, fulfilled demand, usage of facilities with respect to capacity, and others. Outputs may be utilized directly, or they may be used as inputs to descriptive or analytical statistical packages in order to evaluate the recreation system more fully. Successive runs of the program can be used to simulate conditions under postulated changes in temporal or spatial demand conditions or under planned changes to the recreation system.
W77-08300

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS: ECONOMIC, LEGAL, AND FINANCIAL ASPECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg, L. H. Botham, L. Rice, W. J. Shoemaker, and L. S. Tucker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 042, Price codes: A05 in paper copy, A01 in microfiche. Hydrology Paper 85, February, 1976. 78 p, 5 append. OWRT B-113-COLO(9), 14-31-0001-5059.

Descriptors: *Cost-benefit analysis, *Flood control, *Evaluation, Benefits, Budgeting, Cities, Drainage, Drainage practices, *Drainage programs, *Economic justification, Feasibility, Financial feasibility, Flood plains, *Project benefits, Runoff, *Storm drains, Financing, *Urban drainage.
Identifiers: Drainage law.

Techniques for evaluating minor and major Urban Drainage and Flood Control (UDFC) Projects are described. Economic, political, engineering, financial and legal problems must be faced prior to implementation of proper levels of these projects. The measurement of tangible benefits is described while a literature review revealed no direct objective techniques for quantifying intangibles. Some methods for establishing the relative rankings of intangible contributions show promise for improvement of evaluation techniques, however. The legal problem of establishing benefits is described and a copy of recently enacted Colorado legislation is included. Information on the estimation of flood damages and the selection of discount rates is presented. Careful coordination of land use and drainage control measures is stressed. Related recent legislation and regulations are included.
W77-08345

METHODOLOGY AND DATA FOR ANALYZING QUANTITY, QUALITY AND ECONOMIC ASPECTS OF MINIMUM STREAMFLOWS, APPENDICES, VOLUME 2,
Washington Univ., Seattle. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-08349

MULTIPLE OBJECTIVE PLANNING: SMALL WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
D. Byers, and W. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 043, Price codes: A03 in paper copy, A01 in microfiche. Purdue University Agricultural Experiment Station Bulletin No 84. June 1975, 42 p, 3 fig, 13 tab, 16 ref. OWRT-B-042-IND(6).

Descriptors: *Multiple purpose projects, *Water resources development, *Social aspects, *Small watersheds, Project planning, Social impact, Decision making, Estimated costs, Estimated benefits, Water management(Applied).
Identifiers: *Net national benefits, *Trade-offs, *Environmental quality.

This study was an exploration into multiple social goal decision making with reference to small watershed resource planning. The empirical model developed is based on the West Boggs Creek Watershed in Martin and Daviess Counties in Indiana. The programming model consists of maximizing a linear objective function for net national benefits, subject to constraints for physical and institutional limits, discrete activities and incompatible activities. Environmental quality standards were not determined a priori to the evaluation, rather, each of the constraints was ranged to develop the trade-off between the social objectives. Trade-offs between net national benefit and eight environmental components were identified and functional relations developed from the observations of trade-offs ratios. It was found that the environment of the watershed improved considerably befire there was any constraint imposed on national benefits. As soon as the national benefit becomes constrained by environment, all the relationships between the valued and nonvalued objectives are competitive in nature, indicating that there is a definite cost to increasing environmental quality. The model provided information on the causes of the objective trade-offs by reference to the activity taking place as the environmental constraints were parameterized. The results indicated the activities and order of installation which would be most beneficial to improving environmental quality. (Wiersma-Purdue)
W77-08350

PLANNING CHALLENGES IN THE MANAGEMENT OF COASTAL ZONE WATER RESOURCES,
Victoria Univ. (British Columbia). Dept. of Geography.
D. Sewell.
In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (COPLANARH), Caracas, Venezuela, Vol. 14, 1976. 24 p, 62 ref.

Descriptors: *Coasts, *Planning, *Institutions, *Administrative agencies, Comprehensive planning, Project planning, Governments, Oceans, Fisheries, Water management, Water utilization, Legal aspects, Regulation, Water law, Institutions, Environmental effects, Political aspects, Social aspects, Jurisdiction, Research and development, Environmental control, Cost-benefit analysis.
Identifiers: *Coastal zone water resources, *Coastal zone management, Coastal Zone Commission.

This paper identifies the problems of water management in the coastal zones, and then suggests institutions and methods of planning needed for effective resolution of these problems. The problems include a need for devising methods to equalize the negative and positive effects of externalities, and mechanisms whereby common pro-

perty resources are shared equitably. In the past problems arose from conflicts in goals and duplication of efforts due to the division of planning functions among different government levels. Other problems involved a concentration upon a narrow range of alternatives and evaluation of criteria, and failure to account for the impact of policies and programs on other agencies. The author suggests formation of a Coastal Zone Commission to undertake planning on a comprehensive region-wide basis, or a river basin planning authority. Techniques of analysis such as systems modeling, benefit cost analysis, and environmental impact analysis should be used. Attention should be given to the peculiar problems of each coastal zone, including division of responsibilities, and the relationships of the water, land, ocean and atmospheric resources. (Hadoulias-Florida)
W77-08376

TICKET TO THERMIDOR: A COMMENTARY ON THE PROPOSED CALIFORNIA COASTAL PLAN,
University of Southern California, Los Angeles. School of Law.
R. C. Ellickson.
Southern California Law Review, Vol. 49, No. 4, p. 715-36 (May 1976).

Descriptors: *Administrative agencies, *California, *Comprehensive planning, *Economic efficiency, *Governmental interrelations, Political aspects, Conservation, Regional development, Non-structural alternatives, Local governments, Regulation, State governments, Planning, Multi-purpose projects, Legislation, Decision making, Administration, Administrative decisions.
Identifiers: *Coastal zone management, Coastal waters.

The California Coastal Zone Conservation Commission, established in 1972 by the voters, was required to produce a coastal plan by December 1, 1975. Rather than making specific land use designations, the Commission proposed several hundred policies and subpolicies of general application, and recommended an administrative structure for carrying them out. The basic theme of this commentary is that the California Legislature should reject the plan. The program to preserve agricultural lands shows that the plan lacks notice of market resource-allocation; the ends sought do not justify massive intervention in private land markets. Solar energy is not necessarily the best solution for energy production. Reliance on urbanization rather than scattering of development may be negated by lack of urban consumer demand for housing. The plan does not specify whether zoning in coastal areas will be a state or local function. The plan's inefficiencies will benefit planners, attorneys and the economic elite, while taxpapers and housing consumers will lose. Perhaps a massive state coastal agency acting as an information clearinghouse would improve efficiency. (Molloy-Florida)
W77-08379

DETERMINATION OF WATER-RESOURCES POLICIES IN ARID LANDS,
C. Clay.
In: Social Science Research in Dry Lands, Templer, O.W., ed. Frontiers of the Semi-Arid World: An International Symposium, October 14-18, 1974, Lubbock, Texas. International Center for Arid and Semiarid Land Studies (ICASALS) 1976 Publication no 76-6, p 15-24, 12 ref.

Descriptors: *Water policy, *Water resources, *Arid lands, *Environmental effects, *Water resources development, *Inter-basin transfer, Water pollution sources, Governments, Comprehensive planning, Planning, Water reuse, Water transfer.

The problem of water resources planning as part of overall policy making is discussed, and the highlights of studies concerning water resources policy in arid lands and recommendations of the National Water Commission are presented. The problem of pollution and environmental damage in both developed and underdeveloped nations is discussed. The possibilities of and problems associated with interbasin transfer of water are evaluated, and water transfer from Canada to the U.S. and possibly even Mexico is presented as an example. The possible alternative sources of water for arid lands, including cloud seeding and desalination, are discussed; recycling of water and reduced use by irrigation are mentioned as other methods of conserving water. In summary, arid lands need to develop comprehensive water plans, and the political, economic, and environmental aspects of interbasin transfer must be studied carefully. (Jamail-Arizona)
W77-08453

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

MINIMIZING COSTS IN WELL FIELD DESIGN IN RELATION TO AQUIFER MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W77-08214

STATUS OF REVERSE OSMOSIS DESALINATION TECHNOLOGY,
Office of Water Research and Technology, Washington, D.C. Membrane Processes Div.
For primary bibliographic entry see Field 3A.
W77-08225

AN INVESTIGATION OF THE TECHNICAL AND ECONOMIC FEASIBILITY OF USING LOW TEMPERATURE GEOTHERMAL SOURCES IN COLORADO,
Environmental Consulting Services, Inc., Boulder, Colo.
For primary bibliographic entry see Field 4B.
W77-08310

NETWORK EVALUATION OF WASTEWATER COLLECTION ECONOMICS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-08331

ECONOMIC IMPACTS OF CONTROLLING WATER QUALITY IN AN IRRIGATED RIVER BASIN,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-08332

OPTIMAL LAYOUT AND DESIGN OF STORM SEWER SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-08334

AN ECONOMIC APPRAISAL OF REUSE CONCEPTS IN REGIONAL WATER SUPPLY PLANNING,
Utah State Univ., Logan. Dept. of Economics.
For primary bibliographic entry see Field 5D.
W77-08347

CONSTRUCTION AND MAINTENANCE COSTS OF SEWER SYSTEMS (BAU- UND BETRIEBSKOSTEN VON KANALISATIONSANLAGEN),
For primary bibliographic entry see Field 8A.
W77-08542

6D. Water Demand

AN ANALYSIS OF AGRICULTURAL WATER REQUIREMENTS IN THE TAR-NEUSE RIVER BASIN OF NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-08106

INVENTORY OF COLORADO'S FRONT RANGE MOUNTAIN RESERVOIRS,
Colorado State Univ., Fort Collins. Dept. of Recreation Resources.
For primary bibliographic entry see Field 6B.
W77-08107

THE NATIONAL CONFERENCE ON WATER.
For primary bibliographic entry see Field 6E.
W77-08131

UNITED STATES V TULARE LAKE CANAL COMPANY (RECLAMATION LAWS CONCERNING SALE OF LAND IN EXCESS OF 160 ACRES).
For primary bibliographic entry see Field 6E.
W77-08151

AGRICULTURAL WATER DEMAND IN WAKE COUNTY, NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
P. R. McLoud.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 934, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 99 p., 44 tab, 37 ref, append. OWRT B-068-NC(3), 14-31-0001-4114.

Descriptors: *Agricultural water, *Water demand, *Water utilization, *Irrigation water, *Water requirements, Irrigation, Computer models, Linear programming, *North Carolina, Computer programs, Forecasting, Future planning(Projected).
Identifiers: *Agricultural water demand, Irrigation policy, *Wake County(NC).

The objective was to develop data concerning crops, soils, climate, irrigation practices, and costs of agriculture in Wake County, North Carolina. These data were used in two computer programs: the first to compute water usage at a specified level of agriculture, and the second to compute by linear programming the optimum level of agriculture. Using the results of these computer programs, estimates of current irrigation water usage and predictions of usage by the year 2000 were made. The estimates and predictions were made for low, average, and high yearly rainfall levels of 33.5, 45.0, and 58.0 inches respectively. (Stewart-North Carolina State)
W77-08297

RECSAD: A COMPUTER PROGRAM FOR RECREATION PLANNING,
Oklahoma State Univ., Stillwater. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W77-08300

INPUT-OUTPUT MODELING IN WATER RESOURCES SYSTEM PLANNING,
Colorado State Univ. Fort Collins. Dept. of Civil Engineering.

For primary bibliographic entry see Field 6A.
W77-08346

A PRELIMINARY ANALYSIS OF THE ENERGY AND WATER REQUIREMENTS FOR DEVELOPING GEOTHERMAL ENERGY IN ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 4B.
W77-08351

THE WINTERS DOCTRINE AND HOW IT GREW: FEDERAL RESERVATION OF RIGHTS TO USE OF WATER,
Office of the Solicitor (Interior), Washington, D. C.
For primary bibliographic entry see Field 6E.
W77-08375

WATER FOR FOOD - OR FOR MORE IMPORTANT PURPOSES. (REALLOCATION OF IRRIGATION WATER TO CITIES AND INDUSTRIES),
Wyoming Univ., Laramie. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-08377

APPROPRIATION OF WATER.
For primary bibliographic entry see Field 6E.
W77-08405

DIGITAL-MODEL ANALYSIS OF THE EFFECTS OF WATER-USE ALTERNATIVES ON SPRING DISCHARGES, GOODING AND JEROME COUNTIES, IDAHO,
Geological Survey, Boise, Idaho. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08484

6E. Water Law and Institutions

CITIZEN PARTICIPATION IN COMPREHENSIVE WATER RESOURCES PLANNING,
Massachusetts Univ., Amherst. Inst. for Man and Environment.
For primary bibliographic entry see Field 6B.
W77-08105

REORGANIZING POLLUTION CONTROL IN THE U.K.
Wessex Water Authority, Bristol (England).
For primary bibliographic entry see Field 5G.
W77-08111

FEDERAL STATUTORY MODIFICATION OF PRIVATE WATER RIGHTS IN SOUTH FLORIDA,
Florida Univ., Gainesville. School of Law.
W. A. Bollinger.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida 32611, $2.35. November 1971, 26 p.

Descriptors: *Florida, *Water rights, *Federal jurisdiction, *Competing uses, *Federal-state water rights conflicts, Jurisdiction, Regulation, State jurisdiction, Water contracts, Water transfer, Water utilization, Relative rights, Legal aspects, Water law, Water resources, Compensation, National parks.

In June 1970 Congress amended the Flood Control Act of 1948 in a move destined to have a nationwide impact on water allocation. The legislation authorizes $25 million for the Central and Southern Florida Flood Control District so long as $5 million is used for water flow needs to the Everglades National Park. The Park receives 16.5 per cent of the district's annual deliveries. This imposes a guaranteed annual minimum water flow to the Park. The history of the South Florida area is important to an understanding of the amendment, therefore the author traces the history and makeup of the geographical region. The legal problems of the amendment are serious, especially the implications of federal control of water rights. Guaranteeing the Park a federal water appropriation that differs from that of other non-federal users raises the 'states rights' issue. While federal authority in water resources development is constitutionally well founded, the courts may favor an award of compensation to those whose water rights have been affected by federal action. However, South Florida's increasing urbanization and industrialization will put a heavy burden on the region's water resources, and the state alone does not have the funds to sustain the dwindling resources. Thus, Florida will have to accept the federal regulation, as well as take its own positive steps toward developing strict controls. (Welch-Florida)
W77-08112

WATER RESOURCE POLICIES AND AUTHORITIES, COASTAL ZONE MANAGEMENT PROGRAM IMPLEMENTATION,
Corps of Engineers, Washington, D.C.
Federal Register, Vol 41, No 137, p 29146-49, July 15, 1976.

Descriptors: *Coordination, *Governmental interrelations, *Water management(Applied), *State governments, *Coasts, Coastal plains, Administration, Administrative agencies, Legal aspects, Water law, Planning, Projects, Water zoning, Administrative costs, Coastal marshes, Management, Project planning, Technology.
Identifiers: *Coastal zone management, *Administrative regulations, Coastal Zone Management Act of 1972.

The Department of Defense through the Corps of Engineers has proposed new rules pertaining to the Coastal Zone Management Program. The new regulations provide guidance and procedures for the Corps in assisting state programs in accordance with the 1972 Coastal Zone Management Act. State programs must include both short and long range objectives and focus on seven designates substantive elements. Each coastal state has primary responsibility for its own program. Federal administration of the program is to be handled by the National Oceanic and Atmospheric Administration. The Corps of Engineers will fully cooperate with the states and provide technical assistance upon request. Furthermore, all Corps projects shall be in conformance with state programs to the maximuum extent practicable. Corps offices preparing data critical to state planning and management shall assist the states in every way possible and lead offices shall be designated with responsibility for coordination of all Corps Civil Works activities within a particular state coastal zone. In addition, the proposed rules provide for funding of all Corps participation by the federal government subject to certain restrictions. (Moorhouse-Florida)
W77-08114

LEADVILLE MINE DRAINAGE TUNNEL ACT OF 1976.
Hearings---Sub Comm on Energy and Water Resources--Comm on Interior and Insular Affairs, U. S. Senate, June 7, 1976, p 1-24.

Descriptors: *Federal Water Pollution Control Act, *Mining, *Mine drainage, *Tunnels, *Colorado, Legislation, Water pollution, Mineral industry, Shafts(Excavations), Underground structures, Excavation, Administrative agencies, Groundwater, Water management(Applied), Confined water, Mine water, Waste water(Pollution), Impoundments, Impounded waters, Sinks.

In June 1976, the Senate Committee on Interior and Insular Affairs conducted a hearing to consider a bill authorizing investigation, stabilization, and rehabilitation of the Leadville Mine Drainage Tunnel. The tunnel had been constructed during World War Two and the Korean War to facilitate drainage of water out of a mining district in which there were large quantities of strategic metals (lead, copper and zinc). From the completion of the tunnel in 1952 until 1976 there had been no maintenance of the tunnel, and the consequent deterioration of its interior has resulted in an impoundment of water estimated to be more than 8,000,000 gallons. This impoundment in turn has created a hazard to the community in the form of sink holes throughout the surrounding area. The proposed bill would authorize rehabilitation of the tunnel and construction and maintenance of facilities to treat the water to be drained in accordance with the Federal Water Pollution Control Act (FWPCA). Statements presented at the hearing include those of an official of the Colorado Department of Natural Resources; Chief Mining Engineer of the Bureau of Mines; and Assistant Commissioner of the Bureau of Reclamation. (Sloan-Florida)
W77-08115

OPERATION AND IMPACT OF NPDES IN REGION II, PART I,
Environmental Protection Agency, New York. Caribbean Construction Grants Branch.
For primary bibliographic entry see Field 5G.
W77-08117

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 REACH POLLUTING ACTIVITIES OCCURRING ABOVE MEAN-HIGH WATER LINE (COMMENT ON U. S. V. HOLLAND).
For primary bibliographic entry see Field 5G.
W77-08118

STATES NEED FREEDOM TO INNOVATE (COMMENT ON PL 92-500).
Kansas Dept. of Health and Environment, Topeka.
Water and Sewage Works, Vol 122, No 1, p cover, 4 (Jan 1975).

Descriptors: *Water treatment, *Flexibility, *Federal-state water rights conflicts, *Water pollution control, *Governmental interrelations, Federal government, Local governments, Political aspects, Administration, Planning, Standards, Financing, Monitoring, Legislation, Law enforcement.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, Organizational methods.

The Federal Water Pollution Control Act of 1972 (FWPCA) spelled out a partnership role between the federal and state governments that is a little more 'participating' than states would like. Although states have the primary role in pollution control, they are given detailed instructions, and strait-jacketed as they try to adapt to particular situations in their local areas. More progress could be made if the states were to be considered laboratories for innovative treatment methods and as workshops on administrative and organizational methods. If such a plan were adopted, a failure would be on a small scale and not a huge national disaster. A better way to approach the problem then, would be to set national but flexible standards, and provide funds and facilities for research and development. Plans and scientific changes should be the state's responsibility where it can be done more efficiently than under a rigid system of national controls. Monitoring effluents can also be handled better locally. Despite being hampered by a new plan, a new regulatory agency, and a complex law, the federal government appears to be moving toward this view. (Rieck-Florida)
W77-08119

U.S. ENVIRONMENTAL PROTECTION AGENCY ENVIRONMENTAL RESEARCH OUTLOOK FY 1976 THROUGH 1980 (REPORT TO CONGRESS).
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 6G.
W77-08120

TOWARD CLEANER WATER IN THE PACIFIC NORTHWEST AND ALASKA--THE NATIONAL WATER PERMIT PROGRAM.
Environmental Protection Agency, Seattle, Wash. Public Affairs Office.
For primary bibliographic entry see Field 5G.
W77-08121

FEDERAL CONTROL OVER WETLAND AREAS: THE CORPS OF ENGINEERS EXPANDS ITS JURISDICTION,
For primary bibliographic entry see Field 5G.
W77-08123

GOVERNMENTAL INTEREST IN PROTECTING BEACH FROM ENVIRONMENTAL DAMAGE THROUGH OVERUSE OUTWEIGHS DUE PROCESS RIGHT TO BATH NUDE,
J. K. Vogel.
The Georgetown Law Journal, Vol 64, p 1171-85 (May 1976). 88 ref.

Descriptors: *Beaches, Ecology, *Recreation, *Massachusetts, *National parks, Social aspects, Judicial decisions, Constitutional law, Litter, Waste disposal, Legal aspects, Water law, Public access, Regulation, Seashores, Shores, Dunes, Environmental control, Social change, Social values, Recreation demand.
Identifiers: *Administrative regulations.

In William V. Hathaway the First Circuit Court of Appeals acknowledged that the constitutional right of personal liberty protected by the fifth amendment due process clause encompassed the right to bathe nude. The right, so based, is not a fundamental right and was limited to traditional nude beaches. The defendant National Park Service had sought to prohibit nude bathing on the beach in question in order to reduce litter and environmental damage caused by the beach's increasing popularity. The court concluded that the governmental interest in protecting the beach environment was sufficient to outweigh the bather's narrow right. The court did not apply the the rational basis test traditionally used in examination of non-fundamental rights although the same result would have been obtained. Rather, the court adopted a balancing approach weighing the rights and interests of the parties and subordinating the legislative judgement. Such scrutiny of the means might well result in undue judicial interference. The author suggests the equally practicable alternative means test as a more desirable approach to determining the relative rights or parties in such disputes. (Moorhouse-Florida)
W77-08124

OIL AND WATER--A NEW LOOK AT THE UNIFORMITY DOCTRINE,
F. W. Lewis.
Baylor Law Review, Vol 26, No 2, p 194-210 (Spring 1974). 68 ref.

Descriptors: State governments, Federal governments, *Oil spills, *Federal jurisdiction, *State jurisdiction, Constitutional law, Common law, Legal aspects, Political aspects, Judicial decisions, Legal review, Water law, International law, Foreign trade, International waters, Law of the sea, Oil pollution, Water pollution sources, Oil wastes, Foreign countries, Coasts, Shores, Legislation.
Identifiers: *Coastal waters, *Territorial seas(Jurisdiction), *Uniformity doctrine, *Admirality and maritime jurisdiction, Freedom of the seas, Federal judicial power, States' rights.

A serious problem facing the coastal states is the potential damage from oil spills by vessels or offshore facilities. The ability of states to legislate in order to protect themselves from such dangers seems limited. Article III, section 2 of the United States Constitution extends the federal judicial power to, ...'all cases of admirality and maritime jurisdiction.' Hence, the uniformity doctrine has existed as the main barrier to state action. Early cases showed the basis for the doctrine as the need for uniformity in (1) domestic or internal affairs, and (2) international law and foreign affairs. As to domestic affairs, courts will employ a balancing test, and view protection of a state's coastal region from the effects of oil pollution as highly compelling. Hence, a state law directed at domestic action will often be upheld. On the other hand, courts have been reluctant to subordinate the need for uniformity in international law and foreign relations to any state policy or interest. Given the possibility that the act of a state would be attributed to the nation as a whole, and would therefore justify reciprocal action by other nations, state legislation cannot predominate over federal with regard to foreign vessels. State legislation, however, remains effective against domestic vessels, and in all state waters which are not navigable waters of the U. S. (Moorhouse-Florida)
W77-08125

LET'S HAVE ACHIEVABLE 'SAFE' DRINKING WATER,
Illinois State Environmental Protection Agency, Springfield. Div. of Public Water Supplies.
For primary bibliographic entry see Field 5G.
W77-08127

PL 92-500: PHOENIX V. THE EPA,
Arizona State Water and Sewer Dept., Phoenix.
For primary bibliographic entry see Field 5G.
W77-08128

CAN A STATE EMBARGO THE EXPORT OF WATER BY TRANSBASIN DIVERSIONS,
Washington Univ., Seattle. School of Law.
C. E. Corker.
Idaho Law Review, Vol 12, No 2, p 135-52 (1976).

Descriptors: *Inter-basin transfer, *Governmental interrelations, *Interstate rivers, *Interstate compacts, *Equitable apportionment, *Prior appropriation, Colorado River, Columbia River, Interstate commissions, River basin commissions, Colorado River Compact, Governments, State governments, Water law, Rivers, *Diversion, Relative rights, Federal government, Interstate, Legislation, Regulation, California, Arizona, Idaho, Colorado River Basin, Constitutional law.
Identifiers: Boulder Canyon Project, Central Arizona Project, California Limitation Act, Commerce Clause, Congressional powers.

Two propositions support the view that a state cannot embargo the export of its water: (1) Congress can effectively authorize the diversion of any water supply in the United States, and (2) in the absence of an Act of Congress to the contrary, states can generally prohibit future projects diverting water from natural sources. The Supreme Court decision in Arizona v. California established the primacy of Congress in this area. The Court left the choice of proration, priority, or some other formula of allocation to the Secretary of Interior subject to modification of that discretion by an act of Congress. Congress later eliminated any doubts that the decision applied only to navigable groundwater. Furthermore, Congressional superiority with respect to any interstate river systems is squarely based on the Commerce Clause of the Constitution. The second proposition concerning powers exercisable by a state assumes the state has not induced other states to rely on exported water. Then, state legislation limiting or forbidding export by future diversion, not discriminatory in favor of intra-state exports, and clearly related to legitimate state purpose would survive Commerce Clause scrutiny. (Moorhouse-Florida)
W77-08129

AMERICAN SEDIMENTATION LAW AND PHYSICAL PROCESSES,
C. E. Busby.
Reprinted from Chapter VII, ASCE Manuals and Reports on Engineering Practice--No 54, Sedimentation Engineering, 1975, p 629-74. 8 fig.

Descriptors: *Sedimentation, *Deposition(Sediments), *Sediment distribution, *Sedimentation rates, *Legal aspects, Aggradation, Accretion(Legal aspects), Avulsion, Sediment transport, Fluvial sediments, Marine geology, Running waters, Common law, Reasonable use, Riparian rights, Riparian land, Surface waters, Erosion, Salinity.

The process of sedimentation includes weathering, erosion, transportation, deposition and consolidation and often involves legal problems. Of great significance is the issue of who controls the right to sediments suspended in flowing waters. The question assumes particular importance when one realizes such sediments are valuable as mineral and organic fertilizer. Another difficult problem concerns the determination of legal damage caused by sediments when natural flow rates are upset by artificial flow rates induced by man. A precise determination of how much damage is due to sedimentation and how much is due to other causes becomes impossible. The law of sedimentation is derived from two legal sources--the civil and common law. Both sources stress uniformity and stability, but often overlook apparent scientific fact. The engineering and the legal professions could benefit by developing and applying basic scientific data within the broad framework of legal administrative processes and standards of fair play. Definitions of water supplies, sedimentation, saline processes, and theories of property ownership and use should be promptly brought within the realm of current scientific reality. (Moorhouse-Florida)
W77-08130

THE NATIONAL CONFERENCE ON WATER.
Reclamation Era, Vol 61, No 2, p 1-4, 14-18 (1975). 8 p, 4 photo.

Descriptors: *Conferences, *Water resources development, *Water allocation(Policy), *Water users, *Water utilization, Water values, Water law, Water control, Water policy, Water management(Applied), Water costs, Water demand, Water conservation, Federal government, State governments, Governmental interrelations, Water quality, Water rights.

The National Conference on Water, a gathering of experts sponsored by the Water Resources Council, had two primary goals: (1) to examine the role of water in national affairs through 1985; and (2) to consider the adequacy of existing and proposed programs. The conference discussed the wide variety of national objectives concerning the uses of water and how they are in completion, yet need not be incompatible. The conference suggested that the most significant changes in existing water law must come from the states because the greatest amount of water law is state property law. Legislative suggestions for determining water use priorities were presented. The conference examined the trend toward urban population concentration and the resulting water program emphasis. While an urban water policy is certainly encouraged, participants urged that there must also be examination of present and future needs for food, fiber and energy production. Summaries of two of the eight panel sessions were included: Water Laws, Water Rights, and Institutional Arrangements; The Role of Federal, State, and Local Governments. The Experts all agreed that the nation can no longer be complacent about its most basic natural resource. (Welch-Florida)

W77-08131

BOUNDARIES OF THE COASTAL ZONE: A SURVEY OF STATE LAWS,
Louisiana State Univ., Baton Rouge. Sea Grant Legal Program.
J. M. Robbins, and M. J. Hershaw.
Coastal Zone Management Journal, Vol 1, No 3, p 305-331 (1974). 27 p, 83 ref, 2 append.

Descriptors: *Coasts, *Shore protection, *Submerged Lands Act, *Boundaries(Property), Federal government, State governments, Governmental interrelations, Shores, Legislation, Tidal waters, Political aspects, Jurisdiction, Roads, Highways, Vegetation, Elevation, Topography, Tides, Tidal effects, Water level fluctuations.
Identifiers: *Coastal Zone Management Act of 1972, *Coastal zone management, Coastal management statutes, Wetlands statutes, Shorelands statutes, Inland boundaries, Seaward boundaries, Boundary delineation.

The Federal Coastal Zone Management Act provides monetary grants to coastal states developing coastal zone management programs. The Act requires each state program to identify the boundaries of the coastal zone subject to management program. Three aspects of the coastal zone must be clearly identified: (1) a seaward limitation; (2) coastal formations or physical features present in the coastal zone; and (3) inland boundaries. Seaward boundaries are generally prescribed by the Submerged Lands Act. Coastal features and inland boundaries for 24 states are analyzed under three types of statutes: (1) coastal management statutes (Alabama, California, Delaware, Florida, Louisiana, Mississippi, New Jersey, Oregon, Rhode Island, and Texas); (2) wetlands statutes (Connecticut, Georgia, Hawaii, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Rhode Island, Virginia, and Washington); and (3) shorelands statutes (Hawaii, Maine, Michigan, Minnesota, Washington, and Wisconsin). Boundary delineation is made according to various factors including linear measurements, political boundaries, roads and highways, vegetation, elevation, and tidal flow. An appendix and chart are provided containing state provisions relating to boundary-delineation techniques. (Caudill-Florida)
W77-08132

ENVIRONMENTAL PROTECTION THROUGH THE COMMON LAW,
Calgary Univ. (Alberta). Faculty of Environmental Design.
For primary bibliographic entry see Field 6G.
W77-08133

RECREATIONAL USE OF TEXAS RIVERS--RECOMMENDATIONS FOR ADOPTION OF THE TEXAS PUBLIC RIVERS ACT,
S. B. Biggs.
St. Mary's Law Journal, Vol. 7, No. 3, p. 575-93 (1975).

Descriptors: *Rivers, *River beds, *Texas, *Public access, Easements, Trespass, Bodies of water, Water law, Legal aspects, Judicial decisions, Rio Grande River, Banks, Inland waterways, Streams, Streambeds, Navigable rivers, Fishing, Recreation, Camping, Campsites, Lakes, Riparian rights, Eminent domain, Public rights, Water rights, Boundary disputes, State governments, Legislation.
Identifiers: *Texas Public Rivers Act, Texas Open Beaches Act, Litter.

Texas is plagued by conflict over the respective rights of riparian landowners and recreationists in its over 80,000 miles of inland waterways. The Texas Public Rivers Act of 1973, a proposed codification of Texas water law, was never reported out of committee, but it did present viable solutions to the conflict between recreationists and landowners. The Act would prohibit the erection of obstructions which might impede travel along a navigable river except where fencing was reasonably necessary to contain livestock. Administrative criteria for reasonableness would include a determination of low and high-water levels and the use of the riparian land. Furthermore, the Act would allow a reasonable use of river banks as an incident of recreational navigation thus resolving the conflict between common law's mean high water line boundaries and civil law's public servitudes on all river banks and permitting land passage around obstructions in the river. Camping and picnicing would still be limited to lands below the mean high water mark. The problem of extremely limited access to public waters is partially resolved by a provision authorizing acquisition of private lands. However, as this would prove financially prohibitive, development of existing public lands is recommended. (Moorhouse-Florida)
W77-08134

SNAKE RIVER LAND CO V STATE BOARD OF CONTROL (BENEFICIAL USE OF WATER HELD SUFFICIENT PROOF OF APPROPRIATION).
560 P.2d 733-39 (Wyo Sup Ct 1977).

Descriptors: *Wyoming, *Appropriation, *Administrative agencies, *Beneficial use, *Water permits, Irrigated land, Permits, Local governments, State governments, Judicial decisions, Water policy, Water law, Diversion, Water rights, Water resources, Water utilization, Water allocation(POlicy), Water use, Water conservation.

Land company appealed the judgment of the district court which affirmed the decision of an administrative board denying the company's petition to cancel a permit allowing diversion and appropriation of certain state water. Appellant based its appeal on the fact that appellees failed to file a notice of beneficial use as required by statute. Appellant contended that this made the permit invalid. The state supreme court found that although current state law requires such a filing within five years after a specified date, that at the time this permit was issued there was no time limit for submitting proof of appropriation. The court further found that the statute relied upon by the appellant provides a notice procedure which must be complied with before forfeiture can occur. No such procedure had been initiated by the state. Accordingly, since there was substantial evidence that the water had been put to beneficial use for reduced acreage since the issuance of the original permit, the judgment was affirmed. (Petruff-Florida)
W77-08135

PONCE DE LEON CONDOMINIUMS V DIGIROLAMO (DEVELOPER RESPONSIBLE FOR CONTROL OF SURFACE RUNOFF).
232 S.E.2d 62-67 (Ga. Sup Ct 1977).

Descriptors: *Runoff, *Discharge(Water), *Drainage systems, *Surface runoff, *Georgia, Surface waters, Ponding, Silts, Drainage, Routing, Legal aspects, Water law, Sedimentation, Silting, Judicial decisions, Water control, Water injury, Surface drainage, Damages.
Identifiers: *Liability, *Property interests.

Plaintiff landowner brought suit against defendant developer claiming that the development of condominiums adjacent to the plaintiff's property caused the property to receive unnaturally large quantities of surface water. The lower court awarded damages, injunctive relief, and attorneys fees to the plaintiff. The defendant developer appealed. The record showed that at the inception of the project the plaintiff complained to the defendant that the development would result in increased discharge of surface water onto his property. Defendant took no action at that time. The plaintiff then experienced a runoff problem which resulted in the pooling of water and silt on the plaintiff's property. Plaintiff again complained and defendants partially remedied the problem by installing sedimentation ponds. The injury had found that the defendant acted with conscious indifference in his failure to remedy the situation entirely by rerouting the drainage system. The state supreme court found no error of law, and held that the evidence supported the verdict. (Petruff-Florida)
W77-08136

FARMERS INVESTMENT COMPANY V BETTWY (DOCTRINE OF REASONABLE USE AS APPLIED TO GROUNDWATERS).
558 P.2d 14-27 (Ariz 1976).

Descriptors: *Arizona, *Groundwater resources, *Reasonable use, *Competing uses, Water supply, Water table, Water wells, Groundwater basins, Subsurface waters, Farms, Irrigation, Percolating water, Common law, Legal aspects, Water law, Mining, Municipal water.
Identifiers: *Groundwater management.

The incorporated owner of farm lands in the Sahuarita-Continental Critical Groundwater Area filed suit against mining companies to enjoin them (1) from taking waters beneath the critical area and using them on lands other than where they were taken; and (2) from completing the drilling of a deeper well that would deplete the water supply. The City of Tucson, which obtained much of its municipal water from wells downstream from the lands owned by the parties, intervened in the suit to enjoin both parties from returning water to the groundwater system that was so changed in quality as to render the domestic supply undesirable. The Superior Court denied plaintiff's and City's application for injunction and enjoined City from increasing the amount of water it pumped and transported away from the subdivision. Upon appeal by the City and the plaintiff, the Supreme Court upheld the injunction against the City and granted an injunction against the mining companies, holding that the doctrine of reasonable use does not permit percolating waters to be used off the lands from which they are pumped if others whose lands overlie the common supply are injured or damaged thereby. (Jones-Florida)
W77-08137

MC CARDEL V SMOLEN (THE RIGHTS OF RIPARIAN AND NONRIPARIAN OWNERS TO RECREATIONAL USE OF NAVIGABLE INLAND LAKES).
250 N.W.2d 496-502 (Mich 1977).

Descriptors: *Michigan, *Riparian rights, *Lake shores, *Public access, Boat launching, Ramps, Boating, Legal aspects, Public rights, Access routes, Recreation, Recreation demand, Lakes, Navigable waters, Inland waterways, Judicial decisions.
Identifiers: *Non-riparian owners, *Exclusive rights, *Ownership, Servitude, Navigational servitude, Incidental rights.

An action was brought to determine the ownership of riparian rights in a strip of land, which was designated on a 1911 plat as a 'boulevard' and was dedicated to the county essentially as a public street, but which was actually only undeveloped beach property. The Michigan court defined plaintiffs lakefront landowners' riparian rights, as well as the rights of defendants, non-lakefront landowners. The court held that the plaintiffs owned the riparian rights in the boulevard frontage and, that as a result of their riparian rights, plaintiffs had exclusive right to erect or maintain docks and boat hoists along the shore. However, plaintiffs could not prevent defendants from lounging or picnicking on the boulevard so long as defendants did not unreasonably interfere with the private and

public rights of plaintiffs. The reason for the ruling is that although plaintiffs are riparian owners of the shore of the navigable inland lake and, as such, own the bottom of the lake to its center, their title is subordinate to the public's navigation rights so long as the public has a lawful means of access to the lake. Incidental to the public's navigational servitude is the right to boat, fish and swim. Therefore, the public boulevard along the lake, provided defendants with access to the lake which in turn conferred accompanying recreational privileges on them. (Denker-Florida)
W77-08138

STATE V. MATZEN (USE OF HISTORICAL MAPS TO SETTLE CLAIMS TO ACCRETION LANDS).
250 NW2d 232-34 (Neb. 1977).

Descriptors: *Nebraska, *Accretion(Legal aspects), *Land forming, *Surveys, Real property, Boundary disputes, Maps, Geologic investigations, Geologic mapping, Judicial decisions, Geological surveys, Missouri River, Rivers, Legal aspects, Movement.
Identifiers: *Quiet title, *Title extinguishment, Ownership, *Property disputes, Expert witnesses.

Plaintiff state of Nebraska brought action to quiet title to accretion land along the Missuouri River. Defendant landowners claimed that the land in dispute accreted to an island tract owned by them and therefore title to accretion land should rest with them. Plaintiff contended that defendant's land was obliterated during the westward movement of the river, and that the effect of such movement was to destroy title to the land. Plaintiff's theory is that when the river moved back eastward, accretion land formed along the west bank, and that this land is the property of the state. An 1857 General Land Office map, and 1879 Army Corps of Engineers map, an 1884 Atlas map and an 1894 county surveyor's map showed the gradual development of the accreted land in question. Expert geological witnesses were called to interpret the maps. The experts concluded that the accretion land formed as the river moved east was accretion to defendant's land and not to plaintiffs state's tract. The lower court quieted title in defendants and the judgment was affirmed on appeal to the Nebraska Supreme Court. (Denker-Florida)
W77-08139

SALE OF WATER RIGHTS,
Idaho Code Ann secs 42-2601 thru -2608 (Supp 1976).

Descriptors: *Idaho, *Irrigation permits, *Water works, *Water permits, *Water contracts, Water management(Applied), Water rates, Water costs, Water transfer, Water delivery, Water distribution(Applied), Permits, Appropriation, Irrigation, Irrigation programs, Water rights, Water policy.

All owners of irrigation works or reservoirs, dams, canals, or other structures used for conserving or furnishing water for irrigation purposes in the state of Idaho shall petition the department of reclamation for a certificate to sell any water rights in such works. The petition must include a map and other information from which the department can determine the location of the works, the lands to be reclaimed, plans regarding any intended construction, capacity of the works, the number of acres which may be irrigated, names of parties, and terms of the proposed sale. After making necessary on-site inspections, the department shall evaluate the petition and finally issue a certificate to owners of the works. The certificate, which must be filed with the county records, shall indicate the number of water rights which may be sold, the number of acres which may be irrigated, and the form of the contract or deed to be issued to the purchaser. Certificates will not be issued unless the department has considered data and records of stream flow and water supply pertaining to the water to be sold, covering a period of five years. (Josepher-Florida)
W77-08140

DEPARTMENT OF WATER RESOURCES,
Idaho Code Ann, secs 42-1701 thru -1738 (Supp 1976).

Descriptors: *Resources development, *Idaho, *Water resources development, Water storage, Water supply, Water conservation, Permits, Water policy, Water permits, Water management(Applied), Dam construction, Dam failure, Damsites, Dams, Operation and Maintenance, Reservoir construction, Reservoir operation, Reservoir sites, Reservoir design.

The Idaho legislature herein creates a department of water resources. It is the intent of the legislature to provide for the exclusive state regulation of the construction, maintenance, and operation of all dams and reservoirs within the state. Permits must be obtained by persons desiring to construct or alter dams. Owners of dams must perform tests necessary to enable the state inspector to determine whether conformity with state safety standards is being secured. The department is vested with emergency powers enabling it to assume control over the operation of dams which pose immediate threats to life or property. A water resources board is created to coordinate a program which will achieve conservation, development and optimum use of state water resources. The board is vested with broad contractual powers. Specific criteria to guide the board in the achievement of its statutory goals are delineated. The board must approve all significant reservoir project proposals. Maximum economic development of waters involved, conservation of water, flood control, protection of all vested rights, and the prevention of waste are criteria considered in determining whether the reservoir project shall be carried forward. (Josepher-Florida)
W77-08141

WITHDRAWAL OF CERTAIN WATERS FROM APPROPRIATION: SPECIAL MUNICIPAL AND COUNTY WATER RIGHTS,
Ore. Rev. Stat secs 538.010 through .450 (1973).

Descriptors: *Oregon, *Withdrawal, *Diversion, *Columbia River, Legal aspects, Water law, Legislation, Prior appropriation, Recretion, Water utilization, Fish conservation, Fish management, Water rights, Priorities, Condemnation, Parks, Unappropriated water, Streams, Lakes, Municipal water.
Identifiers: *Withdrawn waters, Vested rights.

The diverted waters of Oregon's Ditch Creek, now a part of Willow Creek, are subject to the same rights of appropriation as the original Willow Creek. Morrow County is licensed to divert and store the waters of Ditch Creek and authorized to obtain the property rights necessary to effectuate those rights. The waters of certain other creeks are withdrawn from appropriation or condemnation, except for park purposes, in order to preserve recreational and scenic resources. The waters of Diamond Lake, Lake of the Woods, Hackett, Johnson, Mill, Barr, McNulty, and Milton Creeks, the Rogue River, and the tributaries of the Columbia River are similarly withdrawn in order to protect fish life therein. None of the above withdrawals shall affect vested appropriations. In most instances, the legislature made further exceptions for domestic and various other specific appropriations. All rights to water for municipal water supplies which were acquired before 1909 are confirmed, and certain exclusive rights of water use for municipal purposes are granted. (Moorhouse-Florida)
W77-08142

BELFORD V. CITY OF NEW HAVEN (INDIVIDUAL'S CHALLENGE TO CITY'S DREDGING AND CONSTRUCTION),
364 A.2d 194-200 (Conn. 1976).

Descriptors: *Connecticut, *Dredging, *Recreation facilities, *Environmental effects, Local governments, Channel improvement, Adjacent landowners, Contracts, Public rights, Water sports, Boating, Project planning, Construction, Parks, Natural resources, Facilities, Recreation.
Identifiers: Standing(Legal).

Plaintiff residents sought to enjoin defendant city from constructing rowing course and other facilities on public park land. City had entered into an agreement with private corporation for lease and construction of complete Olympic facilities on city park premises. The park already contained athletic facilities, including an old rowing course, and the proposed facilities would have nearly unrestricted public use. The affected area had limited wildlife value and minimal damage to resources was anticipated. Proposed dredging for the rowing course would cause no permanent damage. Plaintiffs claimed that the proposals constituted a diversion of park lands from proper park purposes, and charged that the construction would result in pollution and destruction of the city's natural resources. The court concluded that only parties with damage distinct from that suffered by the general public had standing to sue for a diversion from park purposes, and that the plaintiffs had no such distinct damage. Under the Connecticut Environmental Protection Act, any person may bring an action for relief against pollution. Here no possible pollution was shown. Nevertheless, the city was directed to get proper approval before proceeding with work in the tidal wetland area. (Molloy-Florida)
W77-08143

WOOD V. BOARD OF COMMISSIONERS FOR THE PONTCHARTRAIN LEVEE DISTRICT (LAND APPROPRIATION FOR LEVEES),
338 So.2d 744-47 (La, Ct. App. 1976).

Descriptors: *Louisiana, *Eminent domain, *Levees, *Flood control, State governments, Condemnation, Condemnation value, Levee districts, Public rights, Local governments, Water transfer, Drainage systems, Water policy, Water zoning, Legal aspects, Taxes, Real property.
Identifiers: *Groundwater management.

Plaintiff sought recovery of the value of two parcels of vacant land which defendant levee board used to construct or enlarge levees along two separate canals. Both parcels were obtained by plaintiff through tax redemption and quit claim deeds from the tax debtor. The trial court awarded judgement for the plaintiff for the value of the lands in 1949 when the levees were constructed, and plaintiff contended the judgement should be for the amount of land value in 1962 when he discovered the taking. The plaintiff was found correct in his contention that there had never been an attempt by the defendant to acquire a right to either parcel. However, the court found that fact unimportant since the title was in the state, by virtue of the tax delinquency, at the time the land was appropriated. There was no necessity for an express dedication to public use, since the land was not privately owned. The plaintiff's tax redemption was defective and subject to the previous dedication for levee purposes. Since only the plaintiff appealed, his request for increase of the award was refused. (Molloy-Florida)
W77-08144

MITCHELL V. CITY OF HIGH POINT (MUNICIPAL LIABILITY FOR DAMAGE FROM OVERFLOW OF PRIVATELY-OWNED STREAM).
228 S.E.2d 634-37 (N.C. Ct. App. 1976).

Descriptors: *North Carolina, *Flood damage, *Local governments, *Drainage, Right-of-way, Drainage practices, Ditches, Paving, Streams, Urban drainage, Legal aspects, Surface drainage, Overflow, Flash floods, Culverts, Water control.

Plaintiff landowners sought recovery for property damage suffered in a flood, and alleged defendant city's failure to maintain drainage system in good condition. A creek flows near plaintiff's property and under defendant's road through two culverts which are maintained by the city. The flood was caused by debris blocking the culverts, and plaintiffs contend that defendant had adopted the natural waterway as part of its drainage system such that a duty of inspection and maintenance was created. The city's right to improve streets was noted by the court to be subject to liability for concentrating waters into artificial drains and throwing the waters onto lands and causing injury. However, there was no evidence that the city augmented the flow of water in this case. Controlling and maintaining of culverts under the street did not mean that the city adopted the stream, nor did it constitute a dedication of a private stream to public use. The city exercised no legal control over the stream bed except the road right-of-way, hence the city had no duty regarding other portions of the stream bed and admission of evidence regarding the condition of other portions was prejudicial error. (Molloy-Florida)
W77-08145

SOLAR SALT COMPANY V SOUTHERN PACIFIC TRANSPORTATION COMPANY (ALTERATION OF SALINE CONTENT OF GREAT SALT LAKE IS NOT POLLUTION UNDER UTAH STATUTE).
555 P2d 286-93 (Utah 1976).

Descriptors: *Utah, *Great Salt Lake, *Saline lakes, *Salinity, *Saline water, Bodies of water, Lakes, Salt balance, Judicial decisions, Pollution, Legal aspects, Diversion, Water law, Appropriation, Brine shrimp, Structures, Algae, Competing uses.
Identifiers: *Causeways, *Property rights.

Plaintiff salt production company brought action against defendant railroad to recover for damages resulting from decreased salt content in portion of Great Salt Lake allegedly caused by the construction and maintenance of causeway. The causeway diverted waters entering the lake in such a way as to raise the saline content of the water in the northern portion of the lake, and reduce it in the southern portion. Plaintiff salt mining company sued on the grounds of nuisance, contending that by raising the salinity in the northern part of the lake, the defendant railroad had violated the Utah Pollution of Waters Act. The act includes in its definition of pollution 'any alteration' of the waters of the state as will 'render such waters harmful'. The Utah Supreme Court affirmed the summary judgment granted by the Third District Court of Salt Lake County. The court held that lowering the salt content of water is not a public nuisance, as the interests of the general public are not affected; nor is it pollution as defined by the statute. The court added that if the statute meant that lowering the salt content was a public nuisance, then the salt company itself would be guilty of a public nuisance whenever it removed salt from the lake's waters. (Sloan-Florida)
W77-08146

SIERRA CLUB V STAMM (NATIONAL ENVIRONMENTAL POLICY ACT DOES NOT REQUIRE COMPREHENSIVE ENVIRONMENTAL IMPACT STATEMENT ON LARGE RECLAMATION PROJECT WHEN EIS HAVE BEEN PREPARED FOR VIABLE PORTION OF PROJECT).
6 ERC 1848-54 (D Utah June 21, 1974).

Descriptors: *Environmental effects, *Utah, *Federal jurisdiction, *Environmental control, *Cost-benefit analysis, Water quality control, Economic impact, Economic prediction, Economic justification, Economic feasibility, Cost analysis, Water pollution control, Water districts, Reclamation, Projects, Legal aspects, Regional economics.
Identifiers: *National Environmental Policy Act, *Environmental Impact Statement, *Injunctive relief.

Plaintiff environmental groups brought this action against defendant federal officers and employees to enjoin continuing construction on the Bonneville Unit of the Central Utah Project, a partially constructed reclamation project designed to develop and provide water for beneficial uses in the state of Utah. Plaintiff contends that defendants failed to comply with the National Environmental Policy Act (NEPA) when they filed an inadequate final environmental statement (FES), which did not consider alternatives, nor contain an economic or cost-benefit analysis. Plaintiffs further allege that the FES was too narrow in scope since it did not cover all phases of the project. The district court held that plaintiffs failed to show by a preponderance of the evidence that any reasonable alternative was not considered and discussed in the FES, and that it did contain a rigorous exploration of alternative actions. The court found that neither NEPA nor the Council on Environmental Quality (CEQ) Guidelines require a benefit-cost analysis in monetary terms of the beneficial and adverse effects on the environment. The FES submitted herein fully and adequately describes and analyzes the significant secondary consequences resulting from the project, and is in compliance with NEPA and CEQ guidelines. Furthermore, the requirements of NEPA are satisfied by the preparation of separate impact statements that assess the environmental effect of each independent portion of the project. (Welch-Florida)
W77-08147

NATURAL RESOURCES DEFENSE COUNCIL V STAMM (NATIONAL ENVIRONMENTAL POLICY ACT NOT SATISFIED WHEN EIS FAILS TO DISCUSS ALL REASONABLE ALTERNATIVES TO THE PROJECT).
6 ERC 1525-34 (E D Cal April 26, 1974).

Descriptors: *California, *Construction, *Dam construction, Dams, *Regulation, Alternative planning, Water law, Water pollution control, Water demand, Water conveyance, Water storage, Water resources development, Water quality control, Water levels, Water management(Applied), Cost-benefit analysis, Project planning, Damsites, Flood control, Flood data, Flood protection.
Identifiers: *National Environmental Policy Act, *Injunctive relief, *Environmental impact statement.

Plaintiff environmental group brought this action against defendant federal officers and agents seeking a preliminary and permanent injunction to halt construction on the Auburn Dam portion of the Auburn-Folsom South Unit. Plaintiffs contend that defendant's planned construction and operation of the Unit in violation of the act authorizing such construction, and secondly, that the Environmental Impact Statement (EIS) concerning the Unit failed to comply with the requirements of the National Environmental Policy Act (NEPA) by failing to disclose the mode of operation of water release operations, failing to disclose the growth inducing impacts of the water contracting and pricing policies, and failing to discuss alternative sources of water. The district court held that the burden of proof fell upon plaintiffs, but that in this case plaintiffs had sustained that burden and that NEPA was not satisfied by the EIS submitted. The EIS was legally insufficient since it lacked a critical analysis of the alternatives available to achieve flood control. The court further noted that the EIS failed to discuss either the water contracting policies or the cost-ratio discussed in the original feasibility studies. An EIS must contain a discussion of reasonable alternatives to a proposed project in a detailed and well reasoned manner in order to qualify as a good faith statement of facts as required under NEPA. (Welch-Florida)
W77-08148

MICHIGAN CONFERENCE ASSOCIATION OF SEVENTH-DAY ADVENTISTS V COMMISSION OF NATURAL RESOURCES (PRIVATE LAKES WITH NO OBVIOUS PUBLIC ACCESS CLOSED TO THE PUBLIC).
245 Nw2d 412-14 (Ct App Mich 1976). 3 p.

Descriptors: *Michigan, *Lakes, *Navigable waters, *Non-navigable waters, *Riparian rights, Judicial decisions, Legal review, Legal aspects, Streams, Boundaries(Property), Recreation, Public rights, Public access, Social aspects, Recreation demand.
Identifiers: *Lake Shellenbarger(Mich), Private lakes.

Plaintiff is the owner of a tract of land which includes a 100-acre lake. The lake has no inlet, as it is spring fed, and only a small creek outlet. The small creek outlet is possibly navigable by a small boat. Plaintiff owns all land surrounding the lake and all land on both sides of the outlet stream up to a certain public highway. Plaintiff sued for and received a declaratory judgment that his lake was non-navigable, private and not subject to use by the general public. Defendant, the Michigan Commission of Natural Resources, challenged the ruling on appeal. The appellate court affirmed the declaratory judgment in Plaintiff's favor. Relying on established Michigan precedent, the court determined that the public may be excluded from a privately owned lake to which there is no readily apparent public access. The fact that the creek outlet may have been navigable was found to be unimportant. The court concluded that the availability of access by water to a lake which is otherwise private does not necessarily mean that the lake is open to public use. (Moorhouse-Florida)
W77-08149

UNITED STATES V OSAGE COMPANY (REMOVAL OF SUNKEN BOATS OBSTRUCTING NAVIGABLE WATERS OWNER'S RESPONSIBILITY).
414 F Supp 1097-1103 (W D Pa 1976).

Descriptors: *Pennsylvania, *Ships, *Submergence, *Judicial decisions, Navigable waters, Rivers, Negligence, Barges, Penalties(Legal), United States, Governments, Costs, Water law, Salvage value, Legal aspects, Obstruction to flow, Streamflow, Federal government.
Identifiers: *Navigation obstructions.

The United States Government, as plaintiff, brought an action against a barge owner to recover the cost of removing a sunken barge and for civil penalty. Defendant corporation alleged that the ship sank through no fault of its own, and therefore that it was not liable for the removal cost incurred by the Government. Defendant-owner failed to present any evidence providing that the barge left the mooring site by accident or by innocent misfortune. The United States District Court found that the barge constituted an obstruction in navigable water, and that the owner was required to prove that the sinking of the barge did not occur through its negligence, and that opinion evidence of nonnegligence was not sufficient to rebut the presumption of negligence. The Court also held that the owner of the barge was liable for the cost of removal incurred by the Government, but that civil penalty would not be imposed against it. (Martin-Florida)
W77-08150

UNITED STATES V TULARE LAKE CANAL COMPANY (RECLAMATION LAWS CONCERNING SALE OF LAND IN EXCESS OF 160 ACRES).
535 F2d 1093-1144 (9th Cir 1976).

Descriptors: *Water delivery, *Federal reclamation law, *Irrigation programs, *Land tenure, *Cost repayment, Dams, Multiple-purpose projects, Reclamation, Water, Contracts, Federal government, Water storage, Water rights, Economics, Irrigation, Farms, Pricing, Value, Land appraisals, Legislation, Construction costs, Legal aspects, Canals.

Plaintiff federal government sought to enjoin defendant canal company from delivering water from a reclamation project to any owner of land in excess of 160 acres unless the owner had executed a recordable contract with the Secretary of Interior requiring him to sell his excess acreage at a price which excluded the enhancement value due to the project. The plaintiff contended that such land owners were bound by Section 46 of the 1926 Onnibus Adjustment Act requiring the contract. The defendant contended that its repayment of a portion of the construction costs of the reclamation project exempted the land owners from Section 46. The district court held for the defendant. The Ninth Circuit Court of Appeals reversed. After an in depth examination, the court said the 1944 Flood Control Act did not exclude this project from the acreage limitation of the reclamation laws. The court also rejected the defendant's contention that repayment of construction costs exempted the landowners. The court said this would thwart the congressional purpose of discouraging land speculation in the project area. (Capehart-Florida)
W77-08151

CANADIAN PACIFIC (BERMUDA) LIMITED V UNITED STATES (NO DUTY TO SURVEY OR DREDGE CHANNEL AT ANY PARTICULAR TIME).
534 F2d 1165-70 (5th Cir 1976).

Descriptors: *Shoals, *Accidents, *Navigable waters, Ships, Channel improvement, Florida, Negligence, Dredging, Channels, Rivers, Damages, Legal aspects, Federal government, Surveys, Sand bars, Navigation, Sounding, Judicial decisions.
Identifiers: Proximate causation, Navigation obstructions, River pilots.

Plaintiff ship owner sought damages in admiralty from defendant United States for negligent maintenance of a waterway. The plaintiff's ship ran aground on a shoal in the St. John's River. The Corps of Engineers had surveyed the section of the river in question and had knowledge of the shoaling condition. The plaintiff contended that the defendant had a duty to advise the pilot's association of the shoaling condition. The plaintiff further contended that the defendant had a duty to dredge the river so as to eliminate the shoals. The trial court entered judgment for the plaintiff. The United States 5th Circuit Court of Appeals reversed; holding that the federal right of regulation of navigable waterways does not imply a duty of federal maintenance of such waterways. Noting the pilot's testimony that he would not have navigated the ship differently if he had had the defendant's information, the court further held that the defendant's failure to notify the pilots was not a cause of the accident. (Capehart-Florida)
W77-08152

COMPLIANCE WITH THE PROVISIONS OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED IN 1972.
Cal Water Code Ann secs 13370 thru 13382 (West Supp 1976).

Descriptors: *California, *Water pollution control, *Permits, *Interstate rivers, State governments, Legal aspects, Control, Legislation, Water quality, Federal government, Pollutants, Governmental interrelations, Penalties(Legal), State jurisdiction, Political aspects, Social aspects, Regulation, Management, Water treatment, *Federal Water Pollution Control Act.
Identifiers: *Water discharge requirement, Injunction(Prohibitory), Licenses, Notice, Effluent limitations, Administrative regulations, Certification.

California, pursuant to the Federal Water Pollution Control Act (FWPCA), has established a permit system to regulate the discharge of pollutants into the navigable waters of the United States. The discharge of any radiological, chemical or biological warfare agent into state waters is flatly prohibited. Any person who discharges other pollutants into state waters is required to submit a request for a waste discharge requirement. Such waste discharge requirements will be issued only after proper notice, and only for a five year period. All interested parties are afforded an opportunity to be heard. Water discharge requirements may be terminated for violation of the terms of the requirement, obtaining such requirement by misrepresentation, or a change in conditions which requires the elimination of a particular discharge. In addition, civil and criminal penalties are provided for violation of the waste discharge requirements. The statute requires that waste discharge requirement holders implement the best pollution control technology by 1977 and also meet any further technological advancement by 1983. (Moorhouse-Florida)
W77-08153

WELLS, PUMPING PLANTS, CONDUITS AND STREAMS,
Cal Water Code Ann secs 7000 thru 7075 (West 1971).

Descriptors: *California, *Conduits, *Legal aspects, *Canals, *Streams, Streamflow, Conveyance structures, Irrigation canals, Canal seepage, Diversion structures, Judicial decisions, Water law, Legislation, Water permits, Natural streams, Bridges, Wells, Canal design, Ditches.
Identifiers: Citizen suits, Standing(Legal), Surface mining, Dredging operations.

Any persons associated in the use of a conduit, well, or pumping plant are liable for the reasonable expenses of repair and maintenance in proportion to their actual use thereof. Any person paying more than his share of such expenses may bring an action for contribution against a non-paying user, and for a declaration of rights of the respective water users to determine the proportionate expenses of each. California has further provided that any resident or freeholder in a road district may, upon filing of the required bond, petition for the opening or alteration of a canal for the convenience of one or more residents of such district. However, no canals or other conduits may be laid so as to obstruct any highway. Every conduit built across a pre-existing highway must comply with county and state standards. All conduits in place for more than thirty years, and all approved bridges, shall be maintained and improved by the public agency having jurisdiction over the highway. In contrast, the flow of water of any stream to the intake of any canal for public or agricultural use may be maintained by the person in charge of the use. Such maintenance, shall not, however, prevent the maintenance or building of reclamation or flood control levees or the use or enlargement of any natural channel for municipal purposes. The alteration of the course of any stream in a surface mining dredging operation, without prior approval is expressly prohibited. (Moorhouse-Florida)
W77-08154

BEAR RIVER COMPACT,
Utah Code Ann secs 73-16-1 thru -2 (1968).

Descriptors: *Idaho, *Utah, *Wyoming, *Water rights, Legislation, Water utilization, Administration, State governments, Legal aspects, Regulation, Water law, Institutions, Interstate, Water policy, Water resources development, Projects, Planning, Reservoirs, Jurisdiction, Priorities, Prior appropriation, Water storage, Eminent domain, Condemnation, Canals, Interstate compacts, Governmental interrelations.
Identifiers: *Bear River Compact(Ida-Uta-Wyo).

Idaho, Utah and Wyoming have agreed to the Bear River Compact, which sought to remove the causes of controversies over the distribution and use of the waters of Bear River. The participants in the compact were concerned about the efficient use of water, additional development of water resources, and promoting interstate comity. The Bear River Commission was established for the purpose of setting policy, adopting laws, rules and regulations and investigating, constructing and operating projects providing for the maximum beneficial use of the water. Procedures regarding water emergencies and storage rights in reservoirs are set forth in the text of the compact. Each signatory state can acquire water rights in one state for use of water in another state provided the exercise of eminent domain shall be in accordance with the law of the state in which such property is located, and any facilities constructed shall be subject to the law of the state where the facility is located. Compact provisions are to be reviewed every twenty years, but can be terminated at any time by the unanimous agreement of the signatory state. (Hadoulias-Florida)
W77-08155

BOARD AND DIVISION OF WATER RESOURCES,
Utah Code Ann. secs. 73-10-1 thru -4 (Supp. 1975).

Descriptors: *Utah, *Water conservation, *Water utilization, Legislation, Administration, Governments, Legal aspects, Regulation, Water law, Institutions, Interstate, State governments, Water policy, Water management(Applied), Water resources, Water resources development, Water yield improvement, Competing uses, Water contracts, Reclamation, Economics, Administrative agencies, Projects, Underground streams, Streams.

The Utah state legislature reaffirms the state public policy of managing the water resources so that they can be put to the highest use for public benefit, including domestic uses and irrigation of lands. The legislature urges co-operation with state and federal agencies to obtain maximum yields from underground waters and small streams, creating a revolving fund so that every mountain stream and water resource can be made to render the highest beneficial service, and constructing projects to increase the beneficial use of water. The Board of Water Resources, consisting of seven members appointed by governor, has been created, and shall assume the responsibilities previously performed by the Utah Water and Power Board. Additional powers and duties include authorizing studies for the promotion of water and power resources, power to enter into contracts for construction of conservation projects, to sue and be sued, to contract with federal and other agencies, and to consider and recommend on behalf of the state regarding reclamation projects or water development projects by state or United States agencies. (Hadoulias-Florida)
W77-08156

BOOM COMPANIES: CONSTRUCTION, POWERS OF,
W Va Code Ann secs 31-3-1 thru 31-3-11 (Supp 1975).

Descriptors: *West Virginia, *Lumbering, *Streams, Legislation, Dams, Water law, Administration, State governments, Local governments, Rivers, Access routes, Saw mills, Facilities, Legal aspects, Water rights, Penalties(Legal), Banks, Surface waters, River flow, Tributaries, Streamflow.
Identifiers: *Booms, Intentional torts.

Any corporation, incorporated in West Virginia for the Express purpose of boom construction is authorized to construct booms in the rivers and streams of the state, wherever such booms are necessary to stop and secure boats, rafts, logs, mosts, spars, lumber and other timber. However, no boom may be constructed in any navigable stream. Each boom corporation shall have exclusive control over the use and flow of the waters within two miles above and below its principal boom. Each corporation may do whatever is necessary for getting logs to, down, and from the river on which its boom is located. Any person willfully or maliciously destroying or defacing any boom or boomed timber shall be guilty of a misdeameanor and liable for treble damages in an action by the corporation. Similarly, if any logs become lodged on improved lands while sustained, but removal, destruction, or conversion of such timber by the landowner shall be a punishable misdemeanor. No log owner shall unreasonably delay driving such loop into a boom so as to obstruct the use of the stream for others. However, once within a boom, the corporation is liable for all damages except sinking, floods, and fire provided the log owner has filed a memorandum with the clerk of the county court describing the marks and brands used to identify his timber. (Moorhouse-Florida)
W77-08157

RESERVOIRS,
Wyo Stat Ann secs 41-26 thru 41-46 (1959), as amended, (Supp 1971).

Descriptors: *Wyoming, *Beneficial use, *Permits, Legislation, Unappropriated water, Water storage, Ditches, Reservoirs, Water rights, Irrigation, Streams, Diversion, Alteration of flow, Irrigation practices, Obstruction to flow, Reasonable use, Water utilization, Relative rights, Industrial production, Municipal water, Conveyance structure, Administration, Water law, Institutions, State governments, Administrative agencies.

Any person, corporation, association or organization intending to store or impouund for beneficial use, any unappropriated waters of Wyoming shall apply to the state engineer for a permit to construct a reservoir. Secondary permits are granted for the appropriation of stored water for the irrigation of any lands. However, such stored water may be discharged into the natural flow of streams in situations where the natural stream waters have been appropriated or obstructed in such a manner that the waters are insufficient to irrigate the land. The natural stream flow can then be diverted in an amount equal to the stored water for irrigation of the land. Under the 1971 Amendments, water may be diverted for industrial and municipal puurposes as well. However, applications for permits to divert the stream water must be filed in the form of secondary permits, and maps, and other information must show the ditches. The 1971 Amendments require that the accompanying maps show other means of conveyance through which the natural flow of the stream is to be conveyed, the lands to be irrigated or the place of the industrial or municipal use, and the point at which the stored water will be discharged into the stream. (Hadoulias-Florida)
W77-08158

WINKLE V MITERA (RIPARIAN RIGHTS OF AN ISLAND OWNER),
241 NW2d 329-34 (Neb 1976). 1 map.

Descriptors: *Judicial decisions, *Land subsidence, *Nebraska, Rivers, Legislation, Legal aspects, Law enforcement, Legal review, Water law, Submergence, Subsidence, Ownership of beds, Boundaries(Property), Islands, Adverse possession, Accretion(Legal aspects), Navigable rivers, Riparian rights, Navigable waters, Adverse possession.

The defendants appealed the decision of the District Court, quieting title in favor of the plaintiff to a portion of land adjoining the island in question, which had been submerged at one time, but was now reappearing. The Supreme Court of Nebraska noted that under Nebraska law once land has eroded, original title is obliterated. Nebraska law also dictates that ownership of an island includes all the land from the island to the center of the river channel. Consequently, when the disputed land finally reemerged, ownership vested in the plaintiff's predecessor in title, as owner of the island. The court refused to recognize the defendant's claim to title from the tax foreclosure sale, since no notice of the sale was given to the plaintiff's predecessor. The court also refused to recognize title by adverse possession, because the defendants failed to claim open and exclusive possession. The Supreme Court therefore affirmed the District Court's judgement in favor of the plaintiff. (Hadoulias-Florida)
W77-08159

COASTAL ZONE LEGISLATION: LOUISIANA LANDMARKS, LABYRINTHS AND LOGROLLING,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
J. R. Van Lopik.
In: The Present and Future of Coasts: Proceedings of the First Annual Conference, November 1975, Arlington, Virginia, Hayden B.P., ed., The Coastal Society, Bethesda, Maryland, p. 37-48. 5 ref.

Descriptors: *Louisiana, *Legislation, *Wetlands, *Management, Regulation, Coordination, Governments, Administrative agencies, Marshes, Coastal marshes, Salt marshes, Tidal marshes, Bayous, Ecosystems, Petroleum, Estuaries, *Estuarine environment.
Identifiers: Coastal zones, *Coastal zone management, *Coastal Zone Management Act of 1972, Marshlands, Estuarine ecology, Marine resources.

More coastal marshlands are found along the coastline of Louisiana than along the entire eastern seaboard of the United States. In 1971 the governor established an advisory commission to investigate the problem of coastal zone management, which at that time was fragmented among twenty-six state agencies in addition to the Corps of Engineers. This commission returned 40 recommendations which form the foundation of work being done on a coastal zone management bill under the federal Coastal Zone Management Act of 1972. Whether the bill is to be passed by the state legislature will require compromise between environmentalists, who want considerable detail as to decision-making guidelines, and legislators, who believe that inordinate detail will preclude any chance of passage. The problems to be considered in formulating a management plan include: the complexity of the problems of ecosystem function, multiple use considerations, and institutional arrangements; economic impacts and management costs; and coordination and control problems among the local, state, and federal agencies. The major areas of concern are the need for additional knowledge regarding the coastal zone, and for increased communication of the knowledge possessed by state agencies and by universities. (Sloan-Florida)
W77-08186

FINAL REPORT OF COMMITTEE VII (FINAL RECOMMENDATIONS OF THE INTERNATIONAL CONFERENCE ON WATER LAW AND ADMINISTRATION),
In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (COPLANRH), Caracas, Venezuela, 1976. 14 p.

Descriptors: *International law, *Water users, *Water resources development, *Water management(Applied), International waters, Water utilization, Water supply, Water sources, Water rights, Water resources, Water policy, Water law, Water control, Water allocation(Policy), Education, Research and development, Research priorities, Basins, Governments, Legislation, Law of the Sea, Compensation, Groundwater basins, Groundwater resources, Groundwater.
Identifiers: Expropriation.

The committee report includes recommendations at two levels--national and international. In its recommendations at the national level it suggests nine principles for governments to consider regarding ownership, use, and protection of water resources. The committee also recommends principles in connection with institutional aspects and research. Guidelines concerning water policy, groundwater resources and planning are also discussed. Various legal and institutional criteria aimed at providing effective instruments for water management are listed. Among these criteria is the recommendation that compensation for acquired water rights not necessarily be paid since a change in the legal regime of water resources does not constitute a case of expropriation. The committee recommends government action in the legal regulation of water and the human environment, as well as in education, research and training in water law and administration. At the international level suggested actions include assistance to developing countries with respect to the utilization of water resources, systematized international water resource rules, and principles to be used when basins are internationally shared. (Rieck-Florida)
W77-08187

NEW WATER LEGISLATION--DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION,
Wyoming Univ., Laramie. Coll. of Law.
F. J. Trelease.
In: Proceedings of the International Conference on Global Water Law Systems, International Association for Water Law, September 1-9, 1975, Valencia Spain; published by Colorado State University, Ft. Collins, Colo. 80523, p 1154-1184, 1976. 31 p, 49 ref.

Descriptors: *Legislation, *Water policy, *Water rights, Water law, Permits, Administration, Planning, Research, Water pollution, Water resources, Water shortage, Water supply, Legal aspects, Regulation, Institutions, Water management(Applied), Priorities, Preferences(Water rights).
Identifiers: *Comparative law, *Phillipines, *Swaziland.

New water laws must be drafted to meet the needs of a rapidly changing world. These new laws must be designed not only to facilitate efficient allocation of resources and protection of the environment, but must also consider social and national goals. The scope of this paper is that part of water law which governs the activities of persons who withdraw and use water for beneficial purposes—the law of water rights. Prior to drafting the author of new water laws should consult local officials who are familiar with the problems, constraints and objectives of the particular area. All water laws should define the scope of the law, and the uses and users of the water resources. Common problems which may arise include: implementing preferences and permits; preserving and register-

ing existing rights; allocating priorities; and implementing administrative controls. The author analyzes various methods of allocating water rights including, temporal priority, equal sharing enforced by proportionate reduction, statutory lists of preferences, administrative discretion, and sale or auctions of water. The author concludes that temporal priority is the preferred method because it cultivates security in the ownership of property rights. The author uses a comparison of the systems of controlling water rights in the Philippines and Swaziland to illustrate his conclusion. (Hadoulias-Florida)
W77-08188

UNIVERSITY PUBLIC SERVICE PROGRAMS AS THEY RELATE TO WATER RESOURCES MANAGEMENT IN WISCONSIN,
Wisconsin Univ. Extension, Madison. Inland Lake Demonstration Project.
S. M. Born, M. T. Beatty, and D. A. Yanggen.
August 1972. 10 p, 1 tab, 15 ref.

Descriptors: *Water resources development, *Water management(Applied), *Natural resources, *Planning, *Land use, *Institutions, *Education, *Wisconsin.
Identifiers: *Water Resources Act of 1965, *Inland Lake Demonstration Project, *Shoreline Management Program, Upper Great Lakes Regional Commission.

The historical and current role of the University of Wisconsin in public policy dealing with water resource management is analyzed. The University has helped shape and define the mission of restructured state agencies, aided general acceptance of planned comprehensive approaches to solving natural resource problems, educated constituents regarding new programs, and, through administrative and legislative efforts, increased the number of environmentally oriented programs by local government. The University should be the research and education arm of government and its policies. The role the University and its Extension Division can play in water related public policy is described in regard to the Water Resources Act of 1965. Within the Act, the University became heavily involved in the educational effort to inform the public of the Shoreline Management Program. Also shown is how applied research is integrally tied to demonstration projects in the analysis of the University's role in the Inland Lake Demonstration Project sponsored by the Upper Great Lakes Regional Commission. Detailed descriptions of current University programs in the water resource area are given, including University Extension, County Extension programs, Public information and public policy programs, University involvement in regional planning for water resources management, and specific University organizations such as the Water Resources Center, the Institute for Environmental Studies, Water Resources Management Program, and various inter-departmental involvement. (Gentry-NC)
W77-08209

IMPROVING INSTITUTIONAL ARRANGEMENTS FOR WATER DEVELOPMENT IN THE STATE OF WASHINGTON: DEVELOPMENTAL AND ENVIRONMENTAL TRADE-OFFS AND CONSTRAINTS,
Washington Univ., Seattle. Inst. of Governmental Research.
R. H. Pealy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 919, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, June 1976, 177 p. OWRT A-057-WASH(1), 14-31-0001-3848.

Descriptors: *Institutions, *Water resource development, *Washington, *Institutional constraints, Organizations, State governments, Networks, Environment, Decision making.

The networks of institutional arrangements in this study consist of federal, state, local, and regional organizations, including the processes they use in planning and developing the functions of irrigation, water supply, electricity generation, navigation, flood control, soil conservation, forest conservation, fish and wildlife conservation and outdoor recreation. The networks are also expected to trade off the values of water development with the values of environmental protection and growth. Each of the networks was originally designed to reach certain objectives: comprehensive, multipurpose, long-range planning and development of river basins; economic efficiency; engineering or technical efficiency; administrative efficiency; and political consensus. The objective of environmental protection was recently added, and, to a limited degree, growth control. The networks have achieved only a moderate degree of success in achieving the objectives. The decision-makers have been using a fragmented model which has made it difficult to set priorities, and to establish the consequences of actions and the decision-making by many groups. It would not be politically feasible, because of certain ideological barriers in the setting in which the networks operate, to use a centralized model for future network design purposes. Rather the principles of the non-structural solution, project smallness and decentralization are likely to be acceptable and effective. Some new organizational structures are suggested, however.
W77-08284

WATER SUPPLY AND CONTROL DEVELOPMENTS SUMMARIZED, (ARIZONA).
From the State Capitals, (Bethune Jones, Asbury Park, N.J.), Water Supply Report No. 6, p 1-2, June 1, 1977.

Descriptors: *Water law, *Water allocation(Policy), Groundwater, Water management(Applied), *Arizona, *Legislation.
Identifiers: *Groundwater law, *Groundwater legislation.

A plan to solve immediate probles with ground water transfer and to set up a commission to develop a state water management plan was recently announced by Arizona state legislative leaders. The bill is designed to meet immediate needs but sets up a process for more comprehensive water management for the state in the future. If approved, existing ground water pumping operations in critical areas would be allowed to continue with a certificate of exemption from the State Land Department. A recent state Supreme Court ruling prohibited the pumping of groundwater from one parcel to another, thereby threatening several Tucson area mining operations and necessitating a change in Arizona's groundwater law. The bill sets up a 23-member commission to devise a water management plan in a two-year time period. (Eberle-NWWA)
W77-08313

THE ERDA GEOTHERMAL PROGRAM,
Energy Research and Development Administration, Washington, D.C.
For primary bibliographic entry see Field 4B.
W77-08314

URBAN DRAINAGE AND FLOOD CONTROL PROJECTS: ECONOMIC, LEGAL, AND FINANCIAL ASPECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W77-08345

METHODOLOGY AND DATA FOR ANALYZING QUANTITY, QUALITY AND ECONOMIC ASPECTS OF MINIMUM STREAMFLOWS, APPENDICES, VOLUME 2,
Washington Univ., Seattle. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-08349

FROM GOOD HUSBANDRY TO REASONABLE USE: ILLINOIS SURFACE WATER DRAINAGE LAW EVOLVES IN SUBDIVISION CASE,
For primary bibliographic entry see Field 4A.
W77-08353

THE IMPORT - EXPORT CLAUSE AND CONTROL OF OIL POLLUTION: REGULATORY FEE IMPOSED PURSUANT TO THE POLICE POWER,
For primary bibliographic entry see Field 5G.
W77-08354

EPA FOCUSES ON MUNICIPAL ENFORCEMENT,
P. S. Ward.
Journal Water Pollution Control Federation, Vol 48, No 9, p 2114-16, September 1976.

Descriptors: *Municipal wastes, *Administrative agencies, *Environmental control, *Water permits, *Sanitary engineering, Waste disposal, Legal aspects, Permits, Water law, Environmental engineering, Environment, Waste water disposal, Waste water treatment, Wastes, Sewage treatment, Control, Regulation, State governments, Federal government, Sewage, Municipal water, Water quality.
Identifiers: *Administrative regulations, *Permit compliance process, *Municipal enforcement.

The Environmental Protection Agency's (EPA) Water Enforcement and Water Program Operations Offices have presented a draft report on the municipal enforcement at EPA. The report, analyzing the interaction between and EPA and state municipal waste facilities programs, advocates an immediate strenthening of the agency's management control over the municipal compliance process. Among the report's major recommendations made in response to the discovered ineffectiveness of the compliance process are: to dramatically increase the rate of EPA and state response to identified violations; to improve tracking procedures and documentation of response and follow-up activity; to make compliance schedules more closely related to the construction grant process; and to clarify EPA priorities with respect to the resolution of operational problems. At EPA request, the Committee of Ten (an advisory group to EPA) had its subcommittee also present its own reort on municipal enforcement. The report focuses on regulatory reponse to permit noncompliance and advocates a regulatory policy that is neither so severe as to encourage a detrimental backlash nor so lax as to be ineffectual. This report goes beyond the EPA report is stressing the need for extensive integration of many programs that will in the long run influence municipal compliance. (Anderson-Florida)
W77-08355

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-08356

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY PRETREATMENT STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08357

COASTAL ENERGY IMPACT PROGRAM.
National Oceanic and Atmospheric Administrations, Washington, D.C.
Federal Register, Vol 42, No 3, p 1164-87, January 5, 1977.

Descriptors: *Coastal structures, *Coastal engineering, *Energy, *Management, Administrative agencies, Federal government, State government, Local governments, Economic impact, Regulations, Control, Planning, Comprehensive planning, Long-term planning, Area redevelopment, Estimated costs, Financial feasibility, Regional development.
Identifiers: *Coastal Zone Management Act of 1972, Coastal zones, Coastal energy impact fund, Coastal Energy Impact Program, Outer Continental Shelf, Coastal energy activity, Coastal waters, Administrative regulations.

The National Oceanic and Atmospheric Administration has established interim-final regulations defining the procedures by which coastal states and local governments can qualify for impact assistance under the Coastal Energy Impact Program. The program is aimed at meeting state and local needs resulting from coastal energy activity and Outer Continental Shelf (OCS) energy activity. To be eligible for assistance, a coastal state must be receiving a grant under section 305 of the Coastal Zone Management Act, must have an approved coastal zone management plan under section 306 of the Act, or must be making satisfactory progress toward the development of a management program. Each year a list of coastal energy activities is compiled which forms the basis for allotments among the coastal states. Calculations are then made regarding the increased employment and population likely to result from construction or expansion of the energy facilities on the list. Such calculations will produce a 'need factor' for the various states. Allotments will then be made to the states who will have responsibility for distribution among their local governmental units. (Moorhouse-Florida)
W77-08358

TOXIC POLLUTANT EFFLUENT STANDARDS FOR BENZIDINE.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08359

EFFLUENT GUIDELINES AND STANDARDS FOR FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, NITRIC ACID SUBCATEGORY.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08360

A NEW MEASURE OF DAMAGE FOR WRONGFULLY APPROPRIATED WATER,
For primary bibliographic entry see Field 4A.
W77-08361

PUBLIC RIGHTS IN PENNSYLVANIA WATERS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Office of Enforcement.
R. T. Weston.
Temple Law Quarterly, Vol 49, No 3, p 515-57, Spring 1976.

Descriptors: *Pennsylvania, *Public rights, *Navigable waters, *Recreation, Bodies of water, Legal aspects, Non-navigable waters, Beds under water, Civil law, Common law, Lake beds, Lakes, Legal review, Low water mark, High water mark, Navigable rivers, Public access, River beds, Rivers, Streambeds, Streams, Water rights, Water law, Beds.
Identifiers: *Navigability tests, *Public trust doctrine, *Water rights(Non-riparians), *Navigational servitude.

The issues of public rights in, and use of, the waters within Pennsylvania are important to the economic, social and environmental development of the state. The origins of public rights in surface waters stem from English law and early federal jurisdiction over navigable water ways. Waters which are navigable in fact are declared public rather than private. A review of both federal and state standards reveals a wide variation as to what constitutes navigable waters, and ultimately to what are private or public, waters. In Pennsylvania, the beds of navigable rivers and lakes are held in trust for the public. The public, therefore, has a right of unencumbered use of these waters. Between the high and low water marks, the public has a right of servitude or easement. The conflict regarding the use of Pennsylvania's private but navigable lakes has not yet been resolved. Pennsylvania approaches public rights to lakes and streams on an ad hoc basis leaving behind the rubric of navigability. Definitive statement of the public's right in surface waters awaits judicial resolution or legislative action. (Morse-Florida)
W77-08362

REMEMBERING MAINE: OFFSHORE FEDERALISM IN THE UNITED STATES AND CANADA,
Toronto Univ. (Ontario). Faculty of Law.
G. S. Swan.
California Western International Law Journal, Vol 6, No 2, p 296-322 (1976).

Descriptors: *Federal jurisdiction, *Oceans, *International waters, *Federal-sstate water rights conflicts, Federal government, Judicial decisions, State jurisdiction, Water rights, Jurisdiction, Legal aspects, Governmental interrelations, Political aspects, Coordination, Continental shelf, Proprietary power, Regions, *United States, *Canada, Australia.
Identifiers: *Seabeds.

The danger of international rivalries over marginal sea area exploitation renders persuasive an energetic federal government role in the marginal sea area. There continues to be a state-federal/provincial-federal issue concerning rights connected to marginal seabeds in both the United States and Canada. The United States Supreme Court has held that national external sovereignty is the critical factor in deciding controversies over seabeds in favor of the federal government. The court stated that federal authority over marginal seabeds hinges on the federal defense/foreign relations capacity, with national rights being paramount. The Canadian Supreme Court's decisions resemble the opinions of the United States Supreme Court in empowering the Dominion Parliament to impose laws having extra-territorial operation. Possible future jurisdictional problems in Canada may be resolved through the use of politicolegal strategies relied upon in both Australia and the United States. The underlying concept of these strategies is one of cooperation between the states and the federal government to establish a single administrative regime rather than to divide the territorial seabed into areas. (Rieck-Florida)
W77-08363

STATES' RIGHTS IN THE OUTER CONTINENTAL SHELF DENIED BY THE UNITED STATES SUPREME COURT,
A. W. Anderson.
University of Miami (Florida) Law Review, Vol 30, No 1, p 203-15 (1975).

Descriptors: *Submerged lands, *Maine, *United States, *Continental shelf, *Federal-state water rights conflicts, Legal aspects, Legal review, Federal government, Boundary disputes, Judicial decisions, Federal jurisdiction, State jurisdiction, Ownership of beds, Water law, Governmental interrelations, Governments, Legislation, Submerged Lands Act.
Identifiers: Territorial sea(Jurisdiction), Coastal waters, *Outer continental shelf.

In response to Maine's issuance of a permit for oil and gas exploration of the outer continental shelf off its coast, the United States sought a declaration that Maine and 12 other states had no rights in the shelf. The U. S. Supreme Court agreed that national sovereignty required exclusive national ownership of the seabed and subsoil from the 3 mile territorial sea to the outer continental shelf. Other states had claimed state ownership of submerged lands on the basis of sovereignty and the exercise of dominion prior to admission to the United States. Those claims were defeated, but Congress, in response, quit claimed the 3 mile territorial sea to the states. Maine asserted the same historical claim to ownership in the instant case. The Supreme Court, rejecting the argument that Congress had abrogated the federal paramount rights doctrine in quit claiming the territorial sea relied on the necessity of exclusive national sovereignty. The court thus confuses dominion over mineral resources and property rights with sovereignty in the international arena. Congress has properly recognized that the right to conduct foreign affairs does not require exclusive federal control over the domestic allocation of benefits and burdens of submerged lands. (Moorhouse-Florida)
W77-08365

SOVEREIGNTY AND THE CONTROL OF WATER POLLUTION,
For primary bibliographic entry see Field 5G.
W77-08366

THE ENVIRONMENTAL PROBLEM OF THE OCEANS: AN INTERNATIONAL STEPCHILD OF NATIONAL EGOTISM,
N. E. Abrams.
Environmental Affairs, Vol 5, No 1, p 3-32 (Winter 1976).

Descriptors: *United Nations, *Environmental effects, *International commissions, *Oceans, *Political aspects, *Political constraints, International waters, International law, Regulation, United States, Water, Water rights, Economic impact, Economics, Economic justification, Competition, Governments, Governmental interrelations.
Identifiers: *Law of the sea, *Law of the Sea Conference.

Protection of the ecological balance of the world's oceans is difficult to accomplish since international agreements regarding the seas are primarily concerned with defining political and economic rights of the participating nations. The author attempts to show that international conventions are generally inadequate, and more importantly, that the practice of treating environmental responsibility for the oceans according to traditional notions of state sovereignty is a serious error. Focusing on the 1975 United Nations Law of the Sea Conference as the most comprehensive attempt to date to codify the rights and obligations of individual states with respect to the sea and to each other's maritime interests, the author demonstrates the devastating effects of regional politics and the lack of international sensitivity. The author suggests that the problems of preservation of the marine environment be treated separately from the problems of re-writing the law of the sea for maximum achievement of ecological goals. (Josepher-Florida)
W77-08367

LEGAL CONTROL OF CONSUMPTIVE WATER USE IN PENNSYLVANIA POWER PLANTS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Office of Enforcement.
For primary bibliographic entry see Field 3E.
W77-08368

AQUACULTURE: PROBLEMS OF IMPLEMENTATION UNDER EXISTING LAW,
British Columbia Univ., Vancouver. Faculty of Law.
R. C. McCutcheon.
University of British Columbia Law Review, Vol 10, p 289-319 (1976). 139 ref.

Descriptors: *Aquiculture, *Navigable waters, *Riparian rights, *Commerical fishing, International law, Governments, Economic impact, Legal aspects, Water rights, Ownership of beds, Water law, Canada, Flow, Fisheries, International waters, Non-navigable waters, Stream-beds, Tidal waters, Pipelines, *Canada.
Identifiers: *British Columbia, Coastal waters.

The oceanographic and topographical characteristics of the British Columbian coastline make it a prime area for aquaculture. However, entrepreneurs are forwarned of inherent problems. Aquaculture facilities are by necessity constructed in navigable waters and pose harmful obstacles to navigators and possible liability to aquaculturists. Adequate warning systems are imperative. Facilities built upon non-tidal waters may conflict with reparian rights. The aquaculturist would probably be required to compensate the riparian owner or obtain a lease from him. Additionally aquaculture may conflict with fishing. In non-tidal areas, water lot leases would be required but in tidal waters the government possesses the power to control fishing. The aquaculturist would be left the task of convincing the government of the true public value of his activities. The construction of aquaculture facilities would restrict other possible uses of public waters. Once again the aquaculturist would be forced to prove his endeavors are worth the cost. A final problem to be faced by the aquaculturist is the damage that could be done to his stock by the construction of submarine pipelines and cables in his underwater area. (Moorhouse-Florida)
W77-08369

PROPOSED EFFLUENT GUIDELINES AND STANDARDS FOR IRON AND STEEL MANUFATURING,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08370

EFFLUENT GUIDELINES AND STANDARDS FOR CANNED AND PRESERVED FRUITS AND VEGETABLES POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08371

SHOULD RIVERS HAVE RUNNING. TOWARD EXTENSION OF THE RESERVED RIGHTS DOCTRINE TO INCLUDE MINIMUM STREAM FLOWS,
Idaho Water Resource Board, Boise.
S. W. Reed.
Idaho Law Review, Vol 12, No 2, p 153-67 (1976).

Descriptors: *Idaho, *Reservation doctrine, *Appropriation, *Beneficial use, Legal aspects, Prior appropriation, Water law, Water rights, Diversion, Unappropriated water, Federal reservations, Aquatic lide, Aquatic animals, Fish, Aquatic plants, Ecosystems, Biological communities, Rivers, Streams, Aquatic environment, Indian reservations.
Identifiers: *Standing(Legal), Reserved rights doctrine, Indian water theory.

Following the notion of standing for natural objects, standing for rivers and the natural creatures living in them is advocated herein. Western water law (prior appropriation of water for beneficial use determines right) is compared with Indian concepts of water rights. The Indians did not believe in ownership of water because it was an integral part of the ecosystem in which all forms of life had equal rights. Recently the Idaho legislature recognized non-economic uses of streams when it provided for recreation uses. The recognition was, however, still phrased in terms of human benefit. Protection of life dependent on stream flow is the true issue, since pollution and diversion destroy aquatic life not people. The reserved rights doctrine may provide the medium for legal recognition of these rights. It maintains that all federal reservations have a right to use of water from included and adjacent streams and rivers to make those reservations productive. Prior appropriation for beneficial use need not be shown. Similarly, the rights of animate and inanimate objects to an adequate instream flow of water should be implied from the ecosystem itself without need for economic justification. (Moorhouse-Florida)
W77-08372

THE 1972 WATER POLLUTION CONTROL ACT: UNFORESEEN IMPLICATIONS FOR LAND USE PLANNING,
For primary bibliographic entry see Field 5G.
W77-08373

FLOOD PLAINS FOR OPEN SPACE AND RECREATION.
Bureau of Outdoor Recreation, Washington, D. C.
For primary bibliographic entry see Field 6F.
W77-08374

THE WINTERS DOCTRINE AND HOW IT GREW: FEDERAL RESERVATION OF RIGHTS TO USE OF WATER,
Office of the Solicitor (Interior), Washington, D. C.
H. A. Ranquist.
Brigham Young University Law Review, Vol 1975, No. 3, p 639-724 (1975). 346 ref.

Descriptors: *Federal government, *Reservation doctrine, *Water rights, *Indian reservations, Prior appropriation, Federal-state water rights conflicts, Administrative agencies, Irrigation water, Diversion, Legal aspects, Reasonable use, Federal reservations, Public lands, Riparian rights, Judicial decisions, Federal jurisdiction, State jurisdiction, Arizona, California, Colorado, Withdrawn lands, Water law.
Identifiers: *Western United States, *Winters doctrine, *Aboriginal water rights, *Indian water rights.

Various historical factors resulted in three different approaches to water law in the evolution of legal systems in the Western states, as opposed to the uniform adherence to the English common law doctrine of riparian rights in the East. Because the Western states each created and enforced their own systems, a pattern of reliance on state law developed, and the role of federal law was ignored for many years. In 1908, however, the Supreme Court held in Winters v. U. S. that there is a right in the federal sovereign to reserve water on Indian reservations. This principle, known as the Winters doctrine, was affirmed in subsequent decisions and eventually expanded to uphold claims asserted by the United States to waters on other federal lands. As the doctrine has developed judicially, with no statute dealing directly with the subject, the states have opposed its development in many areas. The result has been confusion, conflict, and controversy between federal and state interests and disagreement among legal scholars. The author suggests an administrative scheme which bring all users of the water in contested areas into a single forum having jurisdiction over the water and the parties. (Sloan-Florida)
W77-08375

PLANNING CHALLENGES IN THE MANAGEMENT OF COASTAL ZONE WATER RESOURCES,
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W77-08376

WATER FOR FOOD - OR FOR MORE IMPORTANT PURPOSES. (REALLOCATION OF IRRIGATION WATER TO CITIES AND INDUSTRIES),
Wyoming Univ., Laramie. Coll. of Law.
F. J. Trelease.
In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (COPLANARH), Caracas, Venezuela, Vol. 15, 1976. 22 p, 21 ref.

Descriptors: *Irrigation effects, *Water utilization, *Preferences(Water rights), *Irrigation water, *Water allocation(Policy), Appropriation, Food abundance, Water law, Foods, Productivity, Cost allocation, Environmental effects, Social aspects, Beneficial use, Water distribution(Applied), Water management(Applied), Legislation, Agriculture, Industrial water, International law, Cost repayment, Compensation.

Irrigation water, which had previously been allocated for agricultural uses, is presently being reallocated to supply city and industrial water needs. Although the reallocations are 'logical and necessary', the author suggests that the reallocations should be reconsidered because they cause economic dislocations and food crises. The author discusses and analyzes various state, national and international laws which govern reallocations and preferential use of water. The indirect effects of these laws include: (1) declining food production; (2) forced transfers which generate insecurity in farmers; (3) great social costs, such as displaced agricultural workers and disruptions in rural life and values; and (4) failure to consider all alternative solutions. The author concluded that the use and reallocation of water should be practical and functional. The correct approach is to weigh all the social and economic costs and benefits, and to insure that all losses to harmed parties include full compensation. Finally, the crucial question should be whether the particular transfer is the best solution to that problem. (Hadoulias-Florida)
W77-08377

EMERGING LEGAL CONCEPTS IN THE HARMONIZATION OF WATER RESOURCES DEVELOPMENT AND ENVIRONMENTAL PROTECTION,
Fordham Univ., N.Y. School of Law.
L. A. Teclaff.
In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (COPLANARH), Caracas, Venezuela, p. 1023-1046, 1976. 52 ref.

Descriptors: *United Nations, *Environmental effects, *International commissions, *Environmental control, Foreign countries, Governments, Governmental interrelations, Legal aspects, Federal government, Administrative agencies, Regulation, Social aspects, Standards, Water policy, Administration, Project planning, Benefits, Cost allocation, Cost-benefit analysis, Resources.

Identifiers: *National Environmental Policy Act, *Stockholm Conference of the Human Environment, *United Nations Environment Programme, Administrative regulations, Environmental impact statement.

Recently environmental protection has moved from a conflict between development and conservation to active protection of environmental concerns by ensuring their adequate representation in development considerations. In the United States this theory is evidenced by the impact statement called for by the National Environmental Policy Act of 1969. Such statements must be filed by federal agencies before the initiation of any project which significantly affects the environment. The statement is a detailed examination of any impact on the environment, as well as any irreversible commitments to resources. The purpose is to allow more informed decision-making. The Council on Environmental Quality has developed guidelines for agencies to use which ensure that environmental considerations get due weight. The weakness of the process lies in the area of review. Agencies are generally left on their own in deciding whether the project should proceed. Court review is possible, but on an ad hoc basis only. The United Nations has recognized that one nation's development can seriously affect the ecology of a fellow nation and proposed a similar system. Nations should report proposed development to other nations with an analysis of environmental impact and resource commitment. The United Nations Environment Programme has been developed to issue guidelines. As in the United States, compliance is conditioned on good faith as no true final arbiter can be established. (Moorhouse-Florida)
W77-08378

TICKET TO THERMIDOR: A COMMENTARY ON THE PROPOSED CALIFORNIA COASTAL PLAN,
University of Southern California, Los Angeles. School of Law.
For primary bibliographic entry see Field 6B.
W77-08379

REPORT ON WATER RESOURCES PROBLEMS OF WESTERN COLLIER COUNTY, FLORIDA AS AFFECTED BY THE GAC CORPORATION'S CANAL SYSTEM IN ITS GOLDEN GATE DEVELOPMENT PROJECT,
Florida Univ., Gainesville. Coll. of Law.
F. E. Maloney.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611. Price $1.40. In: Phase 1 Golden Gate Estates Redevelopment Study Collier Co., Florida, p M-1 to M-28 (June 1975).

Descriptors: *Florida, *Flood control, *Saline water intrusion, *Legal aspects, Surface drainage, Comprehensive planning, Zoning, Canals, Eminent domain, Local governments, Non-structural alternatives, Wildlife conservation, Waste water disposal, Planning, Water zoning, Constitutional law, Coastal marshes, Groundwater, State governments.
Identifiers: *Coastal waters, Citizen suits, Administrative regulations.

The land and water management of western Collier County in its present form will be destructive of the environment of nearby bays and forests, in addition to being inadequate for flood control. In order to preserve the ecological integrity of the area re-planning is necessary, including returning to use as wetlands those areas best suited for that purpose. This action would deter harm to the coastal areas of the county, and would alleviate the substantial danger of salt water intrusion inland. Such action would, however, return a substantial portion of the Golden Gates Estates area to a non-developable condition, and the resulting rise in ground water level would impair the developers' contracts for sewage facilities. Nevertheless, the regulation would be a reasonable approach to a legitimate end. Moreover, alternative waste disposal methods are available. Sufficient public purpose exists to use eminent domain to acquire the land needed for return to its natural state, both in flood-prevention and protection of fish and wildlife. Methods of implementation for the stated goals are discussed, for example, state, county, and federal regulations, and citizens' suits in the federal courts. (Molloy-Florida)
W77-08380

PUBLIC HEARING REGARDING 180-DAY NOTICE TO THE SANTA FE LAND IMPROVEMENT COMPANY OF VIOLATION OF STATE AND FEDERAL WATER QUALITY STANDARDS FOR THE INTERSTATE WATERS OF THE KANSAS AND MISSOURI RIVERS, HELD AT KANSAS CITY, KANSAS ON 13 JULY 1971.
For primary bibliographic entry see Field 5G.
W77-08381

ENVIRONMENTAL LAW-APPLICATION OF THE REFUSE ACT OF 1899 TO CONTINUAL INDUSTRIAL DISCHARGES IS UPHELD WITHOUT FORMALIZED PERMIT PROCEDURES,
For primary bibliographic entry see Field 5G.
W77-08382

EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR NEW SOURCES FOR THE BLEACHED KRAFT, GROUNDWOOD, SULFITE, SODA, DEINK AND NON-INTEGRATED PAPER MILLS SEGMENT OF THE PULP, PAPER, AND PAPERBOARD POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08383

RESTLESS RIVER: INTERNATIONAL LAW AND THE BEHAVIOR OF THE RIO GRANDE,
Texas Univ. at Austin. Dept. of Geography.
J. E. Mueller.
Texas Western Press, El Paso, 1975. 155 p, 13 map, 9 photo, 15 tab. $5.00.

Descriptors: *Boundaries(Property), *Mexico, *Rio Grande River, *International Boundary and Water Commission, Federal government, Rivers, Running waters, International Joint Commission, International law, Legal aspects, International waters, Treaties, Accretion(Legal aspects), Avulsion, Boundary disputes, Bank erosion, Banks, Fluvial sediments, Meanders, River flow, Estuaries.
Identifiers: Dam effects, Reliction.

The history of the Rio Grande as the international boundary between Mexico and the United States is divided into five distinct segments. The first era, the pre-boundary stage existed while Colonial powers rearranged their North American holdings. It alerted Mexico to the need for a Northern Boundary. The second era lasted from 1848 to 1884 and was characterized by a fixed line boundary between the two countries. Era three, lasting from 1884 to 1905 utilized the Rio Grande as the exclusive boundary. This proved totally unsatisfactory as the scant vegetation and low clay content alonf the banks provided little resistance to highly variable water discharges. The result was a highly erratic and wandering river leading to untold boundary disputes. The fourth era lasted from 1905 to 1970 and was known as the mildly-variable line era since large dams built along the river tamed its flow. The last era arises from a 1970 treaty. Severe restrictions on water discharge and an agreement to restore a channel to its boundary course after a shift, guarantees that the river as a boundary will become fixed in succeeding decades. (Moorhouse-Florida)
W77-08384

OIL SPILLS AND SPILLS OF HAZARDOUS SUBSTANCES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W77-08385

AMERICAN FROZEN FOOD V TRAIN ('GUIDELINES' AND 'EFFLUENT LIMITATIONS' FOR THE POTATO PROCESS INDUSTRY PURSUANT TO THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972).
539 F2d 107-65 (DC Cir 1976). 2 append.

Descriptors: *Effluents, *Industrial wastes, *Food processing industry, *Water pollution control, *Water quality control, Pollution abatement, Water pollution, Wastes, Water pollution sources, Industrial plants, Judicial decisions, Legal review, Federal government, Administrative agencies, Legal aspects, Permits.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972(Amendments of 1972), *American Frozen Food Institute, *Potato Processors of Idaho, Pollution control guidelines, Effluent limitations, Administrative regulations, Congressional hearings on Water Pollution Control Act of 1972.

Petitioners-representatives of the potato processing industry sought a review of an order of the Environmental Protection Agency (EPA) with respect to the issuance of guidelines and effluent limitations for the industry. Petitioners alleged that the Administrator of the EPA had violated the Federal Water Pollution Control Act (FWPCA) Amendments of 1972, and abused his discretion. The court ruled that it had jurisdiction of the case, and that the Administrator's interpretations were valid. It was ruled permissible for the Administrator to establish guidelines and effluent limitations on the same day and in the same document provided advance notice of the proposed action was given to the industry. In this case it was. The Administrator was not required to set guidelines and limitations for individual point sources of pollutant discharges, but rather was permitted to establish them by categories and sub-categories of industry. The Administrator was permitted to use two Canadian plants as 'exemplary plants' for establishing guidelines and limitations provided that the technology used there was also available to industries in this country. The Administrator's addition of fecal coli to the list of controlled pollutants without notice to the industry was held violative of the Administrative Procedures Act; that single point was remanded for further consideration. (Moorhouse-Florida)
W77-08386

LIABILITY FOR DAMAGES TO ADJACENT LAND OR BUILDING CAUSED BY DREDGING,
D. Ytreberg.
62 ALR 3d 526-34 (1975).

Descriptors: *Dredging, *Damages, *Negligence, *Adjacent landowners, Legal aspects, Legal review, Water law, Accidents, Hazards, Risks, Common law, Permits, Public rights, State governments, Riparian land, Governments, Social aspects, Judicial decisions.
Identifiers: *Strict liability, *Absolute liability, Liability, Ultra hazardous activity, Inherently dangerous activity.

In response to damages resulting from dredging operations, land owners have sought recovery on several legal theories, including the common-law right to lateral support from adjacent property, ex-

traordinarily risky operations imposing strict liability and simple negligence. Courts have deemed the common-law right to lateral support from adjacent property inapplicable to adjacent lands underwater. Courts have based their refusal to apply such a doctrine on the fact that the underwater land is in the ownership of the state holding it in trust for the people. Anyone who dredges in relation to such land does so by statutory authorization, and thus there is no liability for any resulting damages. Only one court has held that dredging is an inherently dangerous or extraordinarily risky activity. This theory will probably remain closed to litigants. The most common theory of recovery for dredging damage has been simple negligence. In such an action the plaintiff must prove both that the dredging proximately caused his damage, and that the dredger breached the standard of care common to all dredgers in the community. Plaintiffs have been successful in approximately half the cases. (Moorhouse-Florida)
W77-08387

RUSSO V. NEW YORK DEPT. OF ENVIRONMENTAL CONSERVATION (LIMITS OF STATE REGULATIONS RESTRICTING ALTERATION OF WETLANDS).
391 NYS2d 11-12 (Sup. Ct. 1977).

Descriptors: *New York, *Wetlands, *Eminent domain, *Conservation, Salt marshes, Tidal marshes, Preservation protection, Real property, Property values, Constitutional law, Legislation, Water law, Legal aspects, State governments, State jurisdiction.
Identifiers: *New York Tidal Wetlands Act.

When New York's Tidal Wetlands Act went into effect in 1973, it placed a moratorium against alteration wetlands. Plaintiff was co-owner of real property in a tidal salt marsh which was affected by the moratorium. He applied to the State Department of Environmental Conservation for a permit to construct a one-family home and it was denied. Plaintiff alleged in this appeal from the denial that the act as applied deprived him of all reasonable use and enjoyment of his property so as to constitute a taking of it without compensation. The court held that while the State has the power to temporarily restrict the use of land, the duration cannot be unreasonable; and where there is no indication as to when the moratorium will end, the constitutionality of its provisions is subject to renewed inquiry. (Jones-Florida)
W77-08388

HIBISCUS HARBOR, INC. V. STATE (METES AND BOUNDS DESCRIPTION FAVORED OVER LOW WATER MARK IN DETERMINING OUTCOME OF BOUNDARY DISPUTE).
391 NYS2d 510-13 (Sup. Ct. 1977).

Descriptors: *New York, *Boundaries(Property), *Islands, *Boundary disputes, Judicial decisions, Water law, Lakes, Low water mark, Legal aspects, Maps, Surveys, Water levels, Mapping, Water level fluctuations, Water table, Measurement, State governments, Real property.
Identifiers: Property, *Property interests, *Metes and bounds.

Plaintiff, the purported property owner, brought action to determine title to island property. Defendants include owners of cottages on the disputed tract who claim title by adverse possession, and the state. Plaintiff contended that it had title to the island based on two Letters Patent, which are fully described in metes and bounds and are further supported by field notes describing the parcel with a map. The plaintiff argued that the descriptions could only be interpreted to include title to the island, or in the alternative that its title extended to the low water level of the lake which would be located east of the island, thus encompassing the island. The court held that it was impossible to determine what the level of the lake was at the time of the Letters Patents. Since the natural level of the lake could be varied by man, the court declined to fix a location for the low water line. Instead, by relying on a more recent survey which coincided exactly with the metes and bounds of the Letters Patent the court found that the plaintiff did not own the disputed property. The court declined to decide defendants' claim of adverse possession. (Petruff-Florida)
W77-08389

AUBERT V TOWN OF FRUITA (SENIOR DIRECT FLOW RIGHTS FAVORED IN DISPUTE OVER DAM).
559 P2d 232-35 (Colo Sup Ct 1977).

Descriptors: *Colorado, *Dams, *Flow control, *Prior appropriation, Water rights, Domestic water, Streams, Water law, Reservoir storage, Water control, Control, Flow, Water storage, Reservoirs, Legal aspects, Competing uses, Riparian rights, Judicial decisions.
Identifiers: *Estoppel, *Direct flow rights.

Plaintiff owners sought an injunction directing defendant town to cease violating their senior direct water flow rights. The lower court granted the injunction and the defendant town appealed. The defendant's sole argument on appeal is the alleged err of the trial court in rejecting the defendant's affirmative defenses of estoppel, laches, and waiver. The lower court found that the defendant, utilizing its right to store water for domestic use, built an on-channel reservoir and dam in 1935 and enlarged it in 1959, 1962, and 1967. The enlarged dam blocks the entire flow on the west fork of a creek. The plaintiffs hold direct flow rights downstream on this creek which are senior to defendant's rights. The trial court found that since 1959 the plaintiffs and their predecessors had protested this interference with their direct flow rights. The lower court held that this evidence was sufficient to keep the defendant from asserting estoppel. The state supreme court affirmed and in dicta set out estoppel principles to be used in the context of a water law case. (Petruff-Florida)
W77-08390

BANK OF AMERICA NATIONAL TRUST AND SAVING ASSOCIATION V STATE WATER RESOURCES CONTROL BOARD (CONDITION PLACED ON WATER PERMIT DEFEATED FOR LACK OF EVIDENCE OF NECESSITY).
116 Cal Rptr 770-80 (Ct App 1974).

Descriptors: *California, *Appropriation, *Public access, *Reservoirs, *Diversion, Real property, Recreation, Fishing, Water management(Applied), Municipal water, Irrigation, Water permits, Land development, Competing uses, Water law, Legal aspects, Rivers, Streams.

Appellant was a corporate trustee of land being developed for a labor union training center. It filed several applications with respondent water board for authorization to appropriate water from a river and unnamed streams running through the property. The board granted the applications, attaching, however, a condition that the reservoirs created by the diversions were to be kept open to the public for recreational use. The intention was to compensate the public for diminished recreational value of the river and effects on fishing resulting from the diversions. The court on appeal examined the record for substantial evidence to support the imposition of the condition and found it lacking. The court looked to the fact that the fish and game commission and appellant had agreed upon detailed conditions regulating the amount and periods of diversion to assure fish protection; and it looked to the lack of evidence of impairment of recreational facilities. The condition was ordered deleted and the matter remanded to the board to reconsider its approval of the applications for water appropriation. (Jones-Florida)
W77-08391

ANDERSON V YEAROUS (RIGHTS OF DOMINANT OWNERS TO UNOBSTRUCTED USE OF DRAINAGE EASEMENTS).
249 NW2d 855-65 (Iowa 1977).

Descriptors: *Easements, *Surface runoff, *Iowa, *Flooding, *Ditches, Surface waters, Water rights, Legal aspects, Flow system, Floods, Floodwater, Floodways, Drainage, Drainage water, Drainage systems, Right-of-way, Water conveyances, Levees, Judicial decisions.
Identifiers: *Dominant tracts, *Servient tracts, *Dominant owners, *Servient owners, *Prescriptive rights, Waterflow, Nuisance, Injunction.

Plaintiff owner of dominant tract (land benefitted by adjacent tract) depended on drainage ditch built by his predecessor to carry water runoff across the property of defendant owner of servient tract (land burdened by adjacent tract). Defendants' predecessor dug a trench to carry the water from plaintiff's higher land across defendants' lower land to a nearby river. Thereafter, plaintiff and defendant bought the two adjacent tracts. Defendants erected a levee to stop the water flow from plaintiff's land causing water to back up and flood plaintiff's crops. Plaintiff sued in equity asking for a permanent injunction against defendants to prevent further obstruction of the water flow, and for damage to his crops. The court took notice that the drainage ditch had been in use for 30 years before defendants' erected their levee. At the time defendants bought their tract, they had notice of plaintiff's easement (right-of-way). The court held that plaintiff had a prescriptive easement (legal right resulting from continued use). Also, it held that although the ditch began as an artificial waterway, it had ripened into a natural waterway and therefore defendants' levee unreasonably obstructed a 30 year flowage system and constituted an enjoinable nuisance. (Denker-Florida)
W77-08392

WATER RIGHTS GENERALLY; APPROPRIATION.
Idaho Code Ann secs 42-101 thru -112 (1948), as amended, (Supp 1976).

Descriptors: *Idaho, *Appropriation, *Beneficial use, *Preferences(Water rights), *Water allocation(Policy), Priorities, Prior appropriation, Legal aspects, Water law, Water rights, Administration, Allotments, Water control, Water permits, Water measurement, Water loss, Diversion, Alteration of flow, Water management(Applied), Diversion loss, returns, Irrigation, Irrigation ditches.
Identifiers: *Licenses, *Groundwater management.

All the waters of Idaho when flowing in their natural channels, are the property of the state, and thus under its control. However, the beneficial use of diverted public waters is not considered a property right, but rather an appurtenance to the land--a right which the state may only deny upon the failure to pay ordinary assessments for delivery of the water. The right to the use of unappropriated waters must comply with the license procedure provided for in this title, and must be for some beneficial purpose. The 'first in time is the first in right' doctrine governs priority among appropriators utilizing the waters of running streams, as well as seepage, waste or spring waters. Prior appropriated waters may be diverted into the channel of another stream, and then reclaimed with an allowance for loss by evaporation and seepage. This exchange of water must be approved by the department of water resources and agreed upon by the persons involved in the exchange. Although a change in the point of diversion is permitted, a change in the course of a ditch used for conveying and selling waters for irrigation purposes is prohibited if it interfers with those purposes. (Anderson-Florida)
W77-08393

AMERICAN PETROLEUM INSTITUTE V ENVIRONMENTAL PROTECTION AGENCY (CHALLENGE TO EPA STANDARDS FOR REFINERIES UNDER THE FWPCA AMENDMENTS OF 1972).
540 F2d 1023-39 (10th Cir 1976).

Descriptors: *Federal government, *Permits, *Industrial production, Water pollution, Administrative agencies, Pollution abatement, Legislation, Regulation, Water pollution sources, Water pollution control, Oil industry, Oil wastes, Judicial decisions, Water policy, Water quality standards, Legal aspects.
Identifiers: *Federal Water Pollution Control Act (FWPCA) Amendments of 1972.

Petitioner refineries and organizations requested review of Environmental Protection Agency (EPA) regulations published pursuant to the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. The establishment of effluent limitation was challenged for lack of authority, noncompliance with the act, and on the factual ground that the record does not sustain the action of the EPA. Since the statute demands preventive action, and factual certainty regarding future technologies is impossible, the court considered only whether the record supporting the promulgated standards was adequately adduced and rationally applied. The court observed that permits can be issued by the EPA or a complying state, thus the regulatons were a reasonable exercise of a congressionally delegated power. The general standards were found to be presumptively applicable unless rebutted by a permit applicant. Variances were considered a rule-making prerogative, although there was no statutory provision for variances to the 1977 standard. In reviewing the factual record, the court upheld limitations for existing sources except for stormwater runoff, and upheld new source limitations, but found no reasonable basis for the 1983 existing source limitations. (Molloy-Florida)
W77-08394

APPROPRIATION OF WATER FOR POWER (HYDROELECTRIC POWER PROJECTS).
Ore Rev Stat secs 543.110 thru .320 (1973).

Descriptors: *Hydroelectric power licensing, *Oregon, *Appropriation, *Electric power production, *Permits, Administrative agencies, State governments, Local governments, Bodies of water, Federal government, Electric powerplants, Electric power industry, Social aspects, Management, Water demand, Economic impact, Water allocation(Policy), Water management(Applied), Water supply, Water users, Hydroelectric power, Hydroelectric plants.
Identifiers: Oregon Water Resources Board, Certification, Licenses, Administrative regulations, Oregon statutes.

Oregon has enacted regulations to be followed by those wishing to appropriate water for the production of electricity. Such regulations do not apply to hydroelectric projects constructed by the federal government. All individuals seeking to appropriate water must first submit an application to the State Water Resources Board. All interested parties will be notified of the application and a public hearing will be scheduled. At the hearing the board will rule upon the appropriateness of granting the water use license. Factors considered include the maximum economic development of the water involved, the amount of water available for appropriation, and all other state formulated water resources policies. Licenses issued shall not exceed fifty years in duration. Licensees are expected to follow all regulations established by the State Engineer as well as maintain their projects in good order and repair. The State Engineer is authorized to waive all licensing procedures for projects of less than 100 horsepower. The State Engineer may also grant a preliminary permit for a period not exceeding two years. The terms and conditions of such a preliminary permit are to be established by the State Engineer. The State Engineer may, in his discretion, cancel a permit. (Moorhouse-Florida)
W77-08395

IRRIGATION AND IRRIGATION DISTRICTS.
Kan Stat Ann secs 42-106 thru -358 (1972).

Descriptors: *Kansas, *Irrigation, *Irrigation districts, *Distribution systems, Irrigation operation and maintenance, Irrigation practices, Irrigation systems, Irrigation water, Water rights, State governments, Local governments, Legislation, Water contracts, Irrigation ditches, Embankments, Irrigation canals, Irrigation engineering, Water distribution(Applied), Irrigated land, Eminent domain.
Identifiers: *Kansas irrigation districts, Kansas statutes.

Irrigation districts may be established in Kansas by a petition of three-fourths of the landowners within a proposed district. Such petition is submitted to the board of county commissioners which creates the district. Irrigation districts may utilize existing water channels to supply water or cut new ditches. Right-of-way for new channels can be obtained through the power of eminent domain. Once acquired, the right-of-way remains unless there is a period of non-use for two consecutive years. Irrigation districts as well as other canal companies are charged with keeping their dams, locks and gates, embankments and all other equipment in good order and repair. Such entities are liable for damages resulting from faulty equipment. If purchasers of water from any irrigation company consider the rates for such water to be unreasonable or unjust, complaints may be filed with the state corporation commission. The commission shall hear testimony and determine the validity of the complant. Provisions are also made for the drilling of individual artesian wells and the recording of rights in relation thereto. (Moorhouse-Florida)
W77-08396

ARTESIAN WELLS.
Idaho Code Ann secs 42-1601 thru -1605 (1948).

Descriptors: *Idaho, *Artesian wells, *Well permits, *Well regulations, Water wells, Artesian heads, Public rights, Mechanical control, Mechanical equipment, Water conservation, Water control, Water policy, Water permits, Water storage, Water structure, Water loss, Water management(Applied).
Identifiers: Public nuisance, Nuisance(Legal aspects), Groundwater management.

Artesian wells which are uncapped or which are not equipped with approved devices to control the flow of water from such wells are declared to be a public nuisance in the state of Idaho. However, if the waters of artesian wells are reservoired and controlled so as to prevent waste, the commissioner of reclamation may except such wells from being declared a nuisance. Owners, occupants and possessors of land upon which artesian wells are located may not lawfully permit the continuance of waste or nuisance resulting from such wells. However, domestic users may insert small stop and waste corks in the piping of the wells and use the water taken therefrom for domestic purposes. Persons installing or proposing to install mechaical capping devices on an artesian well must apply to the commissioner for approval of the control device. Artesian wells are defined to include any artificial hole made in the ground through which water naturally flows from subterranean sources to the surface of the ground for any length of time. (Josepher-Florida)
W77-08397

RIPARIAN OWNER'S RIGHT TO NEW LAND CREATED BY RELICTION OR BY ACCRETION INFLUENCED BY ARTIFICIAL CONDITION NOT PRODUCED BY SUCH OWNER.
63 ALR3d 249-303 (1975).

Descriptors: *California, *Riparian rights, *Accretion(Legal aspects), *Artificial use, Legal aspects, Judicial decisions, Riparian land, Water law, Natural flow doctrine, Avulsion, Alteration of flow, Obstruction to flow, Relative rights, Water rights, Bodies of water.
Identifiers: *Reliction.

Cases are herein annotated where the actions of man have served as an artificial catalyst for the natural processes of accretion or reliction. This includes accretion which is a direct result of action of waters, even though the course of such waters has been influenced by some artificial means, but does not include changes wrought by avulsion. The claimant riparian owner must have no direct part in causing the accretion. The primary problem is disagreement as to how and where the accretion occurred so the court generally reconstructs the movements of the water body from the original surveys to the filing of the suit. Cases involving litigation between private parties, and between public entities and private parties, are included. While most jurisdictions support the proposition that alluvial deposits belong to the owner of the land, California courts have awarded the accreted land to the state or its grantees rather than to the upland owner. Consequently, California cases stand apart from the general weight of authority. (Rieck-Florida)
W77-08398

UNITED STATES V 3,727-91 ACRES OF LAND IN PIKE COUNTY, STATE OF MISSOURI (COMPENSATION ALLOWED DRAINAGE DISTRICT FOR CONDEMNED PROPERTY).
416 F Supp 525-29 (E D Mo 1976).

Descriptors: *Missouri, *Condemnation value, *Condemnation, *Drainage districts, Judicial decisions, Water law, Legal aspects, Value, Compensation, Economic impact, Governments, Levee districts, Governmental interrelation, Levees, Ditches, United States, Real property.
Identifiers: Property interests, Condemned property, Nominal damages.

Defendant drainage district, owner of property condemned by the United States, sought compensation for the taking of its lands. The district was the owner of 214 acres of levees and ditches constructed to protect real property in the area from floods. The levees were 53 to 54 years old at the date of taking and in poor condition. Various opinions on the proper market value of the property were presented to the court. The government argued that the District was entitled to only nominal damages on the grounds that the District existed to serve a public function, and since there was no necessity of providing substitute levees and ditches the government had actually relieved the District's maintenance burden. The court agreed, finding this condemnation similar to that of public streets, which absent a showing of need for substitute facilities is non-compensable. The court continued, assuming arguendo the inapplicability of the former theory, to question of proper valuation. Findng none of the testimony sufficiently credible to establish market value, the court used reproduction cost less depreciation as a means of determining compensable value. Based on testimony that the useful life of such levees was 50 years, at the time of taking the levees were fully depreciated and again the District was entitled only to nominal damages. Judgment was entered for $1.00. (Moorhouse-Florida)
W77-08399

STATE V CORPS OF ENGINEERS (COST/BENEFIT ANALYSIS UNDER NEPA AND THE FLOOD CONTROL ACT).
411 F Supp 1261-76 (ND Ala 1976).

Descriptors: *Channels, *Cost-benefit analysis, *Alternative planning, *Environmental effects, *Alabama, State governments, Federal government, Administrative agencies, Flood control, Damages, Creeks, Recreation, Excavations, Construction, Fish, Wildlife, Flood plain zoning, Diversion structures, Insurance, Interest rates, Judicial decisions, Governmental interrelations.
Identifiers: *Environmental impact statement, Injunctive relief, National Environmental Policy Act, Crop insurance, *Tombigbee River Valley Water Management District.

Plaintiff state attorney general sought to enjoin defendant federal agency from continuing a stream channelizaton project. The project was planned to provide flood control for urban areas and agricultural lands along the creek. The plaintiff contends that the defendant's decision to implement the project was arbitrary and capricious because (1) the cost-benefit analysis did not include a consideration of environmental losses such as destruction of recreational activities, and (2) a lack of consideration was given to alternative proposals, such as flood plain zoning, crop insurance, or other flood control structures, which would have minimized environmental harm. The United States District Court for the Northern District of Alabama issued a preliminary injunction. The court held that environmental factors which can be quantified in economic terms must be included in the cost-benefit analysis of an environmental impact statement. The court further held that sufficient consideration of alternatives was required. (Capehart-Florida)
W77-08400

OHIO LIQUID DISPOSAL, INC V DAWE (DEFINING 'WATERS OF THE STATE' WITHIN WATER POLLUTION CONTROL STATUTE).
347 NE2d 541-46 (Ohio Ct App 1975).

Descriptors: *Ohio, *Subsurface waters, *Waste disposal wells, *Well permits, *Liquid wastes, *Judicial decisions, Industrial wastes, Environmental sanitation, Pollutants, Waste disposal, Administrative agencies, Industrial water, Environmental effects, Legislation, Ecology, Water law, Regulation, Water quality control, State jurisdiction, Permits, Legal aspects, Well regulations.

Plaintiff corporation collects liquid industrial waste by-products. The plaintiff sought a permit from the Chief of the Division of Oil and Gas for the state of Ohio to inject these liquids into an existing stratigraphic well. The Chief initially approved the permit after determining that no unreasonable risks to oil and gas resources would arise from waste contamination. The Water Pollution Board (WPB), in violation of applicable statutes, refused to grant the permit without a prior hearing. The plaintiff appealed the decision to the Common Court of Pleas. The court noted that the Ohio Statutes do not allow injections of industrial wastes into 'waters of the state'. The court determined, however, that the stratigraphic wells were not 'waters of the state', and therefore ordered that the permit be granted. The Court of Appeals affirmed, and ascertained as well, that state supervision was not necessarily terminated because the Chief can still impose such conditions on the permit as may be necessary to protect the environment. The WPB was also estopped from asserting error that the plaintiff, by mandamus, should have forced them to give prior notice before refusing the permit. (Hadoulias-Florida)
W77-08401

INTERSTATE STREAM COMMISSION (CREATION, MEMBERSHIP, GENERAL POWERS).
New Mexico Stat. Ann. secs 75-34-1 thru -3, 75-34-10 thru -12 (1968).

Descriptors: *Water districts, *Irrigation districts, *New Mexico, *Interstate commissions, *Interstate rivers, Water resource development, Equitable apportionment, Governments, State governments, Political aspects, Water policy, Condemnation, Water law, Water conservation, Water control, Water management(Applied), Legislation, Irrigation, State jurisdiction.
Identifiers: New Mexico Interstate Stream Commission.

The New Mexico Interstate Stream Commission consists of nine members, eight appointed by the governor for a term of six years, and the ninth member is the state engineer. Each appointed member shall be a representative of a major irrigation section. The members of the commission shall serve without compensation, but may receive reimbursement for expenses incurred while actually engaged in the performance of their duties. The commission has the power to negotiate compacts with other states for the purpose of settling controversies, or providing for equitable distribution of waters in interstate stream systems. The commission has various investigative and development functions centering around the water systems of the state, interstate or otherwise. The commission may acquire, when deemed proper, by condemnation, purchase or exchange any land, rights, water rights or easements which are necessary for construction or operation of works authorized to be maintained by the commission. The cost of any such construction shall be met with the proceeds of revenue bonds authorized or by a grant from the federal government. The purpose of the statute is to meet a state-wide need for conservation, protection, and development of the water resources. (Welch-Florida)
W77-08402

CITY OF YORK V. PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES (DELEGATION OF AUTHORITY UNDER THE PENNSYLVANIA WASTE MANAGEMENT ACT).
364 A.2d 978-980 (Pa. Commonwealth 1976).

Descriptors: *Waste disposal, *Governmental interrelations, *Administrative decisions, *Pennsylvania, Sites, Local governments, State governments, Comprehensive planning, Administration, Planning, Judicial decisions, Legislation, Wastes, Management, Municipal wastes, Solid wastes, New York.
Identifiers: Waste disposal sites, *New York City.

Plaintiff city challenged the authority of defendant Department of Environmental Resources to compel implementation of a regional solid waste management plan. Plaintiff and other cities submitted a plan to the defendant Department. The plan called for the creation of a solid waste refuse authority, and the vesting in it of responsibility to purchase and operate waste disposal sites. Subsequently, the plaintiff refused to implement certain portions of the plan which required delegation of powers to the authority. The Department issued orders seeking to compel compliance with the official plan, and plaintiffs contended that defendant Department lacks such authority under the Waste Management Act. Adopting a liberal construction of the Act, designed to curtail health hazards and environmmental pollution by inadequate disposal practices, the court concluded that to leave implementation to the discretion of cities would frustrate the Act's objectives. Provisions were included in the Act for compelling compliance with sections calling for submission of an officially adopted plan. The court found that abandonment of official plans after approval would reduce the Act to an elaborate and expensive charade, rendering fruitless the comprehensive planning contemplated by the legislature. (Molloy-Florida)
W77-08403

WATER RESOURCES COMMISSION V. CONNECTICUT SAND AND STONE CORPORATION (JUDICIAL REVIEW OF ADMINISTRATIVE FACTUAL DETERMINATION).
364 A.2d 208-12 (Conn. 1975).

Descriptors: *Connecticut, *Sands, *Water pollution control, *Administrative decisions, Adjudication procedure, Decision making, Legislation, State governments, Dredging, Excavation, Gravels, Sediments, Pollutants, Pollution abatement, Legal aspects, Water quality, Water quality control.
Identifiers: *Injunctive relief, Evidence.

Plaintiff Water Resources Commission sought injunctions compelling defendant polluter's compliance with orders to abate pollution. The Water Resources Commission is charged with enforcing statutes regulating, controlling and eliminating pollution of the waters of the state. The Commission determined that defendant was causing pollution, and ordered abatement of operations involving sandwashing and the dredging of sand and gravel. Defendant did not request a hearing, which was a prerequisite for judicial review. At trial for injunctions, defendant attempted to introduce factual evidence relating to its pollution and was not permitted to do so. The court held that failure to request an administrative hearing barred further factual determinations. The injunction was found to be mandated by statute and was therefore not dependant on the court's equity powers and rules. The contention that defendant may have stopped pollution was also judged irrelevant since the review was closed to factual determinations. The possibility of recurrence also indicates that the injunctions were proper since defendant's operations were seasonal in nature. (Molloy-Florida)
W77-08404

APPROPRIATION OF WATER.
Cal Water Code Ann secs 1200 thru 1271, 1375 thru 1485 (West 1971), as amended, (Supp 1976).

Descriptors: *California, *Appropriation, *Beneficial use, *Preferences(Water rights), *Priorities, Water law, Legal aspects, Consumptive use, Domestic water, Municipal water, Irrigation water, State governments, Administrative agencies, Permits, Control, Legislation, Regulation, Governments, Social aspects, Reservoir storage, Public benefits.
Identifiers: *Licenses, *Administrative regulations, California Water Plan.

California has statutorily provided that any unappropriated water may be appropriated for some useful or beneficial purpose. An administrative board has been created to issue permits and generally oversee the water appropriation system. Any person may apply for a water appropriation permit provided he supplies the board with information concerning the amount of water desired and the uses to which it will be put. The board will consider and investigate all applications and determine whether a permit should or should not be granted in light of the public interest. The public is determined by reference to the California Water Plan (a long range outlook on water use in the state). An applicant who is rejected may appeal to a court of competent jurisdiction within a specified time. Permits granted remain valid so long as the water appropriated is used for a useful and beneficial purpose. If such water ceases to be used in the required manner for a period of three years, it reverts and is regarded as unappropriated public water. The board retains discretion to extend time periods when necessary. The statute explicitly grants municipalities and other public corporations priority in the acquisition of unappropriated water. (Moorhouse-Florida)
W77-08405

WATER DISTRICTS AND COMMISSIONERS.
Wyo. Stat. Ann. secs. 41-61 thru 41-75 (1959), as amended (Supp. 1971).

Descriptors: *Wyoming, *Water districts, Streams, Reservoirs, *Ditches, Legislation, Administration, *Legal aspects, Regulation, Governments, Institutions, Stream stabilization, Stream erosion, Stream improvement, Streamflow, Reservoir operation, Water control, Water allocation(Policy), Water distribution(Applied), Water management(Applied), State governments, Water policy, Competing uses, Administrative agencies, Administrative decisions, Economic efficiency, Water rights.
Identifiers: Headgates.

The Wyoming Board of Control shall divide the state's stream systems into units called water districts in order to secure the best protection to the claimants for water, and the most economical supervision for the state. A water commissioner shall be appointed to divide, regulate and control the use of the water of all streams within his district, including regulating headgates to prevent waste. The Commissioner has the right to regulate the distribution of water among various users under any partnership or incorporated reservoir, or any partnership or incorporated ditch, and under the new amendments, any ditch held by joint owners not incorporated and not in partnership, where rights have been adjudicated in accordance with existing decrees. The amendments no longer require the Commissioner to take an oath, or file a bond. But should personal interests and prejudice arise, the Commissioner shall be disqualified and a substitute commissioner appointed to act in the matter in which the conflict of interest exists. All water commissioners, when on duty, shall make reports upon the request of the division superintendent. (Hadoulias-Florida)
W77-08406

GREAT SALT LAKE MANAGEMENT AND DEVELOPMENT.
Utah Code Ann. secs. 65-8a-1 thru -10 (Supp. 1975).

Descriptors: *Utah, *Great Salt Lake, *Administrative agencies, Legislation, Water conservation, Administration, Governments, State governments, Local governments, Legal aspects, Regulation, Water law, Institutions, Water policy, Water resources, Recreation, Flood control, Wildlife conservation, Wildlife management, Industrial production, Conservation, Adoption of practices, Administrative decisions, Administrative costs, Allotments, Comprehensive planning, Decision making, Project planning.

The Utah state legislature recognizes that the Great Salt Lake is a unique natural resource which requires a coordinated institutional arrangement utilizing existing county, state, and federal divisions and agencies in order to protect a balanced use of the resources. An appropriate institutional arrangement is necessary in order to establish and coordinate programs for the development of recreation areas, flood control, wildlife resources, industrial uses, and conservation of the Great Salt Lake. Therefore, a special division is created within the department of natural resources, and a Great Salt Lake board appointed. The twelve-member board shall have the power to establish policy and promulgate rules and regulations consistent with this Act. The division shall have the general responsibility for directing activities and implementing all plans regarding the lake. Other duties include fostering future water development, preparing comprehensive plans, supervising the lake flood plain, regulating waste dischargers, maintaining and creating recreational and wildlife areas, employing other assistants and advisers, handling fund disbursement and receipts, and performing all other acts reasonably necessary to carry out the purposes and provisions of the Act, thereby insuring proper management of Great Salt Lake. (Hadoulias-Florida)
W77-08407

A POSTSCRIPT TO THE MUTUAL PRESCRIPTION DOCTRINE--CITY OF LOS ANGELES V CITY OF SAN FERNANDO,
J. N. Murdock.
Land and Water Law Review, Vol 11, p 131-146 (1976). 16 p, 57 ref.

Descriptors: *California, *Prescriptive rights, *Overdraft, *Water allocation(Policy), *Proration, Water rights, Groundwater, Legal aspects, Pumping, Water supply, Withdrawal, Water resources development, Water utilization, Cities, Watersheds(Basins), Water demand, Water requirements, Judicial decisions, Safe yield, Hydrologic data, Forecasting.

In 1949, the California Supreme Court established the mutual prescription doctrine in City of Pasadena v. City of Alhambra. This doctrine resulted in overdevelopment of California groundwater basins since it rewarded those users who extracted more than their allocation by giving them prescriptive rights against other users in proportion to the actual amount taken rather than the amount allotted. Therefore, it was in every user's best interest to overpump to keep from losing water. In 1975, the court reexamined the problem and adopted a new formula for allocation of groundwater in an overdrafted basin. The court established a stringent standard for notice of adverse use and held that the exemption of municipalities from prescription was applicable to prescription of groundwater. The author suggests that this decision may remove the incentive for overdevelopment of California's groundwater basins. He warns other states against applying a pro rata solution to overdrafting in light of the California experience since such a solution is likely to cause long term disruption due to the subsequent uncertainty of ownership of water rights. (Capehart-Florida)
W77-08490

ALLOCATING BURIED TREASURE: FEDERAL LITIGATION INVOLVING INTERSTATE GROUND WATER,
W. P. Pendley.
Land and Water Law Review, Vol 11, p 103-130 (1976). 28 p, 114 ref.

Descriptors: *Water management(Applied), *Groundwater, *Aquifer management, *State jurisdiction, *Equitable appointment, Prior appropriation, Reservation doctrine, Surface waters, Interstate rivers, Interstate compacts, Beneficial use, Federal government, State governments, Judicial decisions, Legal aspects, Riparian rights, Irrigation, Surface-groundwater relationships, Groundwater resources, Groundwater basins, Reasonable use, Water utilization.

Although groundwater is a water source which must be increasingly utilized in the future, no law has yet been developed for interstate groundwater rights and allocation. An examination of federal court decisions involving interstate surface waters is made here to determine their applicability to groundwater situations. The major problem is a jurisdictional one since a complaining state must meet a heavy burden of proof by showing that the threatened groundwater use poses serious danger. The cost of obtaining such evidence may well be prohibitive. A further requirement of showing real and substantial, rather than potential, harm could mean that litigation would be too late to prevent damage to groundwater basins. The development of a doctrine of equitable apportionment of groundwater must take into account the correlation between ground and surface water. The courts have not yet recognized such a correlation. Although the interstate compact may be the most desirable solution to problems of interstate groundwater allocation, the most probable response is interstate litigation. (Capehart-Florida)
W77-08491

6F. Nonstructural Alternatives

FEDERAL STATUTORY MODIFICATION OF PRIVATE WATER RIGHTS IN SOUTH FLORIDA,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-08112

WATER RESOURCE POLICIES AND AUTHORITIES, COASTAL ZONE MANAGEMENT PROGRAM IMPLEMENTATION,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-08114

BEAR RIVER COMPACT,
For primary bibliographic entry see Field 6E.
W77-08155

FINAL REPORT OF COMMITTEE VII (FINAL RECOMMENDATIONS OF THE INTERNATIONAL CONFERENCE ON WATER LAW AND ADMINISTRATION),
For primary bibliographic entry see Field 6E.
W77-08187

FLOOD MANAGEMENT: WHO BENEFITS AND WHO PAYS,
Massachusetts University, Amherst. Dept. of Food and Resource Economics.
J. H. Foster.
Water Resources Bulletin, Vol. 12, No. 5, October 1976, p. 1029-1039, 1 tab, 3 ref. OWRT B-028-MASS(7), 14-31-0001-3896.

Descriptors: *Cost-benefit analysis, Alternative costs, *Flood protection, *Flood control, *Alternative planning, Flood plain insurance, Land use, Flood plain zoning, Planning, Management, Floodproofing.
Identifiers: *Flood management.

The distribution of costs and benefits among groups in society of alternative flood management actions is examined in terms of their final incidence or resting place--their influence on real estate values. The alternatives examined include structures, disaster relief, floodproofing, watershed land treatment, floodplain zoning, and flood insurance. The impact of each alternative on the amount of flood disability cost paid by the landowner is examined and variations among alternatives are used to explain the past political success of structures and reliefs as compared to zoning, floodproofing, and insurance. (Lefferts-Massachusetts)
W77-08303

FLOOD PLAINS FOR OPEN SPACE AND RECREATION.
Bureau of Outdoor Recreation, Washington, D. C.
For sale by Supt of Documents, US Govt Printing Office Washington, D.C. 20402. Price $1.10 (single copy). Outdoor Recreation Action, No 39, p 3-16. 24 photo. (1976).

Descriptors: *Recreation, *Flood control, *Rivers, *Flood plains, Land use, Reservoir operation, Recreation facilities, Reservoirs, Parks, Dams, Flood damage, Water policy, River basin development, Floodways, Flood protection, Flood plain insurance, Non-structural alternatives, Watershed management.
Identifiers: *Water Resources Development Act, *Land and Water Conservation Fund Program.

The flood plain is nature's arrangement for periodic flood storage and discharge. Exceptional flooding conditions will eventually cause a stream to reclaim its flood plain regardless of what structures man has placed there. Extensive flood

damages to residential and business areas throughout the United States, in the early 1970s resulted in a National Forum on 'The Future of the Flood Plain' held in 1975. Participants in the Forum, including the Bureau of Outdoor Recreation, the US Army Corps of Engineers, The League of Women Voters, and the National Association of Counties, made 50 or more recommendations on flood plain management. Among these recommendations were: a call for a statement of national policy, with criteria for state and local governments to use in planning; identification of critical areas and long-term management plans; expansion of technical assistance in flood plain management; passage of flood plain zoning and standards; and purchase of flood plains when necessary. In many areas of the United States, programs have been implemented which combine flood control projects with outdoor recreation, utilizing non-structural alternatives to development of the flood plain, such as parks, bikeways, golf courses, and playgrounds The article describes typical programs in various states. (Sloan-Florida)
W77-08374

6G. Ecologic Impact Of Water Development

COMPUTERIZED PLANNING SYSTEM FOR NUCLEAR POWER PLANT EVALUATION,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6B.
W77-08108

DISCRIMINANT ANALYSIS OF CHARACTERISTICS DETERMINING ACCEPTANCE OR REJECTION OF NUCLEAR POWER,
Krannert Graduate School of Management, LaFayette, Ind.
For primary bibliographic entry see Field 6B.
W77-08109

U.S. ENVIRONMENTAL PROTECTION AGENCY ENVIRONMENTAL RESEARCH OUTLOOK FY 1976 THROUGH 1980 (REPORT TO CONGRESS).
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 523, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/9-76-003, February 1976. 158 p, 2 fig, 18 photo, 7 tab, 1 append.

Descriptors: *Federal government, *Comprehensive planning, *Administrative agencies, *Environmental effects, Future planning(Projected), *Research and development, *Research priorities, Waste water treatment, Industrial production, Planning, Water pollution sources, Pollution abatement, Governmental interrelations, Industrial wastes, Public health, Water pollution control, Water quality control.

The Office of Research and Development (ORD) was created to conduct a comprehensive and integrated research program for the Environmental Protection Agency (EPA). In a report on the first five year Research Plan, ORD describes research, priorities and trends for the fiscal years 1976-1980. The report covers ORD's five major programs: Health and Ecological Effects, Industrial Processes, Public Sector Activities, Monitoring and Technical Support, and Energy/Environment. Research for developing and improving criteria for pollution control in freshwater systems, and the assessment of progress in marine and estuarine systems is emphasized. The setting of standards for industrial pollution control requires examination of all media, air, water and land, in order to avoid merely transferring pollution impacts from one medium to another. Increased attention will be given to methods to improve the performance and reduce the cost of waste water treatment systems. Priority is placed on the Health and Industrial Processes programs. Monitoring of pollution sources and agreements with other federal agencies are also described. Increased pollution sources and agreements with other federal agencies are also described. Increased pollution control technology is needed in the industrial arena if the 1985 water quality goals are to be achieved. (Molloy-Florida)
W77-08120

ENVIRONMENTAL PROTECTION THROUGH THE COMMON LAW,
Calgary Univ. (Alberta). Faculty of Environmental Design.
P. S. Elder.
Western Ontario L Rev, Vol 12, p 107-71 (1973). 391 ref.

Descriptors: *Common law, *Pollution abatement, *Water pollution control, *Legal aspects, *Negligence, *Trespass, Hazards, Water law, Penalties(Legal), Remedies, Riparian land, Riparian rights, Water rights, Prescriptive rights, Industries, Control, Governments, Legal review, Judicial decisions.
Identifiers: *Nuisance(Legal aspects), *Injunctions(Prohibitory), Absolute liability, Evidence, Intentional torts, Standing(Legal), Statute of limitations.

The explosion of ecological publications and the extensive media coverage has convinced everyone that an environmental crisis exists. Government and industry both have attempted to alleviate the problem and both have been, for the most part, unsuccessful. One avenue of pollution abatement that has been little used is the ordinary common law. Private persons can maintain actions against polluters based upon trespass, negligence and ultrahazardous activities. However, the conservative drawbacks of the common law often make such attempts fruitless. The procedural drawbacks of expert witnesses, funds, time, problems of proof and the requirement of a private property interest should be analyzed and radically redesigned. Substantively, the causes of action themselves should be liberalized. A suit in nuisance should be permitted for an interference with a private right despite the fact that the individual has suffered no particular, direct, and substantial damage. The law of riparian rights should allow an injunction enjoining any pollution whatever without requiring any proof of actual damage to property. Defendants should be barred from claiming any prescriptive right to pollute even though their action may have existed for the requisite period of time. In the absence of extraordinary circumstances, an injunction against pollution should be issued immediately, ignoring the balancing of conveniences. (Moorhouse-Florida)
W77-08133

SIERRA CLUB V STAMM (NATIONAL ENVIRONMENTAL POLICY ACT DOES NOT REQUIRE COMPREHENSIVE ENVIRONMENTAL IMPACT STATEMENT ON LARGE RECLAMATION PROJECT WHEN EIS HAVE BEEN PREPARED FOR VIABLE PORTION OF PROJECT).
For primary bibliographic entry see Field 6E.
W77-08147

NATURAL RESOURCES DEFENSE COUNCIL V STAMM (NATIONAL ENVIRONMENTAL POLICY ACT NOT SATISFIED WHEN EIS FAILS TO DISCUSS ALL REASONABLE ALTERNATIVES TO THE PROJECT).
For primary bibliographic entry see Field 6E.
W77-08148

SUMMARY OF SOME CURRENT AND POSSIBLE FUTURE ENVIRONMENTAL PROBLEMS RELATED TO GEOLOGY AND HYDROLOGY AT MEMPHIS, TENNESSEE,
Geological Survey, Nashville, Tenn. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-08174

NEW WATER LEGISLATION--DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION,
Wyoming Univ., Laramie. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-08188

PUMPED STORAGE POTENTIAL OF THE HELLS CANYON AREA,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W77-08196

CHANNELIZATION: ENVIRONMENTAL, GEOMORPHIC AND ENGINEERING ASPECTS,
North Carolina Univ. at Charlotte. Dept. of Geography and Earth Science.
For primary bibliographic entry see Field 8D.
W77-08352

THE ENVIRONMENTAL PROBLEM OF THE OCEANS: AN INTERNATIONAL STEPCHILD OF NATIONAL EGOTISM,
For primary bibliographic entry see Field 6E.
W77-08367

EMERGING LEGAL CONCEPTS IN THE HARMONIZATION OF WATER RESOURCES DEVELOPMENT AND ENVIRONMENTAL PROTECTION,
Fordham Univ., N.Y. School of Law.
For primary bibliographic entry see Field 6E.
W77-08378

STATE V CORPS OF ENGINEERS (COST/BENEFIT ANALYSIS UNDER NEPA AND THE FLOOD CONTROL ACT).
For primary bibliographic entry see Field 6E.
W77-08400

WATER QUALITY IMPACTS OF URBANIZATION--A METHODOLOGY,
Economic and Social Commission for Asia and the Pacific (UN), Bangkok (Thailand). Div. of Industry, Housing, and Technology.
For primary bibliographic entry see Field 5B.
W77-08514

7. RESOURCES DATA

7A. Network Design

ON THE RELATIONSHIP BETWEEN THE FINITE ELEMENT AND FINITE DIFFERENCE METHODS,
Geological Survey, Trenton, N.J. Water Resources Div.
W. G. Gray, and G. F. Pinder.
International Journal for Numerical Methods in Engineering, Vol 10, p 893-923, 1976. 9 tab, 5 ref.

Descriptors: *Finite element analysis, *Convection, *Diffusion, *Equations, Analytical techniques, Evaluation.
Identifiers: *Galerkin-finite element method, *Finite difference method.

The integral equations which arise from application of the Galerkin-finite element scheme to the

convective-diffusion equation are examined to illustrate how this method represents differential equations. The formulae obtained are effectively spatial averages of standard finite difference equations written at a node. the truncation error in the finite element solution at a node is obtained for various nodal configurations. (Woodard-USGS)
W77-08168

THE OPERATION OF A FLOOD WARNING NETWORK: ITS USE FOR STUDYING FLASH FLOODS (EXPLOITATION D'UN RESEAU D'ALERTE: SON UTILISATION POUR L'ETUDE DES CRUES BRUTALES),
Division des Resources en Eau, Tunis (Tunisia).
For primary bibliographic entry see Field 2E.
W77-08248

DESIGN OF A WATER QUALITY MONITORING NETWORK,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W77-08497

7B. Data Acquisition

MEASUREMENT OF FLASH FLOODS IN THE UNITED STATES--STATE OF THE ART,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08161

ON THE RELATIONSHIP BETWEEN THE FINITE ELEMENT AND FINITE DIFFERENCE METHODS,
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 7A.
W77-08168

INVESTIGATION OF DETECTION LIMITS FOR SOLUTES IN WATER MEASURED BY LASER RAMAN SPECTROMETRY,
Smithsonian Institution, Washington, D.C.; and Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-08171

DELINEATION OF DECIDUOUS WETLAND FORESTS IN NORTHEASTERN CONNECTICUT,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2G.
W77-08194

RELATIVE REFLECTANCE AND COMPLEX REFRACTIVE INDEX IN THE INFRARED FOR SALINE ENVIRONMENTAL WATERS,
Missouri Univ.-Kansas City. Dept. of Physics.
For primary bibliographic entry see Field 2L.
W77-08215

VERTICAL STRAIN-RATE MEASUREMENTS IN AN ARCTIC ICE CAP AND DEDUCTIONS FROM THEM,
Department of Energy, Mines, and Resources, Ottawa (Ontario). Polar Continental Shelf Project.
For primary bibliographic entry see Field 2C.
W77-08226

A FURTHER COMPARISON OF GLACIER VELOCITIES MEASURED BY RADIO-ECHO AND SURVEY METHODS,
British Antarctic Survey, Cambridge (England).
For primary bibliographic entry see Field 2C.
W77-08228

RADIO-ECHO SOUNDING OF TEMPERATE GLACIERS: ICE PROPERTIES AND SOUNDER DESIGN CRITERIA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2C.
W77-08229

RADIO-ECHO SOUNDING: REFLECTIONS FROM INTERNAL LAYERS IN ICE SHEETS,
Wisconsin Univ. Middleton. Geophysical and Polar Research Center.
For primary bibliographic entry see Field 2C.
W77-08230

MEASUREMENT OF ICE MOVEMENT IN SUBGLACIAL CAVITIES: A NEW CAVITOMETER BENEATH THE GLACIER D'ARGENTIERE (MT BLANC, FRANCE),
Grenoble-1 Univ. (France). Institut de Geographie Alpine.
For primary bibliographic entry see Field 2C.
W77-08238

ON DEPTH HOAR AND THE STRENGTH OF SNOW,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2C.
W77-08239

RELOCATION OF BURIED MARKERS,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2C.
W77-08240

APPLICATIONS OF SURFACE RESISTIVITY METHODS,
Alberta Univ., Edmonton. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W77-08244

A METHODOLOGY FOR MEASURING FLASH FLOODS (METHODOLOGIE POUR LA MESURE DES CRUES BRUTALES),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
For primary bibliographic entry see Field 2E.
W77-08249

THERMAL SENSOR FOR MEASUREMENT OF OCEAN CURRENT DIRECTION,
Office of the Secretary (Navy), Washington, D.C.
For primary bibliographic entry see Field 2L.
W77-08257

DETERMINING AREAL PRECIPITATION IN THE BASIN AND RANGE PROVINCE OF SOUTHERN ARIZONA - SONOITA CREEK BASIN,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2B.
W77-08308

TRUE-TEMPERATURE DETERMINATION OF GEOTHERMAL RESERVOIRS,
Texas Instruments, Inc., Dallas, Tex.
D. J. Jin.
Geoexploration, Vol 15, No 1, p 1-9, January, 1977. 16 ref.

Descriptors: *Geothermal studies, *Thermal water, *Water temperature, *Resistivity, Electrical studies, Electronic equipment, Porous media, Saline water, Electrolytes.
Identifiers: *Geothermal reservoirs, *Temperature measurement.

Dwindling supplies of hydrocarbon resources and the many advantages of utilizing terrestrial heat for power generation have sparked intense new interest in geothermal reservoir development. Several techniques are curently being used to determine the extent of geothermal fields, and the electrical resistivity method has proved to be one of the most effective. It is also possible to measure the temperature of geothermal reservoirs via resistivity surveys. The following formula explicitly gives the temperature of a geothermal reservoir: t sub h = t sub c + (1/alpha) ((rho sub c/rho sub h)-1). T sub h and rho sub h are, respectively, the temperature and resistivity of the hot portion of the earth, i.e., the reservoir; t sub c and rho sub c are, respectively, the temperature and resistivity of the cold (surface) portion of the earth, and alpha is the temperature coefficient of resistivity of the ground water in the area under question. Rho sub c and rho sub h are calculated from resistivity survey field data while alpha is determined by laboratory measurements. Experimentation is still necessary, however, before this formula can be assumed valid for geothermal fields of very high temperatures (300 C and up). (Eberle-NWWA)
W77-08318

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, VOLUME I-A, TECHNICAL SESSION PRESENTATIONS, AGRICULTURE-ENVIRONMENT.
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
Available from the National Technical Information Service, Springfeild, VA 22161 as N76-17588, Price codes: A23 in paper copy, A01 in microfiche. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, September 1975 (3 Vol.). 595 p. Smistad, O., Coordinator.

Descriptors: *Conferences, *Remote sensing, *Agriculture, *Environment, Satellites(Artificial), Land use, Water quality, Mapping, Range management, Land management, Marshes, Wetlands, Data processing, Monitoring, Forests, Vegetation, Revegetation, Resources, Land resources.
Identifiers: *LANDSAT, Skylab.

The reported symposium combined with utilization and results of data from NASA programs involving LANDSAT, the Skylab Earth resources experiment package, and aircraft, as well as information from other data acquisition programs. The primary emphasis was on the practical applications of Earth resources survey technology, which is of interest to a large number of potential users. Also featured were scientific and technological exploration and research investigations with potential promising applications. Technical sessions were structured to provide governmental and private organizations with a comprehensive picture of various applications in the management and implementation of remote-sensing data use in their own programs. Volume I-A contained technical papers related to agriculture and environment. (See W77-08409 thru W77-08438) (Humphreys-ISWS)
W77-08408

ESTIMATING VEGETATIVE BIOMASS FROM LANDSAT-1 IMAGERY FOR RANGE MANAGEMENT,
Nebraska Univ., Lincoln. Conservation Survey Div.
For primary bibliographic entry see Field 4A.
W77-08409

DISCRIMINATING COASTAL RANGELAND PRODUCTION AND IMPROVEMENTS WITH COMPUTER AIDED TECHNIQUES,
Lockheed Electronics Co., Inc., Houston, Tex. Aerospace Systems Div.
For primary bibliographic entry see Field 4A.
W77-08410

USEFULNESS OF LANDSAT DATA FOR MONITORING PLANT DEVELOPMENT AND RANGE CONDITIONS IN CALIFORNIA'S ANNUAL GRASSLAND,
Geological Survey, Sioux Falls, S. Dak. EROS Data Center.
For primary bibliographic entry see Field 4A.
W77-08411

MONITORING VEGETATION CONDITIONS FROM LANDSAT FOR USE IN RANGE MANAGEMENT,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 4A.
W77-08412

UTILIZATION OF LANDSAT IMAGERY FOR MAPPING VEGETATION ON THE MILLIONTH SCALE,
Kansas Univ., Lawrence, Space Technology Labs.
For primary bibliographic entry see Field 7C.
W77-08413

LANDSAT-1 DATA, ITS USE IN A SOIL SURVEY PROGRAM,
South Dakota State Univ., Brookings. Dept. of Plant Science; and South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 2G.
W77-08414

DELINEATION OF THE BOUNDARIES OF A BURIED PRE-GLACIAL VALLEY WITH LANDSAT-1 DATA,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 2G.
W77-08415

ARE CLEAR-CUT AREAS ESTIMATED FROM LANDSAT IMAGERY RELIABLE,
Pacific Forest Research Centre, Victoria (British Columbia).
For primary bibliographic entry see Field 4A.
W77-08416

OPERATIONAL CONSIDERATIONS FOR THE APPLICATION OF REMOTELY SENSED FOREST DATA FROM LANDSAT OR OTHER AIRBORNE PLATFORMS,
Saint Regis Paper Co., Jacksonville, Fla. Southern Timberlands Div.
For primary bibliographic entry see Field 7C.
W77-08417

TIMBER TYPE SEPARABILITY IN SOUTHEASTERN UNITED STATES ON LANDSAT-1 MSS DATA,
Lockheed Electronics Co., Inc. Houston, Tex.
For primary bibliographic entry see Field 4A.
W77-08418

MAPPING OF THE WILDLAND FUEL CHARACTERISTICS OF THE SANTA MONICA MOUNTAINS OF SOUTHERN CALIFORNIA,
ESL, Inc., Sunnyvale, Calif. Earth Resources Technology Applications.
For primary bibliographic entry see Field 7C.
W77-08419

COMPUTER ANALYSIS AND MAPPING OF GYPSY MOTH DEFOLIATION LEVELS IN PENNSYLVANIA USING LANDSAT-1 DIGITAL DATA,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7C.
W77-08420

COMPUTER IMPLEMENTED CLASSIFICATION OF VEGETATION USING AIRCRAFT ACQUIRED MULTISPECTRAL SCANNER DATA,
National Aeronautics and Space Administration, Bay Saint Louis, Miss. Earth Resources Lab.
For primary bibliographic entry see Field 4A.
W77-08421

THE USE OF SKYLAB DATA TO STUDY THE EARLY DETECTION OF INSECT INFESTATIONS AND DENSITY AND DISTRIBUTION OF HOST PLANTS,
Agricultural Research Service, Weslaco, Tex. Southern Region Citrus Insects Research.
For primary bibliographic entry see Field 7C.
W77-08422

AGRICULTURAL INVENTORY CAPABILITIES OF MACHINE PROCESSED LANDSAT DIGITAL DATA,
General Electric Co., Beltsville, Md. Space Systems Organization.
For primary bibliographic entry see Field 3F.
W77-08423

AGRICULTURAL APPLICATIONS OF REMOTE SENSING--A TRUE LIFE ADVENTURE,
General Electric Co., Beltsville, Md.
For primary bibliographic entry see Field 3F.
W77-08424

PRACTICAL APPLICATION OF REMOTE SENSING IN AGRICULTURE,
Anderson, Clayton and Co., Houston, Tex.
For primary bibliographic entry see Field 3F.
W77-08425

WILDLIFE MANAGEMENT BY HABITAT UNITS--A PRELIMINARY PLAN OF ACTION,
For primary bibliographic entry see Field 4A.
W77-08426

AN OVERVIEW OF THE DEVELOPMENT OF REMOTE SENSING TECHNIQUES FOR THE SCREWWORM ERADICATION PROGRAM,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 3F.
W77-08427

THE RATIONALE FOR ATTEMPTING TO DEFINE SALT MARSH MOSQUITO-BREEDING AREAS IN GALVESTON COUNTY BY REMOTE SENSING THE ASSOCIATED VEGETATION.
Lockheed Electronics Co., Houston, Tex.
For primary bibliographic entry see Field 4A.
W77-08428

APPLICATION OF EREP, LANDSAT AND AIRCRAFT IMAGE DATA TO ENVIRONMENTAL PROBLEMS RELATED TO COAL MINING,
Earth Satellite Corp. Washington, D. C.
For primary bibliographic entry see Field 5A.
W77-08429

QUANTITATIVE WATER QUALITY WITH LANDSAT AND SKYLAB.
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 5A.
W77-08431

LANDSAT-1 DATA AS IT HAS BEEN APPLIED FOR LAND USE AND WATER QUALITY DATA BY THE VIRGINIA STATE WATER CONTROL BOARD,
Virginia State Water Control Board, Richmond. Div. of Surveillance and Field Studies.
For primary bibliographic entry see Field 5A.
W77-08432

THE LANDSAT-1 MULTISPECTRAL SCANNER AS A TOOL IN THE CLASSIFICATION OF INLAND LAKES,
National Eutrophication Survey, Corvallis, Oreg.
For primary bibliographic entry see Field 5A.
W77-08433

TROPHIC STATUS OF INLAND LAKES FROM LANDSAT,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5A.
W77-08434

THE USE OF LANDSAT-1 IMAGERY FOR WATER QUALITY STUDIES IN SOUTHERN SCANDINAVIA,
Lund Univ., (Sweden). Dept. of Physical Geography.
For primary bibliographic entry see Field 5A.
W77-08435

A COMPARATIVE INTERREGIONAL ANALYSIS OF SELECTED DATA FROM LANDSAT-1 AND EREP FOR THE INVENTORY AND MONITORING OF NATURAL ECOSYSTEMS,
Earth Satellite Corp., Berkeley, Calif.
For primary bibliographic entry see Field 7C.
W77-08436

REMOTE SENSING APPLICATIONS IN KANSAS,
Kansas Univ., Lawrence. Space Technology Labs.
For primary bibliographic entry see Field 4A.
W77-08437

REMOTE SENSING APPLICATIONS IN THE INVENTORY AND ANALYSIS OF ENVIRONMENTAL PROBLEMS,
Environmental Protection Agency, Warrenton, Va. Environmental Photographic Interpretation Center.
For primary bibliographic entry see Field 5A.
W77-08438

A CONTROLLABLE AUTOMATED ENVIRONMENTAL DATA ACQUISITION AND MONITORING SYSTEM,
Brookhaven National Lab., Upton, N. Y.
For primary bibliographic entry see Field 7C.
W77-08441

INVERTEBRATE COLONIZATION OF ARTIFICIAL SUBSTRATES IN SAN LEANDRO CREEK,
California Univ., Berkeley. Dept. of Forestry and Conservation.
For primary bibliographic entry see Field 5A.
W77-08443

7C. Evaluation, Processing and Publication

COMPUTERIZED PLANNING SYSTEM FOR NUCLEAR POWER PLANT EVALUATION,
Krannert Graduate School of Management, Lafayette, Ind.
For primary bibliographic entry see Field 6B.
W77-08108

CONTINUOUS AUTOMATED MONITORING OF CHEMICAL AND PHYSICAL CHARACTERISTICS OF THE RED CEDAR RIVER,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5A.
W77-08110

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1975,
Geological Survey, Indianapolis, Ind. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 859, Price codes: A16 in paper copy, A01 in microfiche.
Water-Data Report IN-75-1, March 1976. 355 p, 3 fig, 22 ref.

Descriptors: *Indiana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reervoirs, Water wells, Water levels, Sampling, Sites.
Identifiers: Annual State report(Ind).

Water resources data for the 1975 water year for Indiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 182 gaging stations; and water levels for 15 observation wells. Partial-record stations include 104 crest stage, 52 low flow, and 20 low and high flow. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Indiana. (Woodard-USGS)
W77-08162

SELECTED WATER-LEVEL RECORDS FOR WESTERN OKLAHOMA, 1950-1975,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
R. L. Goemaat.
Open-File report 77-73, January 1977. 94 p, 1 fig, 1 tab.

Descriptors: *Groundwater, *Water wells, *Water levels, *Water level fluctuations, *Oklahoma, Basic data collections, Irrigation, Observation wells, Aquifers, Groundwater availability.
Identifiers: Western Oklahoma.

Ground-water-level measurements and water level changes are presented for about 900 wells in 19 counties of western Oklahoma where ground water is heavily used for irrigation. Measurements made in major aquifers of the area including the Ogalalla Formation, rush Springs Sandstone, Blaine Gypsum, Cimarron terrace, and Tillman terrace. The data are subdivided by counties. (Woodard-USGS)
W77-08163

GROUND-WATER DATA FOR 1974-75 IN JOSHUA TREE NATIONAL MONUMENT, CALIFORNIA,
Geological Survey, Menlo Park, calif. Water Resources Div.
D. J. Downing.
Open-File report 77-80, January 1977. 34 p, 2 fig, 4 tab, 3 ref.

Descriptors: *Groundwater, *Water levels, *Water quality, *Water wells, *Water yield, Pumping, Basic data collections, Observation wells, California, National Parks.
Identifiers: *Joshua Tree National Monument(Calif).

This report, prepared at the request of the National Park Service, is part of a continuing inventory by the U.S. Geological Survey of general geohydrologic conditions at Joshua Tree National Monument, California. Tables of data for 1974-75 includes chemical analyses of ground water from selected wells and pumpage by Kaiser Steel Corporation from Pinto Basin. The table for yearly pumpage totals by Kaiser Steel Corporation includes years 1960-75. Water-level measurements are included for 22 observation wells. (Woodard-USGS)
W77-08164

SUBSURFACE-TEMPERATURE DATA FOR SOME WELLS IN WESTERN UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
F. E. Rush.
Open-File Report 77-132, January 1977. 84 p, 1 fig, 1 tab.

Descriptors: *Subsurface investigations, *Geothermal studies, *Wells, *Utah, *Temperature, Measurement, Methodology, Depth, Data collections, Sites.
Identifiers: *Electronic thermometer.

This hydrothermal reconnaissance of the State of Utah contains temperature-profile data for 30 wells. Most of the wells were small-diameter geothermal-exploration wells. Some were stock, domestic, or irrigation wells. Temperatures were measured using thermistor, 4-conductor cable, and a digital multimeter. Meter readings were in ohms, but were converted to temperature by a calibration graph. The electronic thermometer is capable of an accuracy to 0.01 deg C, and the highest temperature measured was 107.80 deg C in the only well to have measurements of 100 deg C or higher. Because of variations in field conditions, the temperature data in many wells probably is accurate only to 0.1 deg C. Depths below land surface were measured using a sheave and attached counter. (Woodard-USGS)
W77-08166

GEOHYDROLOGY OF THE ENGLISHTOWN FORMATION IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-08175

GROUND-WATER BASIC DATA FOR RAMSEY COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak. Water Resources Div.
R. D. Hutchinson.
North Dakota County Ground-Water Studies 26--Part II, and North Dakota Geological Survey Bulletin 71--Part II, Bismarck, N.D., 1977. 344 p, 2 fig, 1 plate, 5 tab, 25 ref, append.

Descriptors: *Hydrologic data, *Groundwater resources, *Aquifer characteristics, *Well data, *Water quality, Water levels, Hydrogeology, Drillers logs, Test wells, Water yield, Chemical analysis, North Dakota.
Identifiers: *Ramsey County(N Dak).

This report contains basic data for 1,145 wells and test holes in Ramsey County, North Dakota. Included are 452 logs of test holes and wells, 209 chemical analyses of water samples, and water-level measurements in 73 observation wells. The purpose of the investigation was to provide detailed geologic and hydrologic information needed for the orderly development of water supplies for municipal, domestic, livestock, irrigation, industrial, and similar uses. Specifically, the objectives were to: (1) determine the location, extent, and nature of the major aquifers and confining beds; (2) evaluate the occurrence and movement of ground water, including the sources of recharge and discharge; (3) estimate the potential yields of wells; (4) evaluate the quality of the ground water; and (5) estimate the water use. (Woodard-USGS)
W77-08177

DATA FOR CALIBRATING UNSTEADY-FLOW SEDIMENT-TRANSPORT MODELS, EAST FORK RIVER, WYOMING, 1975,
Geological Survey, Lakewood, Colo. Water Resources Div.
H. A. Mahoney, E. D. Andrews, W. W. Emmett, L. B. Leopold, and R. H. Meade.
Open-File Report 76-22, December 1976. 293 p, 12 fig, 39 tab, 10 ref.

Descriptors: *Sediment transport, *Unsteady flow, *Alluvial channels, *Channel morphology, *Mathematical models, Data collections, Evaluation, Bed load, Particle size, Cross-sections, Stage-discharge relations, Streamflow, Flow rates, Sediment yield, *Wyoming.
Identifiers: *East Fork River(Wyo).

In 1975, data to calibrate a one-dimensional unsteady-flow and sediment-transport routing model were collected on a reach of the East Fork River of western Wyoming. The reach, 3.1 miles in length, was immediately upstream from a previously established bedload sampling station. Nineteen channel cross sections were sounded at regular intervals during the spring-runoff period. Four stage recorders provided continuous records of water-surface elevations. Samples of bed material at most of the cross sections were obtaind prior to high water. Streamflow and sediment-discharge measurements were collected at four of the sections. The physiography and hydrology of the contributing watershed, the study reach, and the equipment and techniques used in data collection are described. The bulk of the report is a presentation of data for late May to early June 1975, for which concurrent water discharge data, bedload transport and size data, and cross-section depth measurements were collected. In addition, some data collected in 1973 and 1974 and before and after the calibration period in 1975 are included. (Woodard-USGS)
W77-08180

SELECTED HYDROLOGIC DATA, UINTA BASIN AREA, UTAH AND COLORADO,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
J. W. Hood, J. C. Mundorff, and D. Price.
Utah Basic-Data Release No 26, Salt Lake City, 1976. 321 p, 9 fig, 2 plates, 15 tab, 19 ref.

Descriptors: *Hydrologic data, *Utah, *Colorado, *Water resources, *Water quality, Basic data collections, Surface waters, Groundwater, Observation wells, Well data, Aquifers, Water levels, Streamflow, Flow rates, Chemical analysis.
Identifiers: *Uinta Basin area (Utah and Colo).

The Uinta Basin area in northeastern Utah and northwestern Colorado covers an area of slightly more than 10,000 sq mi. More than 95 percent of the basin is in Utah, thus most of the data in this report apply to Utah. Selected data are consolidated from available records of water wells, springs, petroleum-test wells, and streams. Included are well logs, laboratory analyses of grain-size distribution and hydrologic properties of

aquifer samples, water levels in observation wells, stream discharge, and water-quality records for all types of water sources. (Woodard-USGS)
W77-08183

WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1975,
Geological Survey, Champaign, Ill. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 434, Price codes: A12 in paper copy, A01 in microfiche. Water-Data Report IL-75-1, April 1976. 408 p, 4 fig, 4 tab, 29 ref.

Descriptors: *Illinois, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites.

Water resources data for the 1975 water year for Illinois consist of records of stage, discharge, and water quality of wells. This report contains discharge records for 174 gaging stations; stage only records for 5 gaging stations; stage and contents for 3 lakes and reservoirs; stage only for 5 lake stations; water quality for 41 gaging stations; and water levels for 3 observation wells. Also included are data for 148 crest-stage partial-record stations and 251 flood-profile stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Suurvey and cooperating State and Federal agencies in Illinois. (Woodard-USGS)
W77-08184

WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1975,
Geological Survey, Carson City. Nev. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 431, Price codes: A14 in paper copy, A01 in microfiche. Water-Data Report NV-75-1, March 1976. 292 p, 8 fig, 4 tab, 35 ref.

Descriptors: *Nevada, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites.

Water resources data for the 1975 water year for Nevada Consists of records of discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 120 gaging stations; stage and contents for 21 lakes and reservoirs; water-quality data for continuing-record stations at 23 stream sites and for partial-record stations at 5 stream sites and 2 lake sites; and water levels for 62 observation wells. Also included are 121 crest-stage partial-record stations and 13 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Nevada. (Woodard-USGS)
W77-08185

EFFECT OF DIP ON THE SUBSURFACE STORAGE OR DISPOSAL OF FLUID IN SALINE AQUIFERS,
Louisiana Water Resources Research Inst., Baton Rouge.
For primary bibliographic entry see Field 4B.
W77-08204

EFFECT OF VISCOSITY RATIO ON THE RECOVERY OF FRESH WATER STORED IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 4B.
W77-08205

THE AFGWC SNOW COVER ANALYSIS MODEL,
Air Force Global Weather Central, Offutt AFB, Nebr.
For primary bibliographic entry see Field 2C.
W77-08223

PUMPED-STORAGE IN THE PACIFIC NORTHWEST, AN INVENTORY.
Corps of Engineers, Portland, Oreg. North Pacific Div.
For primary bibliographic entry see Field 2H.
W77-08224

RESURVEY OF THE 'BYRD' STATION, ANTARCTICA, DRILL HOLE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W77-08227

COMPUTER PREDICTION OF STATIONARY STATES OF MEMBRANES FROM DIFFERENTIAL PERMEABILITIES,
Aberdeen Univ. (Scotland). Dept. of Chemistry.
For primary bibliographic entry see Field 3A.
W77-08234

RECENT FLASH FLOODS OF THE DISON BROOK (CRUES BRUTALES RECENTES DU 'RUISSEAU' DE DISON (BELGIQUE): OBSERVATIONS ET PREVISIONS),
Liege Univ. (Belgium), Faculte des Sciences Appliquees.
For primary bibliographic entry see Field 4A.
W77-08250

REGIONAL SIMULATION OF STREAMFLOW DATA,
North Carolina Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W77-08298

RECSAD: A COMPUTER PROGRAM FOR RECREA. .ON PLANNING,
Oklahoma State Univ., Stillwater. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W77-08300

WATER-LEVEL DECLINE AND PUMPAGE IN DEEP WELLS IN THE CHICAGO REGION, 1971-1975,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2F.
W77-08302

A COMPUTERIZED INFORMATION SYSTEM RELATING TO ARIZONA'S WATER RESOURCES,
Arizona Univ., Tucson. Office of Arid Lands Studies.
K. E. Foster.
In: 1973 Proceedings Institute of Environmental Sciences, p. 341-344. 2 fig, 1 tab, 20 ref. OWRT A-031-ARIZ(4), 14-31-0001-5003.

Descriptors: Data storage and retrieval, Hydrologic data, Data processing, *Arizona, Information exchange, Administrative agencies, State government, Local governments, *Information retrieval.
Identifiers: *Information systems.

Water in Arizona is a vital natural resource, that in some portions of the State, is diminishing from groundwater storage at a rapid rate as increased pumping for agricultural, municipal and mining purposes accelerate. Currently in Arizona there exists six State agencies, seven federal agencies, and countless local irrigation districts and city water departments which have specific statutory responsibilities or administrative needs for inventorying, conserving, developing, managing, operating, protecting, and/or monitoring the water resources and related facilities of the State. These divergent information sources plus many university sources suggest the strong need for a system that can make information from a variety of sources accessible to the many different user groups in Arizona a central objective.
W77-08307

ESTIMATING VEGETATIVE BIOMASS FROM LANDSAT-1 IMAGERY FOR RANGE MANAGEMENT,
Nebraska Univ., Lincoln. Conservation Survey Div.
For primary bibliographic entry see Field 4A.
W77-08409

DISCRIMINATING COASTAL RANGELAND PRODUCTION AND IMPROVEMENTS WITH COMPUTER AIDED TECHNIQUES,
Lockheed Electronics Co., Inc., Houston, Tex. Aerospace Systems Div.
For primary bibliographic entry see Field 4A.
W77-08410

USEFULNESS OF LANDSAT DATA FOR MONITORING PLANT DEVELOPMENT AND RANGE CONDITIONS IN CALIFORNIA'S ANNUAL GRASSLAND,
Geological Survey, Sioux Falls, S. Dak. EROS Data Center.
For primary bibliographic entry see Field 4A.
W77-08411

MONITORING VEGETATION CONDITIONS FROM LANDSAT FOR USE IN RANGE MANAGEMENT,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 4A.
W77-08412

UTILIZATION OF LANDSAT IMAGERY FOR MAPPING VEGETATION ON THE MILLIONTH SCALE,
Kansas Univ., Lawrence, Space Technology Labs.
D. L. Williams, and J. C. Coiner.
In: Proceedings of the NASA Earth Resource Survey Symposium, June 1975, Technical Sessio Presentations, Agriculture-Environment, Volum I-A. Report No. NASA TM X-58168. Symposiu held June 9-12, 1975, Houston, Texas, p 53-6 September 1975. 4 fig, 14 ref. NASA NGL 17-00 024.

Descriptors: *Mapping, *Vegetation, *Remot sensing, *Natural resources, Land use, Area Satellites(Artificial), Distribution pattern Forests, Classification, Surveys.
Identifiers: *LANDSAT, *Unesco, Physio nomic.

The United Nations Education, Scientific and Cu tural Organization (UNESCO) has recent published a vegetation classification system. Th system, based on the physiognomy of the veget tion, is designed to provide a comprehensiv framework for the preparation of vegetation ma of any part of the world at scales of 1:1,000,000 less. The utility of the system lies in the fact th optimal agricultural land uses are always related

the natural vegetation. The system is designed for use with maps covering large areas. The large map area, however, poses a severe problem in uniform data collection, especially if large-scale imagery is employed as a mapping base. Since LANDSAT images have a basic utilization scale of 1:1,000,000, identical to that of the projected maps, they would serve as a uniform base for all parts of the world if they contained the information necessary to delimit vegetation formations. To determine if the information content of the imagery is sufficient to permit mapping according to the Unesco classification, a series of test sites was examined. These sites included examples from the humid tropics, arid and semi-arid subtropics, and temperate zones. In every case, the feasibility of this application of LANDSAT imagery was verified. The imagery may, therefore, be used as a mapping base for the preparation of vegetation maps on the millionth scale. (See also W77-08408) (Humphreys-ISWS)
W77-08413

LANDSAT-1 DATA, ITS USE IN A SOIL SURVEY PROGRAM,
South Dakota State Univ., Brookings. Dept. of Plant Science; and South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 2G.
W77-08414

ARE CLEAR-CUT AREAS ESTIMATED FROM LANDSAT IMAGERY RELIABLE,
Pacific Forest Research Centre, Victoria (British Columbia).
For primary bibliographic entry see Field 4A.
W77-08416

OPERATIONAL CONSIDERATIONS FOR THE APPLICATION OF REMOTELY SENSED FOREST DATA FROM LANDSAT OR OTHER AIRBORNE PLATFORMS,
Saint Regis Paper Co., Jacksonville, Fla. Southern Timberlands Div.
G. R. Barker, and T. P. Fethe.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 115-133, September 1975, 6 fig, 2 tab, 10 ref.

Descriptors: *Forest management, *Pulp and paper industry, *Remote sensing, *Lumbering, *Southeast U.S., Mapping, Forests, Trees, Pine trees, On-site investigations, Analytical techniques, Data processing, Sampling, Surveys, Photogrammetry, Land use, Satellites(Artificial), Aerial photography.
Identifiers: LANDSAT.

The forest data base requirements necessary to manage efficiently a large, timber based forest industry of the 1970's have transcended by a considerable margin those data required two decades ago. These data demands have grown, both in quantitative terms and in the level of precision acceptable to successfully undertake the multiple decision making processes required. From the traditional generation of area/volume and frequency tables used in immediate planning for harvest and cultural activity, data are now subjected to the rigors of long-range planning manipulations, as these data represent the major input to such planning models. To be effective in such planning activity, the data must be provided in a timely manner. Concurrent with the increase in data demand and the speed of preparation, has been the ever increasing difficulty in securing and reducing these data within the timetables demanded. Remote sensing techniques at all levels seemed to offer the most promising prospect in satisfying the data requirements and in alleviating the difficult task of collecting the data. After a thorough review of the technology of remote sensing and the state of the art of interpretation, it was realized that the best hope for a practical, implementable scheme was to approach the problem in three phases, all interrelated, but independent enough to allow for the progressive modular development of a multilevel sampling system. At each stage, operational feasibility will be evaluated so that necessary revisions can be integrated into the system as needed. (See also W77-08408) (Humphreys-ISWS)
W77-08417

TIMBER TYPE SEPARABILITY IN SOUTHEASTERN UNITED STATES ON LANDSAT-1 MSS DATA,
Lockheed Electronics Co., Inc. Houston, Tex.
For primary bibliographic entry see Field 4A.
W77-08418

MAPPING OF THE WILDLAND FUEL CHARACTERISTICS OF THE SANTA MONICA MOUNTAINS OF SOUTHERN CALIFORNIA,
ESL, Inc., Sunnyvale, Calif. Earth Resources Technology Applications.
J. D. Nichols.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 159-166, September 1975. 3 tab.

Descriptors: *Forest management, *California, *Remote sensing, *Forest fires, *Mapping, Analytical techniques, Analysis, Satellites(Artificial), Data processing, Trees, Grasses, Brush, Fuels, Vegetation, Classification.
Identifiers: LANDSAT, *Wildland fuels.

LANDSAT digital MSS data were successfully used to map and evaluate the wildland fuels of the Santa Monica Mountains in Southern California. A mixed classification scheme was used where training areas of known vegetation types were entered, and the maximum likelihood classifier run, followed by an evaluation of the results and an unsupervised retraining of the classifier using an image of the probability of misclassification. Estimation of maturity class and crown closure percents of the major cover types were assigned to each computer class by associating the photo interpretation of 159 large-scale photo samples, with the resultant computer classes using analysis of variance and analysis of categorized data. The result of the computer classification and statistical analysis was then transformed from the LANDSAT Coordinate California State Plane Coordinate system for use in a digital format in the FIRESCOPE data retrieval and fire modeling system. (See also W77-08408) (Humphreys-ISWS)
W77-08419

COMPUTER ANALYSIS AND MAPPING OF GYPSY MOTH DEFOLIATION LEVELS IN PENNSYLVANIA USING LANDSAT-1 DIGITAL DATA,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
D. L. Williams.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 167-181, September 1975. 3 fig, 1 tab, 22 ref.

Descriptors: *Forest management, *Pennsylvania, *Mapping, *Remote sensing, Insects, Data processing, Surveys, Forests, Entomology, Spatial distribution, Satellites(Artificial), Foliar, Leaves.
Identifiers: *Defoliation, LANDSAT, *Gypsy moths defoliation.

The purpose of this study was to investigate the effectiveness of using LANDSAT-1 multispectral digital data and imagery, supplemented by ground truth and aerial photography, as a new method of surveying gypsy moth (Porthetria dispar (L.) (Lepidoptera; Lymantriidae) defoliation, which has greatly increased in Pennsylvania in recent years. Since the acreage and severity of gypsy moth defoliation reaches a peak from mid-June through the first few days of July, the July 8, 1973, LANDSAT-1 scene was chosen for analysis. Results indicated that LANDSAT-1 data can be used to discriminate between defoliated and healthy vegetation in Pennsylvania, and that digital processing methods can be used to map the extent and degree of defoliation. (See also W77-08408) (Humphreys-ISWS)
W77-08420

COMPUTER IMPLEMENTED CLASSIFICATION OF VEGETATION USING AIRCRAFT ACQUIRED MULTISPECTRAL SCANNER DATA,
National Aeronautics and Space Administration, Bay Saint Louis, Miss. Earth Resources Lab.
For primary bibliographic entry see Field 4A.
W77-08421

THE USE OF SKYLAB DATA TO STUDY THE EARLY DETECTION OF INSECT INFESTATIONS AND DENSITY AND DISTRIBUTION OF HOST PLANTS,
Agricultural Research Service, Weslaco, Tex. Southern Region Citrus Insects Research.
W. G. Hart, S. J. Ingle, and M. R. Davis.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 203-219, September 1975. 8 fig, 5 ref.

Descriptors: *Vegetation, *Plant groupings, *Texas, *Remote sensing, Insects, Infection, Classification, Spatial distribution, Citrus fruits, Satellites(Artificial), Aerial photography, Instrumentation, Agriculture, Mapping, Photography.
Identifiers: *Insect infestations, *Host plants, Skylab.

A study of the detection of insect infestations and the density and distribution of host plants was undertaken, using Skylab data, aerial photography, and ground truth, simultaneously. Additional ground truth and aerial photography was acquired between Skylab passes. For the evaluation of S-190B data, two 100 square-mile areas within the task site were selected. Area 1, of high density citrus, was located northwest of Mission, Texas. Area 2, located 20 miles north of Weslaco, Texas, contained different varieties of citrus, winter vegetables, sugarcane, irrigated pastures, and brush-covered land. Skylab S-190A data was also evaluated for similar information over the entire Rio Grande Valley and adjacent areas of Mexico. Satellite data such as that obtained from Skylab S-190B offers promise for detection of some insect pests and the distribution of host plants of various insect pests. With comparative observations of film types and seasonal influences on reflectance characteristics, many crop varieties can be identified with Skylab S-190B data. Vegetative patterns in border areas can be detected with Skylab S-190A and S-190B data. This information can be useful in detection avenues of entry of pest species and areas of stress that require greater vigilance in stopping the spread of destructive species. The influence of some environmental factors on crops thay may be confused with pest injury or related factors can be detected and identified with Skylab S-190B data. (See also W77-08408) (Humphreys-ISWS)
W77-08422

AGRICULTURAL INVENTORY CAPABILITIES OF MACHINE PROCESSED LANDSAT DIGITAL DATA,
General Electric Co., Beltsville, Md. Space Systems Organization.
For primary bibliographic entry see Field 3F.
W77-08423

WILDLIFE MANAGEMENT BY HABITAT UNITS--A PRELIMINARY PLAN OF ACTION,
For primary bibliographic entry see Field 4A.
W77-08426

QUANTITATIVE WATER QUALITY WITH LANDSAT AND SKYLAB.
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 5A.
W77-08431

LANDSAT-1 DATA AS IT HAS BEEN APPLIED FOR LAND USE AND WATER QUALITY DATA BY THE VIRGINIA STATE WATER CONTROL BOARD,
Virginia State Water Control Board, Richmond. Div. of Surveillance and Field Studies.
For primary bibliographic entry see Field 5A.
W77-08432

A COMPARATIVE INTERREGIONAL ANALYSIS OF SELECTED DATA FROM LANDSAT-1 AND EREP FOR THE INVENTORY AND MONITORING OF NATURAL ECOSYSTEMS,
Earth Satellite Corp., Berkeley, Calif.
C. E. Poulton.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Volume I-A. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 507-568, September 1975. 10 fig, 22 tab, 4 ref, 3 append.

Descriptors: *Ecosystems, *Monitoring, *Remote sensing, *Colorado, *California, *Nevada, Mapping, Satellites(Artificial), Water resources, Natural resources, Vegetation, Land use, Costs, Soils, Evaluation, Sampling, Topography, Management, Census, Spatial distribution, Data processing, Aerial photography.
Identifiers: LANDSAT, Skylab.

The paper presented comparative statistics on the capability of LANDSAT-1 and three of the Skylab remote sensing systems (S-190A, S-190B, and S-192) for the recognitiion and inventory of analogous natural vegetations and landscape features that are important in resource allocation and management. Investigations were conducted in two analogous regions presenting vegetational zonation from salt desert to alpine conditions above timberline. The visual interpretation mode was emphasized. An hierarchical legend system was used as the basic classification of all land surface features. Given adequate ground truth and a knowledge of what to expect ecologically within each region, it was possible to map and identify many features to the fourth hierarchical (frist floristic) level in the classification system. Fourth level decisions were, however, strongly based on recognizing associated features and convergence of evidence. Identifications at second and third levels (physiognomic and structural criteria) were generally photo-identifiability with the difference sensor systems, and mapping and interpretation tests were made, both in monocular and stero interpretation, with all systems except the S-192. Significant advantage was found in the use of stereo from space when image analysis is by visual or visual-machine-aided interactive systems. Some cost factors in mapping from space were identified. The various image types were compared, and an operational system was postulated. (See also W77-08408) (Humphreys-ISWS)
W77-08436

REMOTE SENSING APPLICATIONS IN KANSAS,
Kansas Univ., Lawrence. Space Technology Labs.
For primary bibliographic entry see Field 4A.
W77-08437

A CONTROLLABLE AUTOMATED ENVIRONMENTAL DATA ACQUISITION AND MONITORING SYSTEM,
Brookhaven National Lab., Upton, N. Y.
D. G. Dimmler, N. Greenlaw, and S. Rankowitz.
Preprint BNL 20665, November 1975. 22 p, 16 fig, 8 ref.

Descriptors: *Monitoring, *Instrumentation, *Estuaries, Equipment, Sampling, Data collections, Environment, Coasts, Tidal waters, Temperature, Water temperature, Conductivity, Currents(Water), Velocity, Telemetry, Automation, Oceanography.
Identifiers: *Data acquisition systems, Remote sampling systems.

A real time data acquisition and monitoring system was developed for coastal oceanographic parameter measurements. This system continuously measures profiles of temperature, conductivity, current velocity, and direction as a function of depth at a number of fixed offshore locations. The data acquisition, monitoring, and control system features make this system generally suitable for unattended area monitoring applications. (Sims - ISWS)
W77-08441

A GUIDE TO THE USE OF HISARS -- A HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
M. Molnau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 226, Price codes: A05 in paper copy, A01 in microfiche. Agricultural Experiment Station, Miscellaneous Series, No. 32, December 1975. 82 p, 19 ref. OWRT A-045-IDA(1).

Descriptors: *Hydrologic data, *Data collections, *Data storage and retrieval, Publications, *Information retrieval, *Computer programs.
Identifiers: *HISARS manual.

The HISARS (Hydrologic Information Storage and Retrieval System) was developed out of a need to have a large body of hydrologic data available for ease of access. In this system the data are stored on a magnetic disk pack and the data retrieved by the Indexed Sequential Access Method (ISAM). This manual is organized into three sections; the ACCESS facilities, the PROCESS facilities, the COPY facilities. The ACCESS facilities allow a user to obtain listings of data in a standard format. These are described in detail. The PROCESS facilities allow routine types of analyses on the data. These are described in detail. The PROCESS facilities allow routine types of analyses on the data. These are relatively standard types of programs. The COPY facility allows the user to copy data from the disk pack and store it on a private tape or data set where it will be used as input to a user written program.
W77-08445

COMPUTER PROGRAM FOR RESERVOIR-WATER BUDGETS,
Agricultural Research Service, Chickasha Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 4A.
W77-08464

THE EUTAW-MCSHAN AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
E. H. Boswell.
Water-Resources Investigations 76-134 (open-file report), March 1977. 2 sheets, 17 fig, 3 tab, 20 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water quality, *Mississippi, Water supply, Water wells, Water yield, Water level fluctuations, Chemical analysis, *Maps.
Identifiers: *Eutaw Formation(Miss), *McShan Formation(Miss), Cretaceous aquifers.

This report, the fifth in a series of 'atlas-type' reports, summarizes the large amount of unpublished data available for the Eutlaw-McShan aquifer in Mississippi. The Eutaw-McShan aquifer, of Cretaceous age, consists of the interconnected irregular sand beds in the Eutaw and McShan Formations. The aquifer contains fresh water in an area of about 8,000 sq mi in northeastern Mississippi. Water produced from the aquifer by 59 water systems and several industries in 1975 averaged about 24 mgd. Water levels have declined about 200 feet below levels of the early 1900's at Tupelo and West Point and it is estimated that the aquifer is developed to near its potential yield at those places. The aquifer is used extensively in areas where the dissolved-solids concentration of the water is more than 500 mg/liter and in some places where the concentration exceeds 1,000 mg/liter. The most common water-quality problems are excessive chloride and fluoride. (Woodard-USGS)
W77-08466

DISSOLVED SOLIDS, HARDNESS, AND ORTHOPHOSPHATE OF SURFACE-WATER RUNOFF IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT,
Geological Survey, Tallahassee, Fla. Water Resources Div.
J. E. Earle.
Water-Resources Investigations 76-16 (open-file report), 1976. 6 p, 3 maps, 4 ref.

Descriptors: *Surface runoff, *Hardness(Water), *Phosphates, *Dissolved solids, *Florida, Regional analysis, River basins, Water quality, *Maps, Chemical analysis.
Identifiers: *Northwest Florida, *Orthophosphates.

Historical water-quality data collected from January 1965 to September 1970 were used to prepare maps showing the generalized distribution of dissolved solids, hardness, and orthophosphate in streams and lakes in the Northwest Florida Water Management District. The regional concentration patterns shown on the maps are generalized and local variations may be expected. The dissolved-solids concentrations generally range from 10 to 150 milligrams per liter. Higher concentrations are found in the coastal area on tide affected streams. The concentrations of hardness as CaCO3 generally range from 5 to 140 milligrams per liter. The concentrations of dissolved orthophosphate generally range from 0 to 0.75 milligrams per liter. These maps provide information to those concerned with water resources management and establish a basis for comparing future water-quality data. (Woodard-USGS)
W77-08467

WATER-RESOURCES INVESTIGATIONS IN SOUTH DAKOTA, 1976.
Geological Survey, Huron, S.D. Water Resources Div.
Water-Resources Investigations in South Dakota Folder, 1976. 1 sheet.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *South Dakota,

Data collections, Programs, Sites, *Maps, Publications.

This folder contains a brief description of the water-resources investigations in South Dakota in which the U.S. Geological Survey participates and a list of selected references. The principal map shows the location of hydrologic-data stations and the extent of the hydrologic investigations. Small maps give a broad picture of variations in some of the hydrologic characteristics pertaining to South Dakota's water resources. Surface-water data-collection sites include 212 streamflow stations, 9 lake and reservoir stations, and 36 water-quality stations. Ground-water sites include 424 observation wells. Water-quality data are collected at 29 of these wells. (Woodard-USGS)
W77-08468

FLOODS OF NOVEMBER 12, 1974, IN THE CHARLOTTE AMALIE AREA, ST. THOMAS, U.S. VIRGIN ISLANDS,
Geological Survey, Miami, Fla. Water Resources Div.; and Geological Survey, San Juan (Puerto Rico). Water Resources Div.
W. J. Haire, and K. G. Johnson.
Water-Resources Investigations 91-76 (open-file report), 1977. 3 sheets, 6 fig, 3 plates, 1 tab, 3 ref.

Descriptors: *Floods, *Flood profiles, *Virgin Islands, *Flood recurrence interval, Flood stages, Hydrologic data, Evaluation, Land use, Planning, *Maps.
Identifiers: *St Thomas Island, 60-year flood, Inundated areas.

The flood on St. Thomas, U.S. Virgin Islands, of November 12, 1974, was the largest recorded flood in the area from Fort Christian through Charlotte Amalie and Frenchtown to the end of Crown Bay. This flood has a recurrence interval of about 60 years. With the exception of a few narrow beaches, very little flooding occurred outside of the Charlotte Amalie area. The flood boundaries are controlled to a large extent by the prevailing channel and flood-plain conditions. Inundation from future floods may be affected by changes in channel conditions, alteration of waterway openings at roads, changes in runoff characteristics of the stream caused by increased urbanization, and other cultural developments. The areas inundated by the 1974 flood are shown on 2 maps. (Woodard-USGS)
W77-08470

MAPS SHOWING GROUND-WATER CONDITIONS IN THE PUERCO-ZUNI AREA, APACHE AND NAVAJO COUNTIES, ARIZONA--1975,
Geological Survey, Flagstaff, Ariz. Water Resources Div.
L. J. Mann.
Water-Resources Investigations 77-5 (open-file report), January 1977. 3 sheets, 8 ref.

Descriptors: *Groundwater resources, *Water wells, *Water levels, *Water quality, *Arizona, Water table, Mapping, Contours, Profiles, *Maps.
Identifiers: *Apache and Navajo Counties(Ariz), *Puerco-Zuni area(Ariz).

This 3-sheet atlas describes ground-water conditions in the Puerco-Zuni area of northeastern Arizona which includes about 2,800 sq mi. The main source of water is ground water in the several aquifers that are made up of one or more formations. Maps show ground-water conditions in the Coconino aquifer; in the Moenkopi and Chinle Formations; and in the Bidahochi aquifer and the alluvium. Information on the maps includes depth to water, altitude of the water level, and chemical quality of the water; scale 1:125,000. (Woodard-USGS)
W77-08471

TIME OF TRAVEL OF SOLUTES IN THE EAST FORK TRINITY RIVER, NOVEMBER 1975; AND ELM FORK TRINITY RIVER, DECEMBER 1975; TRINITY RIVER BASIN, TEXAS,
Geological Survey, Fort Worth, Tex. Water Resources Div.
D. R. Myers, and R. M. Slade, Jr.
Open-file report 76-683, November 1976. 3 sheets, 2 fig, 2 tab, 4 ref.

Descriptors: *Travel time, *Solutes, *Rivers, *Tracking techniques, *Fluorescent dye, *Texas, Forecasting, Path of pollutants, Data collections, Sampling, Sites, Hydrographs, *Maps.
Identifiers: *East Fork Trinity River(Tex), *Elm Fork Trinity River(Tex).

In Texas, the time of travel of solutes in the East Fork Trinity River and the Elm Fork Trinity River was determined in 1975 by injecting a fluorescent dye (Rhodamine WT, 20-percent solution) that could be detected by fluorometric analysis of water samples collected at selected downstream sites. Plots of dye concentration versus time were made for each injection and sampling site. The graphs were then used to determine arrival times of the leading edge, the peak, and the trailing edge of the dye cloud. The study in November 1975 was conducted on the East Fork Trinity River from just below the Rockwall-Forney Dam at Lake Ray Hubbard to the confluence with the Trinity River, a distance of 27.0 miles. The study in December 1975 was conducted on the Elm Fork Trinity River from just below the dam at Lewisville Lake to the Spur 482 crossing, a distance of 25.7 miles. (Woodard-USGS)
W77-08472

HYDROLOGIC UNIT MAP--1974, STATE OF TEXAS.
Geological Survey, Reston, Va. Water Resources Div.
Available from Branch of Distribution, USGS, Box 25286, Federal Ctr. Denver, CO 80225, price $3.50. Hydrologic Unit Map of Texas, 1976. 4 sheets.

Descriptors: *Maps, *Hydrology, *Texas, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Tex), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Texas that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-08474

HYDROLOGIC UNIT MAP--1974, STATE OF OKLAHOMA.
Geological Survey, Reston, Va. Water Resources Div.
Available from U.S. Geological Survey, Denver, Colo. 80225, price $1.25. Hydrologic Unit Map of Oklahoma, 1976, 1 sheet.

Descriptors: *Maps, *Hydrology, *Oklahoma, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Okla), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Oklahoma that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-08475

HYDROLOGIC UNIT MAP--1974, STATE OF SOUTH DAKOTA.
Geological Survey, Reston, Va. Water Resources Div.
Available from Branch of Distribution, USGS, Box 25286, Denver, CO 80225, price $1.25. Hydrologic Unit Map of South Dakota, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *South Dakota, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(S Dak), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in South Dakota that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-08476

HYDROLOGIC UNIT MAP--1974, STATE OF KANSAS.
Geological Survey, Reston, Va. Water Resources Div.
Available from Branch of Distribution, USGS, Box 25286, Denver Colo. 80225, price $1.25. Hydrologic Unit Map of Kansas, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *Kansas, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Kans), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Kansas that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-08477

DIGITAL-COMPUTER MODEL OF THE SANDSTONE AQUIFER IN SOUTHEASTERN WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-08478

ACTIVITIES OF THE WATER RESOURCES DIVISION IN CALIFORNIA.
Geological Survey, Menlo Park, Calif. Water Resources Div.
California District report, 1977. 20 p, 1 map.

Descriptors: *California, *Water resources, *Programs, *Data collections, Surface waters, Groundwater, Water yield, Water quality, Sediment transport, Projects, Publications.
Identifiers: *US Geological Survey(Calif), 1977 projects, 1976 reports, Cooperating agencies.

This report summarizes the scheduled 1977 activities of the Water Resources Division, U.S. Geological Survey, in California. Reports issued by the Geological Survey on studies completed in 1976 are also listed. Most of these activities are conducted in cooperation with other Federal, State, county, or local public agencies. These cooperating agencies are listed. The investigations of the water resources of California by the Division fall into three broad categories: (1) Hydrologic-data network, (2) resource appraisal studies, and (3) research. The collection of basic data through the hydrologic-data network is concerned with the location, quantity, quality, movement, and occurrence of the water resource. The records appear in annual or regular publications of basic data. Appraisal studies of water-resources conditions on an areal basis or directed to a specific water problem are a significant phase of the program. Research studies are underway to determine fundamental principles and to improve methodology as applied to hydraulics, hydrology, and related fields of science. (Woodard-USGS)
W77-08479

WATER RESOURCES DATA FOR CONNECTICUT, WATER YEAR 1975,
Geological Survey, Hartford, Conn. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 435, Price codes: A17 in paper copy, A01 in microfiche. Water-Data Report CT-75-1, April 1976. 366 p, 3 fig, 4 tab, 34 ref.

Descriptors: *Connecticut, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites, Estuaries, Tidal waters.
Identifiers: Annual State report(Conn).

Water resources data for the 1975 water year for Connecticut consist of records of stage, discharge, and water quality of streams; contents and water quality of lakes and reservoirs; and water levels and water quality in wells. This report contains discharge records for 56 gaging stations; tidal volume for 1 gaging station; stage only records for 3 tidal-gaging stations; contents for 36 lakes and reservoirs; water quality for 16 gaging stations, 39 partial-record flow stations, 3 lakes, 12 tidal stations, and 4 wells; and water levels for 27 observation wells. Also included are 65 crest-stage partial-record stations and 55 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Connecticut. (Woodard-USGS)
W77-08480

SMALL-STREAM FLOOD INVESTIGATIONS IN MINNESOTA, OCTOBER 1958 TO SEPTEMBER 1975,
Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08481

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1974-75 WATER YEARS,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-08483

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1975.
Geological Survey, Albany, N.Y. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 669, Price codes: A10 in paper copy, A01 in microfiche. Water-Data Report NY-75-1, June 1976. 735 p, 8 fig, 4 tab, 29 ref.

Descriptors: *New York, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites, Tidal streams.
Identifiers: Annual State report(NY).

Water resources data for the 1975 water year for New York State include records of surface water, water quality, and ground water. The surface-water section contains discharge data for 209 gaging stations, stage-content data for 39 lake and reservoir stations, and stage-only data for 31 stations (6 of which are tidal stations). Also included are discharge data for 174 partial-record stations (86 crest-stage and 88 low-flow stations) and 199 miscellaneous sites. The water-quality section contains chemical, temperature, and suspended-sediment data on surface water for 151 stations, 81 partial-record stations, and 113 miscellaneous sites, as well as chemical data for 233 groundwater miscellaneous sites and 10 precipitation-quality stations. Water-level data are included for 42 long-term observation wells. (Woodard-USGS)
W77-08485

WATER QUALITY IMPACTS OF URBANIZATION--A METHODOLOGY,
Economic and Social Commission for Asia and the Pacific (UN), Bangkok (Thailand). Div. of Industry, Housing, and Technology.
For primary bibliographic entry see Field 5B.
W77-08514

8. ENGINEERING WORKS

8A. Structures

CONSTRUCTION AND MAINTENANCE COSTS OF SEWER SYSTEMS (BAU- UND BETRIEBSKOSTEN VON KANALISATIONSANLAGEN),
H. Haendel.
Berichte der Abwassertechnischen Vereinigung, e.V., No 29, p 205-219, 1976. 9 tab.

Descriptors: *Sewers, *Construction costs, *Maintenance costs, *Operating costs, Topography, Soil types, Population, Density, Groundwater, Construction materials, Climates, Piping, Earthworks, Cost analysis.

Construction, operating, and maintenance costs of sewer systems are discussed. The construction costs are influenced by such factors as topographic conditions, population density, type of ground, groundwater level, weather conditions, type and price of the pipes and other installations. Charts are presented for the determination of the specific costs of earthworks and piping. The high construction costs fully justify the use of high-quality, more or less expensive pipes to increase the life of the sewer system. (Takacs-FIRL)
W77-08542

DESIGN AND OPERATION OF RAIN RETENTION BASINS (ENTWURF UND BETRIEB VON REGENRUCKHALTEBECKEN),
E. Malpricht.
Berichte der Abwassertechnischen Vereinigung e. V., No 29, p 147-162, 1976. 12 fig, 6 ref.

Descriptors: *Water storage, *Basins, *Design criteria, *Storm runoff, *Model studies, Sewers, Canals, Construction, Canal construction, Engineering, Flow, Operations.
Identifiers: *Rain retention basins.

Design calculations and operation of rain retention basins are described. The value of the design rainfall frequency can be reduced for canals having a small slope within the sewer system. The feed canal should be as high as possible to prevent settling. The longitudinal slope of the retention basin should not be greater than 0.5%; the transversal slope should be 3-5%. The dry-weather runoff can pass through the retention basin. The calculation of rainwater retention basins according to Specification A 117 is described. (Takacs-FIRL)
W77-08547

8B. Hydraulics

DRIFT VELOCITIES OF SURFACE FILMS OVER WAVES,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W77-08193

THE EFFECT OF AERATION OF WATER JET SPREADING,
Connecticut Univ., Storrs. Inst. of Water Resources.
A. H. Hsia.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 717, Price codes: A12 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1977. 236 p, 4 tab, 77 fig, 56 ref, 3 append. OWRT A-050-CONN(5). 14-31-0001-3507.

Descriptors: *Jets, *Aeration, *Hydrodynamics, *Flow characteristics, *Turbulent flow, Discharge(Water), Cooling water, Thermal pollution.
Identifiers: *Aerated turbulent jet flow, *Water jet behavior, *Axisymmetric jets, *Planar aerated jets, *Jet trajectory.

Theoretical and experimental studies were made on jet characteristics when a large number of small air bubbles (.050 to .080 in. dia) were injected into the submerged water jet to form a two phase flow. In the experimental studies for both axisymmetric and planar aerated jets, initial jet velocity was varied from 1.39 to 9.23 ft/sec, initial air to mixture void fraction from 0 to .495, initial temperature difference between the jet and its ambient from 0 to 34.2 C, and for the aerated planar jet tests, submergence from 4.9 to 14.9 in. Respective influences from these parameters on jet behavior were investigated. The dependent variables measured included jet trajectory, local jet diameter or thickness for a planar jet, and centerline temperature decay. The theoretical analyses for both axisymmetric and planar aerated jets were based on a separated-flow model in which fundamental equations characterizing each phase of the air-water mixture were included. The system of dif-

ferential equations was solved numerically and yielded predictions in agreement with the experimental data. Aeration was an effective means for bringing the jet to the free water surface, and the extent of aeration influence on jet path was a function of both initial velocity and void fraction. The discharge submergence was influential in determining planar jet dividing streamline path. Faster centerline temperature decay due to aeration was only detected in vertical axisymmetric jets. (de Lara-Conn)
W77-08197

EFFECTS OF MEANDERING IN ALLUVIAL STREAMS,
Battelle-Pacific Northwest Labs. Richland, Wash.
For primary bibliographic entry see Field 2E.
W77-08216

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; THE WIND-DRIVEN CURRENTS AND CONTAMINANT DISPERSION IN THE NEAR-SHORE OF LARGE LAKES,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W77-08220

EFFECTS OF 40-FOOT CHARLESTON HARBOR PROJECT ON TIDES, CURRENTS, AND SALINITIES; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 2L.
W77-08222

ALTERNATIVE MEASURES OF RIVER CHANNEL SHAPE AND THEIR SIGNIFICANCE,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
G. Pickup.
Journal of Hydrology (New Zealand), Vol. 15, No. 1, p 9-16, 1976. 3 fig, 11 ref.

Descriptors: *Rivers, *Shape, *Open channels, Channels, Hydraulics, Dimensions, Size, Width, Water levels, Depth, River beds, Foreign research, Foreign countries.
Identifiers: *New Guinea, Hydraulic geometry.

The width/depth ratio is not always the best measure of river channel shape because it is measured only at the bankfull stage. Therefore, the width/depth ratio is insensitive to some types of shape difference and as a result may not reflect the effect of variations in sediment characteristics. Two alternative measures were proposed: bed width, and the exponent x in the equation Wi = c(D to the x power), where Wi is width at stage D. In Cumberland Basin stream channels, bed width increases with mean size of the bed material, while x decreases, reflecting shape adjustment to increasing bed-load transportation. (Humphreys-ISWS)
W77-08241

EFFECT OF LATERAL INFLOW ON STEADY OPEN CHANNEL FLOWS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 2E.
W77-08290

100 MESH SAND IMPROVES HYDRAULIC FRAC RESULTS.
For primary bibliographic entry see Field 4B.
W77-08312

DEEP WELLS FOR DEWATERING OFFER REAL ADVANTAGES, PART II,
For primary bibliographic entry see Field 4B.
W77-08325

STATISTICAL CHARACTERIZATION OF DILUTE PARTICULATE SUSPENSIONS IN TURBULENT FLUID FIELDS,
Illinois Univ. at Urbana-Champaign. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5B.
W77-08330

OPTIMAL LAYOUT AND DESIGN OF STORM SEWER SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-08334

A FINITE ELEMENT MODEL TO DETERMINE THE EFFECT OF LAND-USE CHANGES ON FLOOD HYDROGRAPHS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
B. B. Ross.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 246, Price codes: A07 in paper copy, A01 in microfiche. MS Thesis, November 1975. 117 p, 10 tab, 20 fig, 48 ref, 4 append. OWRT A-062-VA(1).

Descriptors: *Land use, Floods, Hydrograph analysis, *Finite element analysis, Computer models, Model studies, Channel flow, Overland flow, *Mathematical models, *Virginia, Watersheds(Basins).
Identifiers: Finite element model, Galerkin's residual method, *South River watershed(Va).

The finite element theory, in conjunction with Galerkin's residual method, was used to mathematically route overland and channel flow. This numrical procedure was applied to the kinematic equations of one-dimensional transient flow in open channels. A one-dimensional finite element scheme was used to simulate overland flow over the watershed and open channel flow in the main stream, after a finite element grid had been devised for both the watershed and the streams. Rainfall excess, the major input parameter, was obtained as a function of rainfall, depending on soil properties and existing land-use conditions across the watershed. The model was tested and calibrated on a natural watershed. The nature of the finite element procedure allowed changes in land-use to be easily incorporated into the model. The effect of several arbitrary land-use changes upon the response of the river under flood conditions was observed. The effect of changes in the number and size of the elements in the watershed and the streams was also observed along with changes in the size of the time increment.
W77-08450

SMALL-STREAM FLOOD INVESTIGATIONS IN MINNESOTA, OCTOBER 1958 TO SEPTEMBER 1975,
Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08481

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1976,
Geological Survey, Helena, Mont. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08482

8C. Hydraulic Machinery

PUMPED STORAGE POTENTIAL OF THE HELLS CANYON AREA,
Idaho Univ., Moscow. Dept. of Civil Engineering.
L. D. Coupe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 722, Price codes: A07 in paper copy, A01 in microfiche. Master of Science Thesis, April 1977. 132 p, 35 fig, 7 tab, 28 ref, append. OWRT B-037-IDA(1). 14-31-0001-5070.

Descriptors: *Pumped storage, Electric power, *Hydroelectric plants, *Reservoir operations, Water level fluctuations, Economics, Feasibility, Feasibility studies, Social values, *Environmental effects, Peak discharge, Nuclear powerplants, National recreation areas, Idaho, Oregon, *Sites.
Identifiers: *Hells Canyon, Hells Canyon Dam, Snake River, Barber Flat, Bear Creek.

The potential for pumped storage hydroelectric development of the Hells Canyon area is reviewed, with conclusions drawn from preliminary investigation. Background information covers the concept and application of pumped storage, Hells Canyon's physical characteristics and history and its status as a National Recreation Area. Of eighteen potential storage sites noted, the three most promising are analyzed in detail. For each, preliminary designs have been developed as well as computer analyses of the reservoir water level fluctuations that would result from such operations. Each is also analyzed for economic feasibility. Conclusions are that pumped storage in the area is too expensive to be competititve now, but it may be more feasible in the future. Possible major environmental and social effects are noted; the sites are compared, and one (Barber Flat, Idaho) is recommended for further consideration. Alternative uses of pumped storage in Hells Canyon are (1) to relieve Hells Canyon Dam of objectionable peaking, (2) to cool a nuclear power plant. For the latter, Bear Creek No. 1 is recommended for further study.
W77-08196

PUMPED-STORAGE IN THE PACIFIC NORTHWEST, AN INVENTORY.
Corps of Engineers, Portland, Oreg. North Pacific Div.
For primary bibliographic entry see Field 2H.
W77-08224

PRODUCTION OF ENERGY FROM CONCENTRATED BRINES BY PRESSURE-RETARDED OSMOSIS, 1. PRELIMINARY TECHNICAL AND ECONOMIC CORRELATIONS,
Ben Gurion Univ. of the Negev, Beersheba (Israel). Research and Development Authority.
For primary bibliographic entry see Field 3A.
W77-08233

KELLY CARE EXTENDS SERVICE LIFE,
Drilco, Houston, Tex.
D. W. Brinegar.
Oil and Gas Journal, Vol. 75, No. 18, p 267-278, May 2, 1977. 5 fig, 4 tab, 5 ref.

Descriptors: *Rotary drilling, *Drilling equipment, *Maintenance, Fatigue(Mechanics), Failures(Mechanics).
Identifiers: *Drill kellys, Drive assemblies.

Kellys, the transmission link between the surface power of the rig and the drill bit, are meeting increasing demands as drilling and drilling technology evolve. The Kelly's ability to perform over a long period depends largely on control of normal wear and keeping clearance between Kelly flats and the drive roller assembly at a minimum. Aside from thread damage, Kellys fail as a result of becoming crooked or bent, from fatigue at certain

key points, or from excessive rounding of drive corners. Proper attention to handling and to the relationship between normal wear or both Kelly and drive assembly will do much to help prolong kelly life. Reversing ends and remilling are two methods of repairing a worn kelly, provided that the repairs are done before excessive and irreversible damage is sustained. (Eberle-NWWA)
W77-08311

THE ERDA GEOTHERMAL PROGRAM,
Energy Research and Development Administration, Washington, D.C.
For primary bibliographic entry see Field 4B.
W77-08314

BETTER PROTECTION FOR CASING AND TOOL JOINTS,
Reed Tool Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W77-08315

IT'S YOUR LOSS,
For primary bibliographic entry see Field 8G.
W77-08319

AIR, MIST AND FOAM DRILLING, A LOOK AT THE LATEST TECHNIQUES, PART 2,
R. A. Hook, L. W. Cooper, and B. R. Payne.
World Oil, Vol. 184, No. 6, p 83-90, May, 1977. 3 fig, 4 ref.

Descriptors: *Rotary drilling, *Drilling equipment, *Drilling fluids, Foaming, Wells, Oil wells, Burning, Aeration.
Identifiers: *Air-rotary drilling, *Mist and foam drilling, *Aerated fluid drilling, Drill collars, Air-percussion hammers, Drill string wear, Stuck pipe, Downhole fires and explosions.

The single most important factor in air and mist drilling is the volume of air used. 2000 to 2400 cubic feet per minute (through 41/2 inch drill pipe in a 7 7/8 inch hole) is adequate for most air drilling situations. Mist drilling requires 30 to 40% more air, with pressures of 200-400 psig as compared to 100-300 psig for air alone. When a water-bearing formation is encountered, air drilling becomes impossible and a mist of water plus soap must be employed. Should the volume of water entering the bore become too great, even mist may have to be abandoned and aerated drilling mud utilized instead. Hole deviation can become a serious problem in any drilling operation, but can be minimized in air/mist drilling with the use of square drill collars, stabilizers, and reamers. All help prevent bending and binding of the drill string. Air-percussion hammers are also helpful in maintaining a straight hole, because they require relatively little bit weight. Proper care and drilling technique can make air/mist drilling an economical method, but constant, close supervision is essential for preventing such problems as stuck drill strings and expensive fishing operations. (Eberle-NWWA)
W77-08326

RESEARCH INTO THE IMPACT ON ELECTRICAL EQUIPMENT FROM VARIABLE SPEED OPERATION OF PUMPED-STORAGE PLANTS,
General Electric Co., Schenectady, N.Y. Electronic Power Conditioning and Control Lab.
T. A. Lipo.
Final Report (SRD-77-063), April 8, 1977. 172 p, 99 fig, 24 tab, 3 append. Bur Reclam 6-07-DR-50090.

Descriptors: *Electrical equipment, *Pumped storage, *Operation, *Performance, *Power system operation, *Electrical design, *Electric generator, *Power transformers, Electric switches, Electric relays, Switch gear, *Electric converters.
Identifiers: *Variable speed operation(Pumped - storage plants).

Work was conducted to determine the effect of operating electrical equipment of pumped-storage plants over a variable frequency range of 30 to 81 Hz. The motivating factor behind the study was the desire to improve pumped-storage hydro efficiency. The reversible Francis type pump-turbine represents a compromise design to achieve a best overall efficiency at constant speed for a particular head. The variable speed concept would allow speed to change with head variations while maintaining optimum pump-turbine efficiency over the entire head range. The electrical equipment considered includes the generator/motor, excitation equipment, switchgear and bus, metering, surge protection, relaying, and power transformer. Converter harmonics and the converter effect on system power factor are analyzed for the generator/motor. A simulation study was conducted on a hybrid computer to identify potential system problems which arise from variable speed operation. (Bur Reclam)
W77-08492

SEWAGE PUMPING STATION BUILT TO HANDLE FUTURE SYSTEM DEMANDS,
Topeka Water Pollution Control Dept. Kans.
J. D. Glidewell, Jr.
Water and Sewage Works, Vol 124, No 4, p 105-106, April, 1977.

Descriptors: *Pumping plants, *Pumps, *Design criteria, Planning, Engineering structures, Cities, Sewage treatment, Automatic controls, Maintenance, Performance, Operations, Waste water treatment, Kansas.
Identifiers: Topeka(KS).

A pumping station of 'concentric cylinder' design was constructed in Topeka, Kansas. The automated station, with computer monitoring, houses variable speed pump and motor combinations which are designed to meet normal growth demands. The system included a 44 foot deep, 22 foot diameter center wet well for sewage which first passes through bar screens. Two variable speed solids-handling pumps have a 21 mgd capacity, and the third has a 14 mgd rating. A 50 mgd design capacity was built into the system. The pumps have mixed-flow sewage-type closed impellers to aid handling of large solids and stringy materials. (Collins-FIRL)
W77-08550

8D. Soil Mechanics

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR NEW ORLEANS, LOUISIANA (LAKE PONTCHARTRAIN, LOUISIANA, AND VICINITY HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, La. Water Resources Div.
H. L. Leone, Jr.
Open-File Report 76-758, October 1976. 22 p, 4 fig, 11 tab, 7 ref.

Descriptors: *Flood protection, *Levees, *Design criteria, *Core drilling, *Water quality control, Water analysis, Sediments, Chemical analysis, Construction, Planning, Hurricanes, Tides, Estuaries, Floods.
Identifiers: *Lake Pontchartrain area(La), Preconstruction data.

When a hurricane approaches the New Orleans, Louisiana area, the accompanying tides and heavy rainfall increase the level of water in Lake Borgne, Mississippi Sound, and Lake Pontchartrain and pose a major threat of water damage to the populated areas. During Hurricane Betsy (1965), for example, the level of Lake Pontchartrain rose as much as 13 feet. Nineteen core-material-sampling sites were chosen by the U.S. Army Corps of Engineers as possible borrow areas for fill material to be used in levee construction for flood protection around Lake Pontchartrain. Twenty-three receiving-water sites were also selected to represent the water that will contact the proposed levees. Selected nutrients, metals, pesticides, and other organic constituents were analyzed from bed-material and native-water samples as well as upon elutriate samples of specific core material-receiving water systems. The results of these analyses are presented without interpretation. (Woodard-USGS)
W77-08165

CHANNELIZATION: ENVIRONMENTAL, GEOMORPHIC AND ENGINEERING ASPECTS,
North Carolina Univ. at Charlotte. Dept. of Geography and Earth Science.
E. A. Keller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 051, Price codes: A06 in paper copy, A01 in microfiche.
Reprint of paper to appear in: Geomorphology and Engineering, 1976 ed. by D. R. Coates. Dowden, Hutchinson & Ross, Inc., 52 p. 21 fig., 24 ref. OWRT B-089-NC (1).

Descriptors: *Channel improvement, *Geomorphology, *Hydrology, *Channel morphology, *Design, *Design criteria, Channel design, Streams, Channel erosion, Fluvial sediment, Urban hydrology, Bank erosion, Alluvial channels, Shape, Slopes, Width.
Identifiers: Channelization, Fluvial processes, Rural streams, Urban streams.

The behavior of alluvial streams is not well understood. Therefore, until more information concerning relations between fluvial processes channel form and biologic systems in streams is available for application to channel design it is recommended that channelization should be minimized and the minimum control provided to obtain the desired (or modified) objectives. Several concepts of fluvial geomorphology and fluvial hydrology that are now or eventually may be useful in designing channels are: (1) streams are open systems in which channel form and process evolve in harmony; (2) convergence and divergence of flow is associated with scour and deposition of sediment; (3) geomorphic thresholds or feedback in open systems may be inherent in the processes of erosion and in change of channel pattern; and (4) relations between erosion, deposition and sediment concentration have an important role in determining the morphologic stability of a stream channel. Engineering trends in channelization are away from the uniform straight channel with uniform channel cross section and gradient and are moving toward construction of more natural appearing streams. (Stewart NC State)
W77-08352

CHEMICAL AND VEGETATIVE STABILIZATION OF SOILS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
W. R. Morrison, and L. R. Simmons.
Report No. REC-ERC-76-13, January 1977. 161 p, 50 fig, 27 tab, 293 ref.

Descriptors: Soil erosion, Soil stability, *Soil stabilization, Soil surfaces, Soil treatment, *Chemical sealants, Vegetation establishment, *Erosion control, Asphalts, *Slope protection, Roads, Revegetation.
Identifiers: Wellton-Mohawk Canal, Fort Thompson Substation, Mt. Elbert Pumped-Storage Powerplant, Mulches, Polyvinyl acetate.

A study was conducted on various chemical and vegetative methods of soil stabilization for possible use in the USBR's construction and O and M programs. Three main items of work accomplished under the study are summarized: (1) Laboratory Studies. -- (a) Screening tests conducted on 30 liquid soil stabilizing materials. Based on the results, tentative performance requirements were

developed for water-based soil stabilizers. (b) Special studies conducted on materials and methods to waterproof problem soils, to arrest erosion occurring on slopes, and to bind gravel together for riprap applications. (2) Field Applications. -- Discussions on where various chemical and vegetative methods have been used in new construction, rehabilitation, or O and M work. (3) State-of-the-Art Survey. -- A survey on chemical stabilization of soils, and revegetation methods and materials for erosion control. Results indicate that through chemical and vegetative stabilization of disturbed soils, sediment production can be reduced, fertile top soil preserved, and a more environmentally acceptable condition achieved after construction is completed. (Bur Reclam)
W77-08512

8E. Rock Mechanics and Geology

AN EARTHQUAKE RISK MODEL THAT INCORPORATES LOCAL NEAR SURFACE SITE CONDITIONS,
California Univ., Los Angeles. School of Engineering and Applied Science.
R. T. Eguchi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 050, Price codes: A07 in paper copy, A01 in microfiche. Report UCLA-ENG-7547, June 1975. 117 p, 15 fig, 4 tab, 42 ref. (California Water Resources Center Project UCAL-WRC-W-339). OWRT B-159-CAL(2).

Descriptors: *Earthquakes, *Earthquake engineering, *Model studies, *California, *Risks, *Sites, Attenuation, Estimating, Forecasting, Velocity, Methodology.
Identifiers: *Los Angeles(Calif), *Modified Mercalli Intensity, *Particle velocity.

An earthquake risk model that incorporates local near surface site conditions was developed and applied to the Los Angeles area. In the model, the occurrence of earthquakes in time, magnitude and space are represented by probability distributions which have been developed by others. However, the particular joint distribution of the three was developed here. The estimation of risk is expressed in terms of two ground motion indices, Modified Mercalli Intensity and maximum particle velocity. Special emphasis is given to establishing the effect of local site geology on the estimation of risk. Local site factors for intensity have been adopted from the work estimation of risk. Local site factors for intensity have been adopted from the work of others, while site factors for maximum particle velocity were developed. The site factors for maximum particle velocity required the establishment of a near surface model, which was developed. 1971 San Fernando earthquake data are utilized to develop attenuation relationships for maximum particle velocity and Modified Mercalli Intensity. The effects of including and excluding aftershocks on the probabilities were observed. Five examples are presented, three in terms of Modified Mercalli Intensity and two in terms of maximum particle velocity. Comparisons are made among the examples. A general discussion of the limitations and merits of the methods used is presented. (Snyder-California, Davis)
W77-08348

POST-TENSIONED SEWER RIVER CROSSING.
New Zealand Engineering, Vol. 32, No. 2, p 42, February, 1977.

Descriptors: *Sewers, *Construction, *Engineering structures, Hydraulic structures, Pipelines, Pumping plants, Equipment, Excavation, Design criteria, Flow, Monitoring.
Identifiers: Hutt River(New Zealand).

A major part of the main sewer drainage of the Hutt Valley, New Zealand, was recently duplicated. This project included an on-grade sewer crossing of the Hutt River at Silverstream. Previous sewers crossing the river were true siphons or pumping mains, which entailed continuous operating costs and potential pollution hazards. The availability of bedrock close to the stream bed surface was confirmed. Because of a fault zone in the area, it was decided to make the 165 meters long crossing and the manholes monolithic by post tensioning. A tidy slab with a reinforced shear key was poured on the excavated rock surface. The pipe structure was post-tensioned with eighteen multistrand cables with five vertical anchors stressed to 70 t to anchor the crossing to the bedrock. Sewage flow is carried by two 1065 millimeters diameter pipes. Design capacity is 10,900 cubic meters/hour. Overflow pipes and service ducts were included in the construction, with a river level recording channel and a modified Parshall flume to monitor total sewage flows of the Upper Hutt basin. (Collins-FIRL)
W77-08552

8F. Concrete

RESEARCH ON CEMENTS FOR GEOTHERMAL AND DEEP OIL WELLS,
Colorado School of Mines, Golden.
G. L. Kalousek, and S. Y. Chaw.
Society of Petroleum Engineers Journal, Vol. 16, No. 6, p 307-309, December, 1976. 1 fig, 2 ref.

Descriptors: *Cements, *Thermal properties, *Deep wells, Laboratory tests, *Oil wells, Geothermal studies.
Identifiers: *Calcium silicate cements.

Strength problems frequently occur in cements used in hot wells, and appear to become worse as temperature and bottom-hole pressure increase. This study investigated the relationship between cement strength versus Ca0/Si02 ratios and the amount of A1203 in cement mixtures. The optimum composition for cement among the substances tested in the study was a proportion of 5 Ca0 : 6 Si02 plus 7% A1203, yielding a tobermorite binder stable to 250 degrees C. A 2 Ca0 : 3 Si02 composition with additions of 5% A1203 also yielded an apparently stable product when autoclaved at 300 degrees C for 10 days. Alumina available to the binder and depending on the amount had a spectrum of effects ranging from highly beneficial to highly deleterious. Particular attention is directed to the need of differentiation between stable and meta-stable products in future research. (Eberle-NWWA)
W77-08320

CEMENTING OIL AND GAS WELLS, PART 2 - CASING INSPECTION AND PIPE HANDLING METHODS, INCLUDING THREAD MAKE-UP CONTROL,
Completion Technology Co., Houston, Tex.
G. O. Suman, Jr., and R. C. Ellis.
World Oil, Vol. 184, No. 5, p 69-76, April, 1977. 8 fig, 4 tab, 20 ref.

Descriptors: *Well casings, *Steel pipes, *Damages, *Inspection, Cement grouting, Nondestructive testing, Oil wells, Electronic equipment, Joints(Connections), Specifications.
Identifiers: *Well casing make-up, Torque, Axial load, Power tongs, Pipe threads, Pipe thread compounds, Rig floor leak tests, Casing landing practices.

Higher equipment and service costs emphasize the need for strict attention to casing quality control and handling before cementing. Many casing probelms are directly related to conditions prior to cementing. Many casing problems are directly related to conditions prior to cementing such as: metallurgical flaws, damage in transit or on location, improper make-up, or poor Sunning practices. Casing inspection can be performed by various visual and electronic means. Although fairly tight quality control is maintained at the mill, well site testing of tubular goods is suggested as a way of detecting transport and handling damage. The contractor himself can minimize handling damage by transporting casing only when thread protectors are in place, and by making sure that all equipment used in running casing is appropriate for the job and in good working order. Torque should not be the exclusive criterion for testing proper joint make-up. Make-up position should be visually inspected as a double check. (See also W77-08328) (Eberle-NWWA)
W77-08327

CEMENTING OIL AND GAS WELLS, PART 3,
Completion Technology Co., Houston, Tex.
G. O. Suman, Jr., and R. C. Ellis.
World Oil, Vol. 184, No. 6, p 48-57, May, 1977. 11 fig, 5 tab, 36 ref.

Descriptors: *Cements, *Cement grouting, *Drilling fluids, *Additives, Bentonite, Portland cements, Pozzolans, Slurries, Strength of materials, Oil wells.
Identifiers: *Cement classifications(API), Thickening time, Lost circulation, Specialty cements.

Cement slurry composition can be tailored to meet the demands of nearly every modern well completion by carefully selecting the correct class of cement, the proper additives, and judging the correct volume of water to be mixed in. Important factors to be considered in well cementing are depth and downhole temperature, potential for fluid loss, time parameters, and of course, cost. Additives can be used to both increase and retard setting time, to change viscosity and permeability, vary density, reduce friction, control lost circulation, introduce gelling properties, and to ensure the cement will perform well in hostile completion environments. This article lists types and classes of cement and additives, details their chemical action, and suggests application to specific drilling situations. Properties of set cement are presented both in the text and in graphic form, and space is devoted to a brief discussion of special cements. (See also W77-08327) (Eberle-NWWA)
W77-08328

CONCRETE BUCKET DISTRIBUTES CRUSHED BEDDING EVENLY ON SEWER JOB.
Highway and Heavy Construction, Vol. 120, No. 4, p 32-33, April, 1977.

Descriptors: *Sewers, *Concrete construction, Construction materials, Excavation, Concrete, Conveyance structures, Conduits, Piping, Clay pipes, Plastics.
Identifiers: Concrete bucket.

A bottom-dump concrete bucket was used to distribute granular bedding for a sanitary sewer line. The work was done quickly and easily in otherwise inaccessible areas. Excavation of sandy, red clay soil in Dothan, Alabama, was done with an hydraulic backhoe with a 1 1/2 cubic yard bucket. Clay and PVC pipe were used for the project which required 23,000 linear feet of sewer line and 14,000 linear feet of water pipe. The terrain ranged rom open prairie to wooded with a creek. An eighteen-foot deep cut was planned near the creek. A right work area was created because many old trees could not be removed. A track loader with a bucket was used to carry granular material from the stockpile to the concrete bucket. The concrete bucket was attached to the backhoe bucket and lowered into a trench after backhoe excavation. The bucket dropped an even 12 inches of crushed bedding into the trench. After pipe connections were made, backfill operation was begun. A compactor was used to consolidate the upper 12 inches

of backfill to a 100% modified Proctor. (Collins-FIRL)
W77-08556

8G. Materials

ASPHALT-RUBBER MIXTURES FOR SEEPAGE CONTROL,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 4A.
W77-08195

KELLY CARE EXTENDS SERVICE LIFE,
Drilco, Houston, Tex.
For primary bibliographic entry see Field 8C.
W77-08311

BETTER PROTECTION FOR CASING AND TOOL JOINTS,
Reed Tool Co., Houston, Tex.
A. E. Gooch.
Drilling-DCW, Vol. 38, No. 8, p 93-96, May, 1977. 1 fig, 3 ref.

Descriptors: *Rotary drilling, *Well casings, *Drilling equipment, Steel pipes, Joints(Connections).
Identifiers: *Tool joint hard facings, *Casing wear.

Casing wear, a problem that has plagued rotary drillers for decades, is caused by friction between casing and the hard-faced surfaces on the outside diameter of tool joints. Casing wear can contribute to many serious and costly well problems, however, drill string wear would pose equally costly problems if hard-facing were not used on the joints. The dilemma now seems to have been solved by a two-step surfacing process. 14-20 mesh sintered tungsten carbide pelletized surfacing is first applied to the OD of the tool joint, then a thin layer of alloy steel is applied over the tungsten carbide. The result is a bearing-type hard surface that significantly reduces abrasion and galling of casing, yet wears very little itself. In tests against various ferrous and nonferrous facing, this dual combination showed much better performance than commonly available joint wear protection materials. (Eberle-NWWA)
W77-08315

RESIN-COATED GRAVEL IS USED TO HELP CONTROL SAND,
Maurer Eng. Inc., Houston, Tex.
A. R. Sinclair, and J. W. Graham.
Oil and Gas Journal, Vol. 75, No. 16, p 58-60, April 18, 1977. 5 fig, 2 ref.

Descriptors: *Gravels, *Resins, *Well filters, Oil wells.
Identifiers: *Gravel packing, *Phenolic resins, Sand control.

High strength-high permeability gravel packs can now be obtained with a special resin-coated gravel. Regular sand or gravel is thinly coated with thermosetting phenolic resins which sets up in formations with temperature above 130 degrees F. Not only does the material remain highly porous, but the resin coating bears part of any load placed on the sand. The special gravel handles like any ordinary dry gravel in field use; long-term strength after setting up seems satisfactory. In several experimental applications, the resin-coated material significantly improved the performance of oil wells which chronically pumped sand. Occasional failures occurred when insufficient material was placed in the well or when parts of the formation remained untreated. (Eberle-NWWA)
W77-08316

IT'S YOUR LOSS,
R. B. McDannald.
Water Well Journal, Vol. 31, No. 5, p 34-35, May, 1977. 9 tab.

Descriptors: *Pumps, *Fluid friction, Pumping, Flow characteristics, Plastic pipes, Pipes.
Identifiers: *Friction loss, Submersible pumps.

Unless a well or pump contractor pays close attention to the piping in a new water system, he runs the risk that friction loss will drastically reduce the output of an otherwise adequate pump. The following relationships should always be kept in mind when designing an individual water system: (1) the longer the pipe coming from the pump, the greater the friction loss (2) the smaller the pipe, the greater the friction loss (3) the greater the flow, the greater the friction loss (4) deposit build-up on the indside walls of the pipe can increase friction loss two or three times (5) tees, ells, and check valves contribute to friction loss (6) generally, plastic pipe has less friction loss than metal pipe of equivalent size, and also less chance of deposit build-up. Friction loss charts are an invaluable aid to the contractor. In addition, many pump manufacturers list friction loss for check valves in their pump specifications. (Eberle-NWWA)
W77-08319

RESEARCH ON CEMENTS FOR GEOTHERMAL AND DEEP OIL WELLS,
Colorado School of Mines, Golden.
For primary bibliographic entry see Field 8F.
W77-08320

AIR, MIST AND FOAM DRILLING, A LOOK AT THE LATEST TECHNIQUES, PART 2,
For primary bibliographic entry see Field 8C.
W77-08326

CEMENTING OIL AND GAS WELLS, PART 2 - CASING INSPECTION AND PIPE HANDLING METHODS, INCLUDING THREAD MAKE-UP CONTROL,
Completion Technology Co., Houston, Tex.
For primary bibliographic entry see Field 8F.
W77-08327

CHEMICAL AND VEGETATIVE STABILIZATION OF SOILS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8D.
W77-08512

POLYETHYLENE SEWER FORCE MAIN TAKES VARYING PRESSURES.
Water and Sewage Works, Vol 124, No 4, p 108-110, April, 1977. 1 fig.

Descriptors: *Sewers, *Construction, *Plastics, Planning, Pipes, Physical properties, Construction materials, Pumps, Costs, Hydraulic structures.

A 16,640-foot, 14-inch polyethylene sewer force main has been constructed in Ruston, Louisiana. This is part of the first of a three stage project to rehabilitate the city's treatment system. The force main is subjected to pressures of up to 100 psi. The pipe was formed by butt fusing of the joints to provide resistance to railway vibration; it is also elastic and able to withstand deflection. The Driscopipe 1000 chosen has a high molecular weight and is suited for sewer use due to its stress crack resistance, stiffness, and toughness. Variable speed pumps will be used to minimize shock wave production when pressure is increased or dropped. A pressure profile was used and pipe thicknesses were chosen to match pressure at various points along the line. This resulted in a material and cost savings of nearly 15%. Hydraulic backfilling of the ditches eliminated the need for a man in the ditch after pipe laying. (Collins-FIRL)
W77-08549

THE PROTECTION AND REPAIR OF UNDERGROUND PIPELINES FOR WATER AND SEWAGE,
M. S. Leng.
Water Services, Vol 82, No 973, p 168, 171, March, 1977.

Descriptors: *Pipelines, Metal pipes, Concrete pipes, Oxidation, Corrosion, Conveyance structures, Resins, Linings, *Sewers, Chemical reactions, Corrosion control, Physical properties, Chemical properties, Hydraulic structures.

The protection and repair of underground pipelines of ferrous metals, asbestos cement, and various concretes is very important. Metal pipes are subject to various chemical reactions, such as oxidation, which causes them to revert to their original ores, and corrosion from the elements in raw sewage. Coatings of various types and cathodic protection are used to protect ferrous metal pipes. Various polymer resins are used for cement and concrete pipes. These pipes require protection primarily from sulfuric acid, acidic water and groundwater, and chemicals from industrial sources. Special equipment is available for sealing defective joints. Pipe repairs may be needed to stop excessive infiltration, protect pipes from interior chemical attack, correct damage already done, or to strengthen pipelines. Repair is expensive, but reconstruction is much more costly. (Collins-FIRL)
W77-08551

PLAIN-END PIPE 'COLLARS' PROBLEM SEWER CONNECTIONS,
W. S. Foster.
The American City and County, Vol. 92, No. 4, p 76, April, 1977.

Descriptors: *Piping, *Sewers, *Joints(Connections), Clay pipes, Plastics, Infiltration, Costs, Physical properties, Chemical properties, Construction materials.
Identifiers: Plain-end pipes.

Plain-end pipe, which has a factory-applied polyvinyl chloride or fiber-glass-reinforced polyester plastic collar, may permit reductions of installation costs in sewer collection systems. The collar is molded to provide a double bead and ensure an infiltration-tight seal; the spigot end is provided with a flexible molded band, generally of urethane rubber. The bells of flared-end pipes represented the most common site of breakage in the past. Trench excavation and pipe bedding had to be very carefully executed to provide safe and proper support for these pipes. Clay pipe has many desirable properties, but the cold mastic or cement mortar previously used to join them were not sufficiently resistant to movement or infiltration. Jointing systems for clay pipes are now improved. Many suppliers of bell-and-spigot type pipes expect to offer plain-end pipe in the future, and some suppliers of plain-end pipe are listed. (Collins-FIRL)
W77-08553

IDEAS APLENTY-BUT STILL SEWERS FACE CASH NEGLECT.
Surveyor, Vol. 149, No. 4425, p 14-15, April, 1977.

Descriptors: *Sewers, *Maintenance, *Repair, *Construction, Economics, Planning, Costs, Construction materials, Tunneling, Flow, Measurement, Polymers, Corrosion control, Cleaning, Inspection.

Proposals from Great Britain's Water Research Centre conference on Opportunities for Innovations in Sewerage are reported. The lack of progress towards innovation in the British sewerage industry was blamed not upon a lack of

ideas, but on shortages in funding. British sewer systems are greatly in need of repair. A four-point plan was outlined for improvements, involving: identification of work priorities; use of existing techniques to increase sewer life; development of new technology where applicable; and increasing the efficiency and cost-effectiveness of full reconstruction techniques. The five sections of the conference focused upon planning and design, construction and records, flow measurement and control, inflow and infiltration and maintenance and renovation. New synthetic materials for sewerage were suggested as replacements for traditional ones. These plastics provide high reliability and durability in drainage systems, rising mains, and gravity and trunk sewers. It was recommended that upgrading of sewerage systems be implemented, using available and new technologies, in order to counteract the effects of years of neglect on these systems. (Collins-FIRL)
W77-08554

PERFORATED, VITRIFIED CLAY PIPE USED IN PEORIA FACILITIES,
Water and Wastes Engineering, Vol. 14, No. 4, p 85, April, 1977.

Descriptors: *Clay pipe, *Treatment facilities, Pumping plants, Excavation, Lagoons, *Sludge treatment, Drying, Evaporation, Dewatering, Sludge disposal, Soil amendments, *Waste water treatment, *Pipes.

East Peroria, Illinois, had used 54,000 feet of 4 inch, perforated vitrified clay pipe (VCP) in constructing eight sludge lagoons and a supernatant pumping station. The lagoon acreage was decreased by two feet. Eight foot dikes were built around each lagoon. Trenches 2 feet deep and 1 foot wide were dug 60 feet apart. The trench base was a 6 inch bed of well-graded gravel and the pipe was covered by 6 inches of gravel and 16 inches of well-graded sand. The lagoons were convered with pea gravel. They will be charged sequentially; the maximum accumulation of sludge in each lagoon will be 2 feet. A 1 year period will elapse before the organic soil is sufficiently dry to be scraped off and stored in an adjacent area. Experimental lagoons were used to determine the spacing and depth of pipe placement. It was found that a 2 foot depth would protect pipes from damage when machinery removed the organic soil. Influent is pumped into the lagoons and the supernatant is pumped to the river upstream from the plant. The influent is treated, and the clean water is discharged into the river. The system handles nearly 30 mdg, but is expected to treat 154 mdg after completion. There is no odor problem. The 5% solids which remain after lagoon treatment is called an organic soil stabilizer. It will be produced at an annual rate of 9 to 10,000 dry tons. (Collins-FIRL)
W77-08598

8I. Fisheries Engineering

MARINE LIFE PROTECTOR,
E. Daidola, and J. C. Daidola.
U.S. Patent No. 3,996,138, 10 p, 6 fig, 18 ref; Official Gazette of the United States Patent Office, Vol 953, no 1, p 284, December 7, 1976.

Descriptors: *Patents, *Intakes, Structures, Orifices, Engineering structures, Protection, Aquatic life.

A device for protecting marine life from water intake ducts is presented. The intake duct enters the marine life protector which is characterized as an inner body of water separated from the main outer body of water by means of barrier walls. Through one or more of these barrier walls, input ducts are arranged which pass through the barrier walls having their longitudinal axes other than parallel to the free surface of the water bodies so that the input and exit orifices of the ducts are at different water levels. At least one of these orifices may be covered with a grating or screening or other additional protective means. (Sinha-OEIS)
W77-08262

27TH NORTHWEST FISH CULTURE CONFERENCE.
For primary bibliographic entry see Field 2I.
W77-08309

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

INVENTORY OF WATER RESOURCES RESEARCH AT THE UNIVERSITY OF WYOMING, FISCAL YEAR 1975,
Wyoming Univ., Laramie. Water Resources Research Inst.
L. K. Perry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 560, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Series No. 54, January 1975. 62 p. OWRT A-999-Wyo(22).

Descriptors: *Water resources, *Research and development, *Water Resources Institute, Colleges, *Universities, Training, Personnel, Research facilities, *Wyoming, Projects.

A summary is presented of water resources research in progress at the University of Wyoming, a brief description of outstanding research facilities, and a list of researchers and faculty currently engaged in water resources research.
W77-08506

9D. Grants, Contracts, and Research Act Allotments

INVENTORY OF WATER RESOURCES RESEARCH AT THE UNIVERSITY OF WYOMING, FISCAL YEAR 1975,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 9A.
W77-08506

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

A COMPUTERIZED INFORMATION SYSTEM RELATING TO ARIZONA'S WATER RESOURCES,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 7C.
W77-08307

10B. Reference and Retrieval

A COMPUTERIZED INFORMATION SYSTEM RELATING TO ARIZONA'S WATER RESOURCES,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 7C.
W77-08307

A GUIDE TO THE USE OF HISARS -- A HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W77-08445

10C. Secondary Publication And Distribution

LOW FLOW ANALYSES OF STREAMS: DETAILS OF COMPUTATIONAL PROCEDURES AND ANNOTATED BIBLIOGRAPHY,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-08219

10F. Preparation Of Reviews

STATUS OF REVERSE OSMOSIS DESALINATION TECHNOLOGY,
Office of Water Research and Technology, Washington, D.C. Membrane Processes Div.
For primary bibliographic entry see Field 03A.
W77-08225

STATE OF THE ART IN SEWAGE TREATMENT PLANT CONTROL,
Lund Inst. of Tech. (Sweden).
For primary bibliographic entry see Field 05D.
W77-08515

LIBRARY U. OF I. URBANA-CHAMPAIGN

SUBJECT INDEX

ABORIGINAL WATER RIGHTS
The Winters Doctrine and How It Grew: Federal Reservation of Rights to Use of Water,
W77-08375 6E

ABSOLUTE LIABILITY
From Good Husbandry to Reasonable Use: Illinois Surface Water Drainage Law Evolves in Subdivision Case,
W77-08353 4A

Liability for Damages to Adjacent Land or Building Caused by Dredging,
W77-08387 6E

ABSORPTION
Organochlorine Residues in New Zealand Birds and Mammals 2. Polychlorinated Biphenyls,
W77-08210 5C

Biochemical Transformation and Detoxification of Mercury in Aquatic Environment,
W77-08289 5C

Measurement of the Attenuation of Electromagnetic Radiation by Water in the Visible Region of the Spectrum,
W77-08293 1A

Mercury Accumulation in Trout of Southern Missouri,
W77-08304 5C

ACCIDENTS
Canadian Pacific (Bermuda) Limited V United States (No Duty to Survey or Dredge Channel at Any Particular Time).
W77-08152 6E

ACCRETION (LEGAL ASPECTS)
State v. Matzen (Use of Historical Maps to Settle Claims to Accretion Lands).
W77-08139 6E

Riparian Owner's Right to New Land Created by Reliction or by Accretion Influenced by Artificial Condition Not Produced by Such Owner.
W77-08398 6E

ACHNANTHES-MINUTISSIMA
The Productivity of Fouling Organism Associations in Lake Zelenetskoe, (In Russian),
W77-08323 5C

ACID PRECIPITATION
The Utility of Paleolimnological Analyses of Lake Sediments for Evaluating Acid Precipitation Effects on Dilute Lakes,
W77-08103 5A

ACIDITY
Root Growth, Strength, and Chemical Properties of a Hobson Fragipan,
W77-08285 2G

ACIDS
Fulvic Acid-Metal Ion Interactions in Water,
W77-08102 5A

ACTIVATED CARBON
What Lies Ahead for PAC,
W77-08541 5D

ACTIVATED SLUDGE
Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

Bacterial Growth Kinetics in the Completely Mixed Activated Sludge Treatment of Fellmongery Effluent,
W77-08281 5D

Process Design of Single-Sludge Activated Sludge Systems Using Nitrate Respiration,
W77-08336 5D

Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

Improved Galvanic Dissolved Oxygen Sensor for Activated Sludge,
W77-08539 5A

Use of Oxygen in Activated Sludge Plants (Utilizzazione dell'ossigeno allo stato puro negli impianti a fanghi attivi),
W77-08545 5D

High Capacity Waste Water Treatment System,
W77-08566 5D

Oxygen System Activated Sludge Process.
W77-08575 5D

ADDITIVES
Cementing Oil and Gas Wells, Part 3,
W77-08328 8F

ADJACENT LANDOWNERS
Liability for Damages to Adjacent Land or Building Caused by Dredging,
W77-08387 6E

ADMINISTRATIVE AGENCIES
U.S. Environmental Protection Agency Environmental Research Outlook FY 1976 Through 1980 (Report to Congress).
W77-08120 6G

Toward Cleaner Water in the Pacific Northwest and Alaska--The National Water Permit Program.
W77-08121 5G

Snake River Land Co V State Board of Control (Beneficial Use of Water Held Sufficient Proof of Appropriation).
W77-08135 6E

EPA Focuses on Municipal Enforcement,
W77-08355 6E

Planning Challenges in the Management of Coastal Zone Water Resources,
W77-08376 6B

Ticket to Thermidor: A Commentary on the Proposed California Coastal Plan,
W77-08379 6B

Great Salt Lake Management and Development.
W77-08407 6E

ADMINISTRATIVE DECISIONS
Public Hearing Regarding 180-Day Notice to the Santa Fe Land Improvement Company of Violation of State and Federal Water Quality Standards for the Interstate Waters of the Kansas and Missouri Rivers, Held at Kansas City, Kansas on 13 July 1971.
W77-08381 5G

City of York V. Pennsylvania Department of Environmental Resources (Delegation of Authority Under the Pennsylvania Waste Management Act).
W77-08403 6E

Water Resources Commission V. Connecticut Sand and Stone Corporation (Judicial Review of Administrative Factual Determination).
W77-08404 6E

ADMINISTRATIVE REGULATIONS
Water Resource Policies and Authorities, Coastal Zone Management Program Implementation,
W77-08114 6E

Governmental Interest in Protecting Beach from Environmental Damage Through Overuse Outweighs Due Process Right to Bath Nude,
W77-08124 6E

Let's Have Achievable 'Safe' Drinking Water,
W77-08127 5G

EPA Focuses on Municipal Enforcement,
W77-08355 6E

Timber Products Processing Point Source Category Effluent Guidelines and Standards,
W77-08356 5G

Nonferrous Metals Manufacturing Point Source Category Pretreatment Standards.
W77-08357 5G

Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Nitric Acid Subcategory.
W77-08360 5G

Proposed Effluent Guidelines and Standards for Iron and Steel Manufaturing,
W77-08370 5G

Effluent Guidelines and Standards for Canned and Preserved Fruits and Vegetables Point Source Category,
W77-08371 5G

Oil Spills and Spills of Hazardous Substances.
W77-08385 5G

Appropriation of Water.
W77-08405 6E

ADMIRALITY AND MARITIME JURISDICTION
Oil and Water--A New Look at the Uniformity Doctrine,
W77-08125 6E

ADOPTION OF PRACTICES
Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6B

ADSORPTION
Removing Explosives from Wastewater,
W77-08266 5D

Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

Clay Adsorption Treatment of Non-Ionic Surfactants in Waste Water,
W77-08522 5D

Use of Oxygen in Activated Sludge Plants (Utilizzazione dell'ossigeno allo stato puro negli impianti a fanghi attivi),
W77-08545 5D

AERATED FLUID DRILLING
Air, Mist and Foam Drilling, A Look at the Latest Techniques, Part 2,
W77-08326 8C

AERATED TURBULENT JET FLOW
The Effect of Aeration of Water Jet Spreading,
W77-08197 8B

AERATION
The Effect of Aeration of Water Jet Spreading,
W77-08197 8B

Liquid Waste Treatment Apparatus,
W77-08263 5D

Occupational Characteristics and Biological Kinetic Constants of Extended Aeration Process,
W77-08270 5D

Oxygen Aeration at Newton Creek,
W77-08526 5D

Application of Corrugated Sheet Sprayers for Water Purification (Die Anwendung von Wellbahnrieslern in der Wasseraufbereitung),
W77-08543 5F

Mechanical Surface Aerator for Effluent Purification--Has the Liquid Scooped by the Curved Elements and Ejected into the Air Above,
W77-08558 5D

High Capacity Waste Water Treatment System,
W77-08566 5D

Aerators Control Lift Station Odor and Corrosion,
W77-08567 5G

Trends in Small Sewage Treatment Plants,
W77-08569 5D

Prospects Strong for Waste Water Oxygenation,
W77-08578 5D

Effluent Emphasis Underlines Environmental Effort at Enpocon,
W77-08579 5D

History and Development of the Oxidation Ditch,
W77-08587 5D

Plant Capacity to Increase,
W77-08597 5D

AEROBIC BACTERIA
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

AEROBIC CONDITIONS
Aerobic Digestion of Waste Activated Sludge at Low Temperatures,
W77-08527 5D

AEROBIC DIGESTION
Aerobic Digestion of Waste Activated Sludge at Low Temperatures,
W77-08527 5D

Aerobic Digestion of Sludges Precipitated from Waste Water by Lime Addition,
W77-08530 5D

AEROBIC SLUDGE *ANAEROBIC SLUDGE
Response of Oat and Spinach to Sewage Sludge Application in Soil,
W77-08495 5C

AEROBIC TREATMENT
Aerobic Digestion of Sludges Precipitated from Waste Water by Lime Addition,
W77-08530 5D

Aerobic Treatment of Liquid Wastes--With Oxygen Concentration Measured and Used to Control Pump Speed Used to Force Liquid Through Venturis.
W77-08557 5D

Sodium Bicarbonate Can Settle Many Waste Water Problem Upsets,
W77-08589 5D

AFRICA
The Operation of a Flood Warning Network: Its Use for Studying Flash Floods (Exploitation D'un Reseau D'alerte: Son Utilisation Pour L'etude Des Crues Brutales),
W77-08248 2E

Lake Naivasha and Lake Nakuru: An Ecological Comparison Between Two Bird Lakes in East Africa, (In Swedish),
W77-08324 2H

AGRICULTURAL CHEMICALS
Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Nitric Acid Subcategory.
W77-08360 5G

AGRICULTURAL RUNOFF
Irrigated Agriculture: Nonpoint and Point Source Water Pollution,
W77-08116 5G

Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-08329 5B

AGRICULTURAL WATER
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3F

Agricultural Water Demand in Wake County, North Carolina,
W77-08297 6D

AGRICULTURAL WATER DEMAND
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3F

Agricultural Water Demand in Wake County, North Carolina,
W77-08297 6D

AGRICULTURE
Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Volume I-A, Technical Session Presentations, Agriculture-Environment.
W77-08408 7B

Agricultural Applications of Remote Sensing--A True Life Adventure,
W77-08424 3F

Practical Application of Remote Sensing in Agriculture,
W77-08425 3F

AIR POLLUTION SOURCES
Progress in MHI's Integrated Techniques for Environmental Protection,
W77-08533 5D

AIR-ROTARY DRILLING
Air, Mist and Foam Drilling, A Look at the Latest Techniques, Part 2,
W77-08326 8C

AIR TEMPERATURE
The Influence of Precipitation on Biochemical Oxygen Demand on Nine Streams in New Jersey,
W77-08203 5B

ALABAMA
A Simulation of an Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W77-08343 3F

State V Corps of Engineers (Cost/Benefit Analysis Under NEPA and the Flood Control Act).
W77-08400 6E

ALASKA
Toward Cleaner Water in the Pacific Northwest and Alaska--The National Water Permit Program.
W77-08121 5G

Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

ALBERTA (CANADA)
Applications of Surface Resistivity Methods,
W77-08244 2F

ALGAL ASSAY
A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

ALGAL GROWTH POTENTIAL
A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

ALGAL TOXINS
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

Hypophthalmichthys Molitrix (Val.)) for Increasing Fish Productivity and Decreasing the Level of Eutrophication of Dnieper Reservoirs, (In Russian),
W77-08364 5C

The Ecological Significance of Antibiotic Substances Excreted by Algae in Waters, (In Polish),
W77-08463 5C

ALKALINITY
Is pH Pretreatment Necessary,
W77-08276 5D

Treatment of High Strength Acidic Waste Water with a Completely Mixed Anaerobic Filter,
W77-08524 5D

ALLUVIAL CHANNELS
Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

Effects of Meandering in Alluvial Streams,
W77-08216 2E

ALLUVIAL STREAMS
Effects of Meandering in Alluvial Streams,
W77-08216 2E

ALTERNATE TERMINAL ELECTRON ACCEPTORS
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

ALTERNATIVE PLANNING
Water and Energy Systems: A Planning Model,
W77-08212 6A

Flood Management: Who Benefits and Who Pays,
W77-08303 6F

State V Corps of Engineers (Cost/Benefit Analysis Under NEPA and the Flood Control Act).
W77-08400 6E

ALTERNATIVE WATER USE
Digital-Model Analysis of the Effects of Water-Use Alternatives on Spring Discharges, Gooding and Jerome Counties, Idaho,
W77-08484 4B

ALUM PRECIPITATION
The Solubility of Particulate Phosphorus in the Effluent From Alum Treatment of Wastewater and Phosphorus Solutions,
W77-08500 5D

ALUMINUM
Closed-Loop System Separates Oil from Prewash Overflow,
W77-08271 5D

Fluoride Analysis of Water-Treatment-Plant Sludges,
W77-08342 5F

Nonferrous Metals Manufacturing Point Source Category Pretreatment Standards.
W77-08357 5G

ALUMINUM PHOSPHATE
Availability of Aluminum Phosphate Complexes to a Green Alga in Various Culture Media,
W77-08496 5D

AMERICAN FALLS RESERVOIR (IDAHO)
The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

AMERICAN FROZEN FOOD INSTITUTE
American Frozen Food v Train ('Guidelines' and 'Effluent Limitations' for the Potato Process Industry Pursuant to the Federal Water Pollution Control Act Amendments of 1972).
W77-08386 6E

AMMONIA
Treatment of Aqueous Condensates and Effluents from Coking Plants--With Alkali Salts of Weak Acids, to Expel Ammonia.
W77-08275 5D

AMMONIFICATION
A Method for Quantitative Determination of Ammonifying and Denitrifying Bacteria in Water with Applied Examples from Gravel-Pit Pools, (In Czech),
W77-08509 5A

AMMONIFYING BACTERIA
A Method for Quantitative Determination of Ammonifying and Denitrifying Bacteria in Water with Applied Examples from Gravel-Pit Pools, (In Czech),
W77-08509 5A

AMMONIUM COMPOUNDS
Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Nitric Acid Subcategory.
W77-08360 5G

ANABAENA
Effects of pH and Inorganic Carbon Concentrations Upon Competition Between Anabaena flos-aquae and Selenastrum capricornutum,
W77-08200 5C

ANABAENA FLOS-AQUAE
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

ANAEROBIC BACTERIA
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

ANAEROBIC CONDITIONS
Treatment of High Strength Acidic Waste Water with a Completely Mixed Anaerobic Filter,
W77-08524 5D

ANAEROBIC DIGESTION
Sodium Bicarbonate Can Settle Many Waste Water Problem Upsets,
W77-08589 5D

Higher Gas Yields and Reduced Retention Times Obtained from Anaerobic Digester,
W77-08600 5D

ANALYTICAL TECHNIQUES
Determination of Pyridine in Farm Crops and Fish, (In Russian),
W77-08126 5A

Measurement of Flash Floods in the United States--State of the Art,
W77-08161 2E

Flash Floods in Spain (Les Crues Brutales En Espagne),
W77-08247 2E

Spectroanalytical Parameters of Fungal Metabolites: Oosporein and Desmethoxyviridiol,
W77-08449 2K

A Method for Quantitative Determination of Ammonifying and Denitrifying Bacteria in Water with Applied Examples from Gravel-Pit Pools, (In Czech),
W77-08509 5A

Confirmation of the Single-Step Membrane Filtration Procedure for Estimating Pseudomonas Aeruginosa Densities in Water,
W77-08518 5A

Enterovirus Types in Israel Sewage,
W77-08519 5A

Rapid Agar Pour-Plate Technique for Detection and Enumeration of Faecal Coliforms in Sewage,
W77-08520 5A

Improved Method for the Determination of Ethylenediaminetetraacetic Acid in Aqueous Environmental Samples by Gas-Liquid Chromatography,
W77-08521 5A

Determination of BOD After Freezing Water Samples (Bestimmung des BSB nach Einfrierung der Wasserproben),
W77-08546 5A

ANNUAL PEAK DISCHARGE
Annual Peak Discharges from Small Drainage Areas in Montana Through September 1976,
W77-08482 2E

ANTARCTIC
Resurvey of the 'Byrd' Station, Antarctica, Drill Hole,
W77-08227 2C

Radio-Echo Sounding: Reflections from Internal Layers in Ice Sheets,
W77-08230 2C

The Ecological Significance of Antibiotic Substances Excreted by Algae in Waters, (In Polish),
W77-08463 5C

ANTHRACITE MINING REFUSE
Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

ANTIBIOTIC PROPERTIES (ALGAE)
The Ecological Significance of Antibiotic Substances Excreted by Algae in Waters, (In Polish),
W77-08463 5C

APACHE AND NAVAJO COUNTIES (ARIZ)
Maps Showing Ground-Water COnditions in the Puerco-Zuni Area, Apache and Navajo Counties, Arizona--1975,
W77-08471 7C

APHANIZOMENON FLOS-AQUAE
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

APPROPRIATION
Snake River Land Co V State Board of Control (Beneficial Use of Water Held Sufficient Proof of Appropriation).
W77-08135 6E

Should Rivers Have Running. Toward Extension of the Reserved Rights Doctrine to Include Minimum Stream Flows,
W77-08372 6E

Bank of America National Trust and Saving Association V State Water Resources Control Board (Condition Placed on Water Permit Defeated for Lack of Evidence of Necessity).
W77-08391 6E

Water Rights Generally; Appropriation.
W77-08393 6E

Appropriation of Water for Power (Hydroelectric Power Projects).
W77-08395 6E

Appropriation of Water.
W77-08405 6E

AQUATIC ALGAE
Lake Naivasha and Lake Nakuru: An Ecological Comparison Between Two Bird Lakes in East Africa, (In Swedish),
W77-08324 2H

AQUATIC MICROORGANISMS
Longitudinal Distribution of Selected Micronutrients in Northern San Francisco Bay During 1973,
W77-08487 5C

AQUATIC PLANTS
Lake Naivasha and Lake Nakuru: An Ecological Comparison Between Two Bird Lakes in East Africa, (In Swedish),
W77-08324 2H

AQUEOUS-PHASE OXIDATION
Involvement of Free Radicals in the Catalytic Oxidation of Phenol in Aqueous Solution,
W77-08201 5D

AQUICULTURE
27th Northwest Fish Culture Conference.
W77-08309 2I

Aquaculture: Problems of Implementation Under Existing Law,
W77-08369 6E

AQUIFER CHARACTERISTICS
Ground-Water Resources of Vanderburgh County, Indiana,
W77-08170 4B

Ground Water in the San Juan Metropolitan Area, Puerto Rico,
W77-08173 4B

Geohydrology of the Englishtown Formation in the Northern Coastal Plain of New Jersey,
W77-08175 2F

Geohydrology of the Albin and La Grange Areas, Southeastern Wyoming,
W77-08176 4B

Ground-Water Basic Data for Ramsey County, North Dakota,
W77-08177 7C

The Eutaw-McShan Aquifer in Mississippi,
W77-08466 7C

Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975,
W77-08469 4B

Digital-Model Analysis of the Effects of Water-Use Alternatives on Spring Discharges, Gooding and Jerome Counties, Idaho,
W77-08484 4B

AQUIFER MANAGEMENT
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

Allocating Buried Treasure: Federal Litigation Involving Interstate Ground Water,
W77-08491 6E

AQUIFERS
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

Minimizing Costs in Well Field Design in Relation to Aquifer Models,
W77-08214 4B

Sanitary and Hygienic Characteristics of Subsurface Waters of the Tselinograd and Turgai Oblasts, (In Russian),
W77-08253 5B

Aquifer Modeling Helps Farmers.
W77-08317 2F

Groundwater Resources of Guam: Occurrence and Development,
W77-08448 4B

ARCTIC
Vertical Strain-Rate Measurements in an Arctic Ice Cap and Deductions from Them,
W77-08226 2C

A Further Comparison of Glacier Velocities Measured by Radio-Echo and Survey Methods,
W77-08228 2C

AREAL PRECIPITATION
Determining Areal Precipitation in the Basin and Range Province of Southern Arizona - Sonoita Creek Basin,
W77-08308 2B

ARID LANDS
Determination of Water-Resources Policies in Arid Lands,
W77-08453 6B

ARIZONA
PL 92-500: Phoenix V. the EPA,
W77-08128 5G

Farmers Investment Company V Bettwy (Doctrine of Reasonable Use as Applied to Groundwaters).
W77-08137 6E

Rainfall Infiltration Characteristics for a Semi-Arid Watershed Soil,
W77-08206 2G

A Computerized Information System Relating to Arizona's Water Resources,
W77-08307 7C

Determining Areal Precipitation in the Basin and Range Province of Southern Arizona - Sonoita Creek Basin,
W77-08308 2B

Water Supply and Control Developments Summarized, (Arizona).
W77-08313 6E

A Preliminary Analysis of the Energy and Water Requirements for Developing Geothermal Energy in Arizona,
W77-08351 4B

Practical Application of Remote Sensing in Agriculture,
W77-08425 3F

Maps Showing Ground-Water COnditions in the Puerco-Zuni Area, Apache and Navajo Counties, Arizona--1975,
W77-08471 7C

ARKANSAS
Population Dynamics and Species Diversity of Ichthyo-Parasitofauna of the Buffalo National River,
W77-08446 5C

ARSENIC
Arsenic in Water and Fish from Lakes Hartwell, Keowee, and Jocassee, South Carolina,
W77-08191 5A

ARTESIAN AQUIFERS
Digital-Computer Model of the Sandstone Aquifer in Southeastern Wisconsin,
W77-08478 2F

ARTESIAN WELLS
Artesian Wells.
W77-08397 6E

ARTIFICIAL SUBSTRATES
Invertebrate Colonization of Artificial Substrates in San Leandro Creek,
W77-08443 5A

ARTIFICIAL USE
Riparian Owner's Right to New Land Created by Reliction or by Accretion Influenced by Artificial Condition Not Produced by Such Owner.
W77-08398 6E

ASPHALT
Asphalt-Rubber Mixtures for Seepage Control,
W77-08195 4A

ATLANTIC COASTAL PLAIN
Geohydrology of the Englishtown Formation in the Northern Coastal Plain of New Jersey,
W77-08175 2F

ATLANTIC OCEAN
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

ATTENUATION COEFFICIENT (WATER)
Measurement of the Attenuation of Electromagnetic Radiation by Water in the Visible Region of the Spectrum,
W77-08293 1A

ATTITUDES
Citizen Participation in Comprehensive Water Resources Planning,
W77-08105 6B

Discriminant Analysis of Characteristics Determining Acceptance or Rejection of Nuclear Power,
W77-08109 6B

AUSTRALIA
Application of Three Daily-Rainfall Runoff Models to Four Australian Catchments,
W77-08218 2A

Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

AUSTRIA
A New Climatic Model for Glacier Behavior of the Austrian Alps,
W77-08235 2C

AUTOMATED MONITORING
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5A

AUTOMATIC CONTROLS
State of the Art in Sewage Treatment Plant Control,
W77-08515 5D

Suspended Solids Measurement Gives Improved Control,
W77-08568 5A

Automatic Control of Whitlingham Sewage Treatment Works Norwich,
W77-08585 5D

Reliable pH Measurement When Effluent Conditions Get Tough,
W77-08592 5A

AXISYMMETRIC JETS
The Effect of Aeration of Water Jet Spreading,
W77-08197 8B

BACTERIA
Bacteriological Investigation of Alberta Meat-Packing Plant Wastes with Emphasis on Salmonella Isolation,
W77-08269 5D

Bacterial Growth Kinetics in the Completely Mixed Activated Sludge Treatment of Fellmongery Effluent,
W77-08281 5D

Reproduction Rate and Productivity of Bacteria in the Ponds of the Karamet-Niyaz Fishery Farm, (In Russian),
W77-08462 5C

Bacterial Growth on Dissolved Organic Compounds in Fresh-Water Reservoirs, (In Russian),
W77-08498 5A

A Method for Quantitative Determination of Ammonifying and Denitrifying Bacteria in Water with Applied Examples from Gravel-Pit Pools, (In Czech),
W77-08509 5A

Pollution Indicator Bacteria Associated with Municipal Raw and Drinking Water Supplies,
W77-08516 5A

Confirmation of the Single-Step Membrane Filtration Procedure for Estimating Pseudomonas Aeruginosa Densities in Water,
W77-08518 5A

Rapid Agar Pour-Plate Technique for Detection and Enumeration of Faecal Coliforms in Sewage,
W77-08520 5A

BACTERIAL GROWTH
Bacterial Growth on Dissolved Organic Compounds in Fresh-Water Reservoirs, (In Russian),
W77-08498 5A

BACTERIOLOGY
Possibilities and Role of Biological Analysis in Evaluating the Degree of Pollution of Water Bodies, (In Russian),
W77-08430 5A

BASIN CHARACTERISTICS
Small-Stream Flood Investigations in Minnesota, October 1958 to September 1975,
W77-08481 2E

BASINS
Design and Operation of Rain Retention Basins (Entwurf und Betrieb von Regenruckhaltebecken),
W77-08547 8A

BASS
A Statistical Analysis of the Mercury Concentrations in Fish from Lake Jocassee, South Carolina,
W77-08190 5A

BAYS
Suspended-Particle Transport and Circulation in San Francisco Bay: An Overview,
W77-08486 2L

Longitudinal Distribution of Selected Micronutrients in Northern San Francisco Bay During 1973,
W77-08487 5C

Phytoplankton Production and Enumeration in Northern San Francisco Bay During 1972,
W77-08488 5C

Implications of Seasonal Chemical and Physical Factors on the Production of Phytoplankton in Northern San Francisco Bay,
W77-08489 5C

BEACH EROSION
Beach Profile Changes: East Coast of Lake Michigan, 1970-72,
W77-08440 2J

BEACH PROFILES
Beach Profile Changes: East Coast of Lake Michigan, 1970-72,
W77-08440 2J

BEACHES
Governmental Interest in Protecting Beach from Environmental Damage Through Overuse Outweighs Due Process Right to Bath Nude,
W77-08124 6E

BEAR RIVER COMPACT (IDA-UTA-WYO)
Bear River Compact,
W77-08155 6E

BED FORMS
Effects of Meandering in Alluvial Streams,
W77-08216 2E

BEDROCK
Stress in an Elastic Bedrock Hump Due to Glacier Flow,
W77-08236 2C

BEDROCK HUMPS
Stress in an Elastic Bedrock Hump Due to Glacier Flow,
W77-08236 2C

BEDS
Effects of Meandering in Alluvial Streams,
W77-08216 2E

BELGIUM
Recent Flash Floods of the Dison Brook (Crues Brutales Recentes Du 'Ruisseau' De Dison (Belgique): Observations Et Previsions),
W77-08250 4A

BENEFICIAL USE
Snake River Land Co V State Board of Control (Beneficial Use of Water Held Sufficient Proof of Appropriation).
W77-08135 6E

Reservoirs,
W77-08158 6E

Should Rivers Have Running. Toward Extension of the Reserved Rights Doctrine to Include Minimum Stream Flows,
W77-08372 6E

Water Rights Generally; Appropriation.
W77-08393 6E

Appropriation of Water.
W77-08405 6E

BENTHIC FAUNA
Invertebrate Colonization of Artificial Substrates in San Leandro Creek,
W77-08443 5A

BENTHIC MICROBIAL COMMUNITY RESPIRATION
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

BENZIDINE
Toxic Pollutant Effluent Standards for Benzidine.
W77-08359 5G

BERKSHIRE HILLS (MASS)
Laminated Sediments in Holomictic Berkshire Lakes,
W77-08341 2J

BICARBONATES
Effect of Some Chemical Elements on the Accumulation of Cesium-137 in Freshwater Fish, (In Russian),
W77-08322 5C

Sodium Bicarbonate Can Settle Many Waste Water Problem Upsets,
W77-08589 5D

BILGE WATER TREATMENT
Pump-Filter for Bilge Water,
W77-08261 5G

BIOACCUMULATION
Organochlorine Residues in New Zealand Birds and Mammals 2. Polychlorinated Biphenyls,
W77-08210 5C

BIOASSAY
Chromosome Mutations in a Fern Population Growing in a Polluted Environment: A Bioassay for Mutagens in Aquatic Environments,
W77-08305 5A

A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

Possibilities and Role of Biological Analysis in Evaluating the Degree of Pollution of Water Bodies, (In Russian),
W77-08430 5A

BIOCHEMICAL OXYGEN DEMAND
The Influence of Precipitation on Biochemical Oxygen Demand on Nine Streams in New Jersey,
W77-08203 5B

The Mathematical Description of the BOD Reaction in Stream Water,
W77-08493 5B

A Comparison of the Methods for Calculating the Constants for the First Order BOD Equation,
W77-08494 5B

Determination of BOD After Freezing Water Samples (Bestimmung des BSB nach Einfrierung der Wasserproben),
W77-08546 5A

Travelling Grate-Type Filtration System Uses Pulverized Coal to Lower BOD of Wastewater.
W77-08577 5D

BIODEGRADATION
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

The Effect of Soluble Organic Matter On the Utilization of Phenoxy Herbicides by Pseudomonas sp.,
W77-08504 5C

BIOINDICATORS
Possibilities and Role of Biological Analysis in Evaluating the Degree of Pollution of Water Bodies, (In Russian),
W77-08430 5A

Invertebrate Colonization of Artificial Substrates in San Leandro Creek,
W77-08443 5A

Pollution Indicator Bacteria Associated with Municipal Raw and Drinking Water Supplies,
W77-08516 5A

Confirmation of the Single-Step Membrane Filtration Procedure for Estimating Pseudomonas Aeruginosa Densities in Water,
W77-08518 5A

BIOLOGICAL-PHYSICAL GRADIENTS
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

BIOLOGICAL TREATMENT
The Role of Protozoa in Biological Purification of Oil Industry Sewage, (In Russian),
W77-08254 5D

Waste Impoundment Efficiency at Sugar Mill,
W77-08268 5D

Purifying Biological Effluent Rich in Carbohydrates or Protein--By Anaerobic Fermentation Separation, Aerobic Treatment and Then Separation.
W77-08277 5D

Taking Acres Out of Pollution-Control Plans,
W77-08283 5D

Treatment of High Strength Acidic Waste Water with a Completely Mixed Anaerobic Filter,
W77-08524 5D

Enzymatic Treatment of Primary Municipal Sludge with Trichoderma Viride Cellulase,
W77-08529 5D

Biological Treatment Kinetics of Landfill Leachate,
W77-08532 5D

An Estimation of the Efficiency of a Waste Water Treatment Plant, as Measured by Several Parameters Including Lipid Biodegradation (Essai d'evaluation de l'efficacite d'une station d'epuration a l'aide de plusieurs parametres dont la biodegradation des lipides),
W77-08548 5D

BOC Blows Bubbles in Dirty Bath Water,
W77-08564 5D

BIOMASS
Estimating Vegetative Biomass from LANDSAT-1 Imagery for Range Management,
W77-08409 4A

BIOTIC CYCLE
Characteristics of the Biotic Cycle of Lake Baikal, (In Russian),
W77-08321 2H

BIOTRANSFORMATION
Biochemical Transformation and Detoxification of Mercury in Aquatic Environment,
W77-08289 5C

BIRDS
Organochlorine Residues in New Zealand Birds and Mammals 2. Polychlorinated Biphenyls,
W77-08210 5C

Lake Naivasha and Lake Nakuru: An Ecological Comparison Between Two Bird Lakes in East Africa, (In Swedish),
W77-08324 2H

BLUFF EROSION
Beach Profile Changes: East Coast of Lake Michigan, 1970-72,
W77-08440 2J

BOOMS
Boom Companies; Construction, Powers Of,
W77-08157 6E

BOUGHTON MODEL
Application of Three Daily-Rainfall Runoff Models to Four Australian Catchments,
W77-08218 2A

BOUNDARIES
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

BOUNDARIES (PROPERTY)
Boundaries of the Coastal Zone: A Survey of State Laws,
W77-08132 6E

Restless River: International Law and the Behavior of the Rio Grande,
W77-08384 6E

Hibiscus Harbor, Inc. V. State (Metes and Bounds Description Favored Over Low Water Mark in Determining Outcome of Boundary Dispute).
W77-08389 6E

BOUNDARY DISPUTES
Hibiscus Harbor, Inc. V. State (Metes and Bounds Description Favored Over Low Water Mark in Determining Outcome of Boundary Dispute).
W77-08389 6E

BRACKISH WATER
The Influence of Brackish-Water Intrusion on Macroinvertebrate Associations of the Lower Tchefuncte River, Louisiana,
W77-08292 5B

BREWERY CANNING WASTES
Closed-Loop System Separates Oil from Prewash Overflow,
W77-08271 5D

BRINE REUSE
Investigation of Coagulation - Precipitation and Ultrafiltration for the Regeneration of Brines in the Cucumber Pickle Industry,
W77-08511 5D

BRITISH COLUMBIA
Aquaculture: Problems of Implementation Under Existing Law,
W77-08369 6E

BROWN TROUT
A Statistical Analysis of the Mercury Concentrations in Fish from Lake Jocassee, South Carolina,
W77-08190 5A

BUFFALO NATIONAL RIVER (ARK)
Population Dynamics and Species Diversity of Ichthyo-Parasitofauna of the Buffalo National River,
W77-08446 5C

BULK DENSITY
Drainable Porosity Evaluation and its Relationship to Hydraulic Conductivity and Exchangeable Cations Under Different Bulk Densities,
W77-08461 4A

BURIED MARKERS
Relocation of Buried Markers,
W77-08240 2C

BYRD STATION
Resurvey of the 'Byrd' Station, Antarctica, Drill Hole,
W77-08227 2C

Radio-Echo Sounding: Reflections from Internal Layers in Ice Sheets,
W77-08230 2C

CADMIUM
A Survey of Cadmium Occurrence and Concentration in Fish from Eleven Major Reservoirs in South Carolina,
W77-08192 5A

Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

CALCIUM SILICATE CEMENTS
Research on Cements for Geothermal and Deep Oil Wells,
W77-08320 8F

CALIFORNIA
Natural Resources Defense Council V Stamm (National Environmental Policy Act Not Satisfied When EIS Fails to Discuss All Reasonable Alternatives to the Project).
W77-08148 6E

Compliance with the Provisions of the Federal Water Pollution Control Act as Amended in 1972.
W77-08153 6E

Wells, Pumping Plants, Conduits and Streams,
W77-08154 6E

An Earthquake Risk Model That Incorporates Local Near Surface Site Conditions,
W77-08348 8E

Ticket to Thermidor: A Commentary on the Proposed California Coastal Plan,
W77-08379 6B

Bank of America National Trust and Saving Association V State Water Resources Control Board (Condition Placed on Water Permit Defeated for Lack of Evidence of Necessity).
W77-08391 6E

Riparian Owner's Right to New Land Created by Reliction or by Accretion Influenced by Artificial Condition Not Produced by Such Owner.
W77-08398 6E

Appropriation of Water.
W77-08405 6E

Usefulness of LANDSAT Data for Monitoring Plant Development and Range Conditions in California's Annual Grassland,
W77-08411 4A

Mapping of the Wildland Fuel Characteristics of the Santa Monica Mountains of Southern California,
W77-08419 7C

Agricultural Applications of Remote Sensing--A True Life Adventure,
W77-08424 3F

A Comparative Interregional Analysis of Selected Data from LANDSAT-1 and EREP for the Inventory and Monitoring of Natural Ecosystems,
W77-08436 7C

Invertebrate Colonization of Artificial Substrates in San Leandro Creek,
W77-08443 5A

Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

Activities of the Water Resources Division in California.
W77-08479 7C

Suspended-Particle Transport and Circulation in San Francisco Bay: An Overview,
W77-08486 2L

Longitudinal Distribution of Selected Micronutrients in Northern San Francisco Bay During 1973,
W77-08487 5C

Phytoplankton Production and Enumeration in Northern San Francisco Bay During 1972,
W77-08488 5C

Implications of Seasonal Chemical and Physical Factors on the Production of Phytoplankton in Northern San Francisco Bay,
W77-08489 5C

A Postscript to the Mutual Prescription Doctrine--City of Los Angeles V City of San Fernando,
W77-08490 6E

CANADA

Applications of Surface Resistivity Methods,
W77-08244 2F

Bacteriological Investigation of Alberta Meat-Packing Plant Wastes with Emphasis on Salmonella Isolation,
W77-08269 5D

Remembering Maine: Offshore Federalism in the United States and Canada,
W77-08363 6E

Aquaculture: Problems of Implementation Under Existing Law,
W77-08369 6E

Are Clear-Cut Areas Estimated from LANDSAT Imagery Reliable,
W77-08416 4A

Agricultural Inventory Capabilities of Machine Processed LANDSAT Digital Data,
W77-08423 3F

CANALS

Wells, Pumping Plants, Conduits and Streams,
W77-08154 6E

Hydrologic Effects of the Tampa Bypass Canal System,
W77-08182 4A

CANNERIES

Effluent Guidelines and Standards for Canned and Preserved Fruits and Vegetables Point Source Category,
W77-08371 5G

CARBOHYDRATES

Waste Impoundment Efficiency at Sugar Mill,
W77-08268 5D

Purifying Biological Effluent Rich in Carbohydrates or Protein--By Anaerobic Fermentation Separation, Aerobic Treatment and Then Separation.
W77-08277 5D

CARBON DIOXIDE

A Quantitative Study of Organic Carbon Decomposition and Nitrogen Transformations in Sewage Sludge-Soil Systems,
W77-08291 5B

CARBON RADIOISOTOPES

U S Geological Survey, Water Resources Division, Radiocarbon Measurements I,
W77-08169 4B

CARCINOGENS

Toxic Pollutant Effluent Standards for Benzidine.
W77-08359 5G

CARP

Hypophthalmichthys Molitrix (Val.)) for Increasing Fish Productivity and Decreasing the Level of Eutrophication of Dnieper Reservoirs, (In Russian),
W77-08364 5C

CASING WEAR

Better Protection for Casing and Tool Joints,
W77-08315 8G

CATALYSTS

Involvement of Free Radicals in the Catalytic Oxidation of Phenol in Aqueous Solution,
W77-08201 5D

CATALYTIC OXIDATION

Involvement of Free Radicals in the Catalytic Oxidation of Phenol in Aqueous Solution,
W77-08201 5D

CAUSEWAYS

Solar Salt Company V Southern Pacific Transportation Company (Alteration of Saline Content of Great Salt Lake is Not Pollution Under Utah Statute).
W77-08146 6E

CAVITOMETERS

Measurement of Ice Movement in Subglacial Cavities: A New Cavitometer Beneath the Glacier D'Argentiere (Mt Blanc, France),
W77-08238 2C

CELLULOSE NITRATE

Treatment of Wastewater From Military Explosives and Propellants Production Industry by Physicochemical Processes,
W77-08337 5D

Investigation of the Effectiveness of Polymers in the Treatment of Nirocellulose-Manufacturing Wastewater,
W77-08338 5D

CEMENT CLASSIFICATIONS (API)

Cementing Oil and Gas Wells, Part 3,
W77-08328 8F

CEMENT GROUTING

Cementing Oil and Gas Wells, Part 3,
W77-08328 8F

CEMENTS

Research on Cements for Geothermal and Deep Oil Wells,
W77-08320 8F

Cementing Oil and Gas Wells, Part 3,
W77-08328 8F

CENSUS

Remote Sensing Applications in the Inventory and Analysis of Environmental Problems,
W77-08438 5A

CENTRIFUGATION

Characterizing Sludge for Centrifugal Dewatering,
W77-08535 5D

CESIUM-137

Effect of Some Chemical Elements on the Accumulation of Cesium-137 in Freshwater Fish, (In Russian),
W77-08322 5C

CHANNEL IMPROVEMENT

Channelization: Environmental, Geomorphic and Engineering Aspects,
W77-08352 8D

Fractionation and Control of Iron in Channelized and Swamp Drainage Streams in North Carolina,
W77-08510 5B

CHANNEL MORPHOLOGY

Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

Channelization: Environmental, Geomorphic and Engineering Aspects,
W77-08352 8D

CHANNELIZATION

Fractionation and Control of Iron in Channelized and Swamp Drainage Streams in North Carolina,
W77-08510 5B

CHANNELS

State V Corps of Engineers (Cost/Benefit Analysis Under NEPA and the Flood Control Act).
W77-08400 6E

CHAPPELL PROCESS (TANNING WASTES)

Split-Stream Chemical Treatment (A Patented Process by Chemlan Company, Inc.) of Tanning Industry Waste Water,
W77-08280 5D

CHARLESTON HARBOR (SC)
Effects of 40-Foot Charleston Harbor Project on Tides, Currents, and Salinities; Hydraulic Model Investigation,
W77-08222 2L

CHELATING AGENTS
Chelating Agent Analysis by High Speed Liquid Chromatography,
W77-08286 5A

CHELATION
Chelating Agent Analysis by High Speed Liquid Chromatography,
W77-08286 5A

CHEMICAL ANALYSIS
Investigation of Detection Limits for Solutes in Water Measured by Laser Raman Spectrometry,
W77-08171 2K

Impurity Concentrations in Sea Ice,
W77-08237 2C

CHEMICAL COMPOUNDS
Deep Water Resources of the Limestones of Franche-Comte: Problems of Quantity and Quality, (In French),
W77-08122 4B

CHEMICAL INDUSTRY
Toxic Pollutant Effluent Standards for Benzidine.
W77-08359 5G

CHEMICAL OXYGEN DEMAND
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

CHEMICAL PRECIPITATION
Investigation of Coagulation - Precipitation and Ultrafiltration for the Regeneration of Brines in the Cucumber Pickle Industry,
W77-08511 5D

Aerobic Digestion of Sludges Precipitated from Waste Water by Lime Addition,
W77-08530 5D

CHEMICAL PROPERTIES
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5A

CHEMICAL REACTION
Involvement of Free Radicals in the Catalytic Oxidation of Phenol in Aqueous Solution,
W77-08201 5D

CHEMICAL REACTIONS
Improved Method for the Determination of Ethylenediaminetetraacetic Acid in Aqueous Environmental Samples by Gas-Liquid Chromatography,
W77-08521 5A

CHEMICAL SEALANTS
Chemical and Vegetative Stabilization of Soils,
W77-08512 8D

CHEMICAL WASTES
Apparatus for Continuous Liquid-Liquid Extraction of Water with a Solvent,
W77-08264 5F

Sources, Characteristics and Treatment and Disposal of Industrial Wastes Containing Hexachlorobenzene,
W77-08265 5D

Split-Stream Chemical Treatment (A Patented Process by Chemlan Company, Inc.) of Tanning Industry Waste Water,
W77-08280 5D

Effluent Limitations and Guidelines for Existing Sources and Standards of Performance and Pretreatment Standards for New Sources for the Bleached Kraft, Groundwood, Sulfite, Soda, Deink and Non-Integrated Paper Mills Segment of the Pulp, Paper, and Paperboard Point Source Category.
W77-08383 5G

CHEMISORPTION BY RUBBER
Biochemical Transformation and Detoxification of Mercury in Aquatic Environment,
W77-08289 5C

CHICAGO REGION (ILL)
Water-Level Decline and Pumpage in Deep Wells in the Chicago Region, 1971-1975,
W77-08302 2F

CHLORIDES
Effect of Some Chemical Elements on the Accumulation of Cesium-137 in Freshwater Fish, (In Russian),
W77-08322 5C

CHLORINATED BIPHENYLS
Chlorine Combining with Sewage,
W77-08571 5D

CHLORINATED HYDROCARBON PESTICIDES
The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

CHLORINATION
Ozone and Chlorine in Waste Water Disinfection,
W77-08536 5D

Chlorobiphenyls and PCB's: Formation During Chlorination,
W77-08538 5A

Chlorine Combining with Sewage,
W77-08571 5D

Effluent Emphasis Underlines Environmental Effort at Enpocon,
W77-08579 5D

CHLORINE
Ozone and Chlorine in Waste Water Disinfection,
W77-08536 5D

Chlorine Combining with Sewage,
W77-08571 5D

CHLOROBIPHENYLS
Chlorobiphenyls and PCB's: Formation During Chlorination,
W77-08538 5A

CHLOROPHYTA
Effects of pH and Inorganic Carbon Concentrations Upon Competition Between Anabaena flos-aquae and Selenastrum capricornutum,
W77-08200 5C

Availability of Aluminum Phosphate Complexes to a Green Alga in Various Culture Media,
W77-08496 5D

CHROMATOGRAPHY
Development of a Column Chromatography Method for Field of Pre-Concentration of Trace Metals with Application to the Haw-Cape Fear Rivers, N.C.,
W77-08299 5A

Improved Method for the Determination of Ethylenediaminetetraacetic Acid in Aqueous Environmental Samples by Gas-Liquid Chromatography,
W77-08521 5A

CHROMOSOME MUTATIONS
Chromosome Mutations in a Fern Population Growing in a Polluted Environment: A Bioassay for Mutagens in Aquatic Environments,
W77-08305 5A

CITIZEN PARTICIPATION
Citizen Participation in Comprehensive Water Resources Planning,
W77-08105 6B

CLASSIFICATION
Agricultural Inventory Capabilities of Machine Processed LANDSAT Digital Data,
W77-08423 3F

The LANDSAT-1 Multispectral Scanner as a Tool in the Classification of Inland Lakes,
W77-08433 5A

CLAY ADSORPTION TREATMENT
Clay Adsorption Treatment of Non-Ionic Surfactants in Waste Water,
W77-08522 5D

CLAY PIPE
Perforated, Vitrified Clay Pipe Used in Peoria Facilities,
W77-08598 8G

CLAYS
Clay Adsorption Treatment of Non-Ionic Surfactants in Waste Water,
W77-08522 5D

CLEANING
Cleaning of Sewage Sludge System.
W77-08561 5D

CLEAR-CUTTING
Are Clear-Cut Areas Estimated from LANDSAT Imagery Reliable,
W77-08416 4A

CLIMATES
Pluvial Lakes of Nevada and Estimated Full Pluvial Climates,
W77-08199 2H

CLIMATIC DATA
A New Climatic Model for Glacier Behavior of the Austrian Alps,
W77-08235 2C

A Note on the Study of Rainy Days and Wet Spells at Bijapur,
W77-08455 2B

COAGULATION
Investigation of Coagulation - Precipitation and Ultrafiltration for the Regeneration of Brines in the Cucumber Pickle Industry,
W77-08511 5D

COAL
Travelling Grate-Type Filtration System Uses Pulverized Coal to Lower BOD of Wastewater.
W77-08577 5D

COAL MINE WASTES
Detection of Phosphate Adsorption onto Coal Humic Acids,
W77-08294 5A

COAL MINES
Application of EREP, LANDSAT and Aircraft Image Data to Environmental Problems Related to Coal Mining,
W77-08429 5A

COASTAL ENGINEERING
Coastal Energy Impact Program.
W77-08358 6E

COASTAL STRUCTURES
Coastal Energy Impact Program.
W77-08358 6E

COASTAL WATERS
Oil and Water--A New Look at the Uniformity Doctrine,
W77-08125 6E

Report on Water Resources Problems of Western Collier County, Florida as Affected by the GAC Corporation's Canal System in Its Golden Gate Development Project,
W77-08380 6E

COASTAL ZONE MANAGEMENT
Water Resource Policies and Authorities, Coastal Zone Management Program Implementation,
W77-08114 6E

Boundaries of the Coastal Zone: A Survey of State Laws,
W77-08132 6E

Coastal Zone Legislation: Louisiana Landmarks, Labyrinths and Logrolling,
W77-08186 6E

Planning Challenges in the Management of Coastal Zone Water Resources,
W77-08376 6B

Ticket to Thermidor: A Commentary on the Proposed California Coastal Plan,
W77-08379 6B

COASTAL ZONE MANAGEMENT ACT OF 1972
Boundaries of the Coastal Zone: A Survey of State Laws,
W77-08132 6E

Coastal Zone Legislation: Louisiana Landmarks, Labyrinths and Logrolling,
W77-08186 6E

Coastal Energy Impact Program.
W77-08358 6E

COASTAL ZONE WATER RESOURCES
Planning Challenges in the Management of Coastal Zone Water Resources,
W77-08376 6B

COASTS
Water Resource Policies and Authorities, Coastal Zone Management Program Implementation,
W77-08114 6E

Boundaries of the Coastal Zone: A Survey of State Laws,
W77-08132 6E

Planning Challenges in the Management of Coastal Zone Water Resources,
W77-08376 6B

Discriminating Coastal Rangeland Production and Improvements with Computer Aided Techniques,
W77-08410 4A

COKING PLANT EFFLUENTS
Treatment of Aqueous Condensates and Effluents from Coking Plants--With Alkali Salts of Weak Acids, to Expel Ammonia.
W77-08275 5D

COLIFORMS
Rapid Agar Pour-Plate Technique for Detection and Enumeration of Faecal Coliforms in Sewage,
W77-08520 5A

COLORADO
Inventory of Colorado's Front Range Mountain Reservoirs,
W77-08107 6B

Leadville Mine Drainage Tunnel Act of 1976.
W77-08115 6E

Selected Hydrologic Data, Uinta Basin Area, Utah and Colorado,
W77-08183 7C

An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

Input-Output Modeling in Water Resources System Planning,
W77-08346 6A

Aubert V Town of Fruita (Senior Direct Flow Rights Favored in Dispute Over Dam).
W77-08390 6E

A Comparative Interregional Analysis of Selected Data from LANDSAT-1 and EREP for the Inventory and Monitoring of Natural Ecosystems,
W77-08436 7C

COLORADO RIVER BASIN
Sediment Yield and Land Use in Southwest United States,
W77-08178 4D

COLUMBIA RIVER
Withdrawal of Certain Waters from Appropriation: Special Municipal and County Water Rights,
W77-08142 6E

27th Northwest Fish Culture Conference.
W77-08309 2I

COMMERICAL FISHING
Aquaculture: Problems of Implementation Under Existing Law,
W77-08369 6E

COMMON ENEMY RULE
From Good Husbandry to Reasonable Use: Illinois Surface Water Drainage Law Evolves in Subdivision Case,
W77-08353 4A

COMMON LAW
Environmental Protection Through the Common Law,
W77-08133 6G

COMPACTION
Rainfall Infiltration Characteristics for a Semi-Arid Watershed Soil,
W77-08206 2G

COMPARATIVE LAW
New Water Legislation--Drafting for Development, Efficient Allocation and Environmental Protection,
W77-08188 6E

COMPETING USES
Federal Statutory Modification of Private Water Rights in South Florida,
W77-08112 6E

Farmers Investment Company V Bettwy (Doctrine of Reasonable Use as Applied to Groundwaters).
W77-08137 6E

COMPREHENSIVE PLANNING
Citizen Participation in Comprehensive Water Resources Planning,
W77-08105 6B

U.S. Environmental Protection Agency Environmental Research Outlook FY 1976 Through 1980 (Report to Congress).
W77-08120 6G

Ticket to Thermidor: A Commentary on the Proposed California Coastal Plan,
W77-08379 6B

COMPUTER MODELS
Application of Three Daily-Rainfall Runoff Models to Four Australian Catchments,
W77-08218 2A

Regional Simulation of Streamflow Data,
W77-08298 2A

A Water Management Model for High Water Table Soils,
W77-08301 3F

Aquifer Modeling Helps Farmers.
W77-08317 2F

COMPUTER PROGRAMS
The AFGWC Snow Cover Analysis Model,
W77-08223 2C

Regional Simulation of Streamflow Data,
W77-08298 2A

RECSAD: A Computer Program for Recreation Planning,
W77-08300 6B

A Guide to the Use of HISARS -- A Hydrologic Information Storage and Retrieval System,
W77-08445 7C

Computer Program for Reservoir-Water Budgets,
W77-08464 4A

CONCRETE CONSTRUCTION
Concrete Bucket Distributes Crushed Bedding Evenly on Sewer Job.
W77-08556 8F

CONDEMNATION
United States V 3,727-91 Acres of Land in Pike County, State of Missouri (Compensation Allowed Drainage District for Condemned Property).
W77-08399 6E

CONDEMNATION VALUE
United States V 3,727-91 Acres of Land in Pike County, State of Missouri (Compensation Allowed Drainage District for Condemned Property).
W77-08399 6E

CONDUITS
Wells, Pumping Plants, Conduits and Streams,
W77-08154 6E

CONFERENCES
The National Conference on Water.
W77-08131 6E

27th Northwest Fish Culture Conference.
W77-08309 2I

Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Volume I-A, Technical Session Presentations, Agriculture-Environment.
W77-08408 7B

CONNECTICUT
Belford V. City of New Haven (Individual's Challenge to City's Dredging and Construction),
W77-08143 6E

Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

Ground Water Recharge in Eastern Connecticut Based on Simulation Modeling,
W77-08344 2F

Water Resources Commission V. Connecticut Sand and Stone Corporation (Judicial Review of Administrative Factual Determination).
W77-08404 6E

Water Resources Data for Connecticut, Water Year 1975,
W77-08480 7C

CONOWINGO RESERVOIR (PENN-MD)
A Predictive Model for Transient Temperature Distributions in Unsteady Flows,
W77-08221 5B

CONSERVATION
Russo V. New York Dept. of Environmental Conservation (Limits of State Regulations Restricting Alteration of Wetlands).
W77-08388 6E

CONSITUTIONAL LAW
The Import - Export Clause and Control of Oil Pollution: Regulatory Fee Imposed Pursuant to the Police Power,
W77-08354 5G

CONSTRUCTION
Natural Resources Defense Council V Stamm (National Environmental Policy Act Not Satisfied When EIS Fails to Discuss All Reasonable Alternatives to the Project).
W77-08148 6E

Polyethylene Sewer Force Main Takes Varying Pressures.
W77-08549 8G

Post-Tensioned Sewer River Crossing.
W77-08552 8E

Ideas Aplenty-But Still Sewers Face Cash Neglect.
W77-08554 8G

Seabed Sewers for Hong Kong,
W77-08555 5E

CONSTRUCTION COSTS
Construction and Maintenance Costs of Sewer Systems (Bau- und Betriebskosten von Kanalisationsanlagen),
W77-08542 8A

CONSTRUCTION GRANT PROGRAM
PL 92-500: Phoenix V. the EPA,
W77-08128 5G

CONSUMPTIVE USE
Legal Control of Consumptive Water Use in Pennsylvania Power Plants,
W77-08368 3E

Estimating Evapotranspiration in the North Platte Basin of Wyoming,
W77-08505 2D

CONTINENTAL SHELF
States' Rights in the Outer Continental Shelf Denied by the United States Supreme Court,
W77-08365 6E

CONTINUOUS MONITORING
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5A

CONVECTION
On the Relationship Between the Finite Element and Finite Difference Methods,
W77-08168 7A

A Study of Cooling Initially Uniform and Thermally Stratified Layers of Water,
W77-08444 5G

COOLING WATER
Year Round Cooling Water from the Cold Weather of Winter,
W77-08251 5D

COORDINATION
Water Resource Policies and Authorities, Coastal Zone Management Program Implementation,
W77-08114 6E

COPPER
Effect of Metals on Photosynthesis of Marine Phytoplankton, (In Russian),
W77-08160 5C

Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

Nonferrous Metals Manufacturing Point Source Category Pretreatment Standards.
W77-08357 5G

CORE DRILLING
Analyses of Water, Core Material, and Elutriate Samples Collected Near New Orleans, Louisiana (Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project),
W77-08165 8D

CORN (FIELD)
Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

CORROSION CONTROL
Aerators Control Lift Station Odor and Corrosion,
W77-08567 5G

CORRUGATED SHEET SPRAYERS
Application of Corrugated Sheet Sprayers for Water Purification (Die Anwendung von Wellbahnrieslern in der Wasseraufbereitung),
W77-08543 5F

COST-BENEFIT ANALYSIS
Sierra Club V Stamm (National Environmental Policy Act Does Not Require Comprehensive Environmental Impact Statement on Large Reclamation Project When EIS have been Prepared for Viable Portion of Project).
W77-08147 6E

Flood Management: Who Benefits and Who Pays,
W77-08303 6F

Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

State V Corps of Engineers (Cost/Benefit Analysis Under NEPA and the Flood Control Act).
W77-08400 6E

COST COMPARISONS
What Lies Ahead for PAC,
W77-08541 5D

COST FUNCTIONS
Network Evaluation of Wastewater Collection Economics,
W77-08331 5D

COST MINIMIZATION
Minimizing Costs in Well Field Design in Relation to Aquifer Models,
W77-08214 4B

COST REPAYMENT
United States V Tulare Lake Canal Company (Reclamation Laws Concerning Sale of Land in Excess of 160 Acres).
W77-08151 6E

COSTS
Minimizing Costs in Well Field Design in Relation to Aquifer Models,
W77-08214 4B

Status of Reverse Osmosis Desalination Technology,
W77-08225 3A

Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-08329 5B

CROP PRODUCTION
Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

Growth of Tropical and Temperate Grasses at Palmerston North I. Warm-Season Yields With and Without Irrigation,
W77-08457 3F

Potential of New Summer Grasses in Northland: I. Warm-Season Yields Under Dryland and Irrigation,
W77-08458 3F

Improving Food Crop Production in the Sudan Savanna Zone of Northern Nigeria,
W77-08459 3F

CROPS
Practical Application of Remote Sensing in Agriculture,
W77-08425 3F

CRYOGENICS
Use of Oxygen in Activated Sludge Plants (Utilizzazione dell'ossigeno allo stato puro negli impianti a fanghi attivi),
W77-08545 5D

CRYSTALLOGRAPHY
Crystal Structure Analysis of Selected Pesticides by Single Crystal X-Ray Diffraction: The Crystal and Molecular Structure of Padan,
W77-08503 5A

CURRENTS (WATER)
Thermal Sensor for Measurement of Ocean Current Direction,
W77-08257 2L

CYANOPHYTA
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

Effects of pH and Inorganic Carbon Concentrations Upon Competition Between Anabaena flos-aquae and Selenastrum capricornutum,
W77-08200 5C

Hypophthalmichthys Molitrix (Val.)) for Increasing Fish Productivity and Decreasing the Level of Eutrophication of Dnieper Reservoirs, (In Russian),
W77-08364 5C

CYCLING NUTRIENTS
Mineral Cycling in Reservoirs,
W77-08217 5C

Availability of Aluminum Phosphate Complexes to a Green Alga in Various Culture Media,
W77-08496 5D

DAIRY FARMS
Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-08329 5B

DALLAS RESERVOIR SYSTEM (TEX)
Implementation of an Optimization Model for Operation of a Metropolitan Reservoir System,
W77-08211 4A

DAM CONSTRUCTION
Natural Resources Defense Council V Stamm (National Environmental Policy Act Not Satisfied When EIS Fails to Discuss All Reasonable Alternatives to the Project).
W77-08148 6E

DAMAGES
Cementing Oil and Gas Wells, Part 2 - Casing Inspection and Pipe Handling Methods, Including Thread Make-Up Control,
W77-08327 8F

Liability for Damages to Adjacent Land or Building Caused by Dredging,
W77-08387 6E

DAMS
Aubert V Town of Fruita (Senior Direct Flow Rights Favored in Dispute Over Dam).
W77-08390 6E

DARTERS
Population Dynamics and Species Diversity of Ichthyo-Parasitofauna of the Buffalo National River,
W77-08446 5C

DATA ACQUISITION SYSTEMS
A Controllable Automated Environmental Data Acquisition and Monitoring System,
W77-08441 7C

DATA COLLECTIONS
Recent Flash Floods of the Dison Brook (Crues Brutales Recentes Du 'Ruisseau' De Dison (Belgique): Observations Et Previsions),
W77-08250 4A

Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2H

A Guide to the Use of HISARS -- A Hydrologic Information Storage and Retrieval System,
W77-08445 7C

Activities of the Water Resources Division in California.
W77-08479 7C

DATA MANAGEMENT SYSTEMS
Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6B

DATA PROCESSING
Trophic Status of Inland Lakes from LANDSAT,
W77-08434 5A

DATA STORAGE AND RETRIEVAL
Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6B

A Guide to the Use of HISARS -- A Hydrologic Information Storage and Retrieval System,
W77-08445 7C

DDT
The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

DEAD SEA (ISRAEL)
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

DECISION MAKING
Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6B

Classification and Test of Public Participation Concepts Applied to Local Resource Planning,
W77-08295 6B

DECOMPOSING ORGANIC MATTER
A Quantitative Study of Organic Carbon Decomposition and Nitrogen Transformations in Sewage Sludge-Soil Systems,
W77-08291 5B

DEEP WELLS
Water-Level Decline and Pumpage in Deep Wells in the Chicago Region, 1971-1975,
W77-08302 2F

Research on Cements for Geothermal and Deep Oil Wells,
W77-08320 8F

Deep Wells For Dewatering Offer Real Advantages, Part II,
W77-08325 4B

DEFOLIATION
Computer Analysis and Mapping of Gypsy Moth Defoliation Levels in Pennsylvania Using LANDSAT-1 Digital Data,
W77-08420 7C

DEHYDROGENASE ACTIVITY
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

DELINEATION METHODOLOGY
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

DEMAND
RECSAD: A Computer Program for Recreation Planning,
W77-08300 6B

DEMINERALIZATION
Thermocompression-Type Apparatus for Desalting Saline Water,
W77-08252 3A

DENITRIFICATION
Process Design of Single-Sludge Activated Sludge Systems Using Nitrate Respiration,
W77-08336 5D

Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

A Method for Quantitative Determination of Ammonifying and Denitrifying Bacteria in Water with Applied Examples from Gravel-Pit Pools, (In Czech),
W77-08509 5A

Factors Affecting the Denitrification Rate in Two Water-Sediment Systems,
W77-08517 5B

DENITRIFYING BACTERIA
A Method for Quantitative Determination of Ammonifying and Denitrifying Bacteria in Water with Applied Examples from Gravel-Pit Pools, (In Czech),
W77-08509 5A

DEPOSITION (SEDIMENTS)
American Sedimentation Law and Physical Processes,
W77-08130 6E

DEPTH HOAR
On Depth Hoar and the Strength of Snow,
W77-08239 2C

DESALINATION
Thermocompression-Type Apparatus for Desalting Saline Water,
W77-08252 3A

Forward Osmosis Extractors,
W77-08340 3A

DESALINATION APPARATUS
Status of Reverse Osmosis Desalination Technology,
W77-08225 3A

DESIGN
Process Design of Single-Sludge Activated Sludge Systems Using Nitrate Respiration,
W77-08336 5D

Channelization: Environmental, Geomorphic and Engineering Aspects,
W77-08352 8D

Moduflex Sewage Treatment Plants Provide the Answer to Growth,
W77-08588 5D

DESIGN CRITERIA
Analyses of Water, Core Material, and Elutriate Samples Collected Near New Orleans, Louisiana (Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project),
W77-08165 8D

Optimal Layout and Design of Storm Sewer Systems,
W77-08334 5D

Channelization: Environmental, Geomorphic and Engineering Aspects,
W77-08352 8D

Design of a Water Quality Monitoring Network,
W77-08497 5A

Design and Operation of Rain Retention Basins (Entwurf und Betrieb von Regenruckhaltebecken),
W77-08547 8A

Sewage Pumping Station Built to Handle Future System Demands,
W77-08550 8C

DESMETHOXYVIRIDIOL
Spectroanalytical Parameters of Fungal Metabolites: Oosporein and Desmethoxyviridiol,
W77-08449 2K

DESTRATIFICATION
Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

DETOXIFICATION OF HG2+
Biochemical Transformation and Detoxification of Mercury in Aquatic Environment,
W77-08289 5C

DEVON ISLAND ICE CAP (CANADA)
Vertical Strain-Rate Measurements in an Arctic Ice Cap and Deductions from Them,
W77-08226 2C

A Further Comparison of Glacier Velocities Measured by Radio-Echo and Survey Methods,
W77-08228 2C

DEWATERING
Deep Wells For Dewatering Offer Real Advantages, Part II,
W77-08325 4B

Dewatering: A New Method Bows,
W77-08528 5D

Characterizing Sludge for Centrifugal Dewatering,
W77-08535 5D

Dewatering Machines (Entwasserungsmachinen),
W77-08544 5D

Sludge Dewatering Press.
W77-08581 5E

DIAGENESIS
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

DIATOMS
The Utility of Paleolimnological Analyses of Lake Sediments for Evaluating Acid Precipitation Effects on Dilute Lakes,
W77-08103 5A

The Productivity of Fouling Organism Associations in Lake Zelenetskoe, (In Russian),
W77-08323 5C

DIELDRIN
The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

DIFFUSION
On the Relationship Between the Finite Element and Finite Difference Methods,
W77-08168 7A

DIP ANGLE (AQUIFERS)
Effect of Dip on the Storage of Fresh Water (or the Disposal of Waste) in a Saline Aquifer,
W77-08288 4B

DIPPING SYSTEM (WELLS)
Effect of Dip on the Subsurface Storage or Disposal of Fluid in Saline Aquifers,
W77-08204 4B

DIRECT FLOW RIGHTS
Aubert V Town of Fruita (Senior Direct Flow Rights Favored in Dispute Over Dam).
W77-08390 6E

DISCHARGE PERMIT PROVISIONS
PL 92-500: Phoenix V. the EPA,
W77-08128 5G

DISCHARGE (WATER)
Operation and Impact of NPDES in Region II, Part I,
W77-08117 5G

Ponce de Leon Condominiums v Digirolamo (Developer Responsible for Control of Surface Runoff).
W77-08136 6E

DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING
Optimal Layout and Design of Storm Sewer Systems,
W77-08334 5D

DISCRIMINANT ANALYSIS
Discriminant Analysis of Characteristics Determining Acceptance or Rejection of Nuclear Power,
W77-08109 6B

DISINFECTION
Bacteriological Investigation of Alberta Meat-Packing Plant Wastes with Emphasis on Salmonella Isolation,
W77-08269 5D

Ozone and Chlorine in Waste Water Disinfection,
W77-08536 5D

Chlorobiphenyls and PCB's: Formation During Chlorination,
W77-08538 5A

Sewage Sludge Disinfected by Electron-Beam Bombardment.
W77-08580 5D

DISON BROOK (BELGIUM)
Recent Flash Floods of the Dison Brook (Crues Brutales Recentes Du 'Ruisseau' De Dison (Belgique): Observations Et Previsions),
W77-08250 4A

DISPERSION
Statistical Characterization of Dilute Particulate Suspensions in Turbulent Fluid Fields,
W77-08330 5B

DISSOLVED ORGANIC CARBON
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

DISSOLVED OXYGEN
Factors Affecting the Denitrification Rate in Two Water-Sediment Systems,
W77-08517 5B

Improved Galvanic Dissolved Oxygen Sensor for Activated Sludge,
W77-08539 5A

DISSOLVED SOLIDS
Investigation of Detection Limits for Solutes in Water Measured by Laser Raman Spectrometry,
W77-08171 2K

Dissolved Solids, Hardness, and Orthophosphate of Surface-Water Runoff in the Northwest Florida Water Management District,
W77-08467 7C

DISTILLATION
Fluoride Analysis of Water-Treatment-Plant Sludges,
W77-08342 5F

DISTRIBUTION SYSTEMS
Irrigation and Irrigation Districts.
W77-08396 6E

DITCHES
Anderson V Yearous (Rights of Dominant Owners to Unobstructed Use of Drainage Easements).
W77-08392 6E

Water Districts and Commissioners.
W77-08406 6E

DIVERSION
Can a State Embargo the Export of Water by Transbasin Diversions,
W77-08129 6E

Withdrawal of Certain Waters from Appropriation: Special Municipal and County Water Rights,
W77-08142 6E

Hydrologic Effects of the Tampa Bypass Canal System,
W77-08182 4A

From Good Husbandry to Reasonable Use: Illinois Surface Water Drainage Law Evolves in Subdivision Case,
W77-08353 4A

Bank of America National Trust and Savings Association V State Water Resources Control Board (Condition Placed on Water Permit Defeated for Lack of Evidence of Necessity).
W77-08391 6E

DNIEPER RIVER RESERVOIRS (USSR)
Hypophthalmichthys Molitrix (Val.)) for Increasing Fish Productivity and Decreasing the Level of Eutrophication of Dnieper Reservoirs, (In Russian),
W77-08364 5C

DOMESTIC WASTES
Oil-Flushed Toilets Gain,
W77-08583 3D

DOMESTIC WATER
What We Can Do Before the Well Runs Dry--A Summary of WRC Report No. 35 --Residential Water conservation-Milne,
W77-08101 3D

DOMINANT OWNERS
Anderson V Yearous (Rights of Dominant Owners to Unobstructed Use of Drainage Easements).
W77-08392 6E

DOMINANT TRACTS
Anderson V Yearous (Rights of Dominant Owners to Unobstructed Use of Drainage Easements).
W77-08392 6E

DRAINAGE
Mitchell V. City of High Point (Municipal Liability for Damage from Overflow of Privately-Owned Stream).
W77-08145 6E

Drainable Porosity Evaluation and its Relationship to Hydraulic Conductivity and Exchangeable Cations Under Different Bulk Densities,
W77-08461 4A

Fractionation and Control of Iron in Channelized and Swamp Drainage Streams in North Carolina,
W77-08510 5B

DRAINAGE DISTRICTS
United States V 3,727-91 Acres of Land in Pike County, State of Missouri (Compensation Allowed Drainage District for Condemned Property).
W77-08399 6E

DRAINAGE POROSITY
Drainable Porosity Evaluation and its Relationship to Hydraulic Conductivity and Exchangeable Cations Under Different Bulk Densities,
W77-08461 4A

DRAINAGE PROGRAMS
Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

DRAINAGE SYSTEMS
Ponce de Leon Condominiums v Digirolamo (Developer Responsible for Control of Surface Runoff).
W77-08136 6E

A Water Management Model for High Water Table Soils,
W77-08301 3F

DRAINAGE WATER
Spray Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soil,
W77-08202 5D

DRAWDOWN
Digital-Computer Model of the Sandstone Aquifer in Southeastern Wisconsin,
W77-08478 2F

DREDGING
Belford V. City of New Haven (Individual's Challenge to City's Dredging and Construction),
W77-08143 6E

Liability for Damages to Adjacent Land or Building Caused by Dredging,
W77-08387 6E

DRIFT VELOCITIES
Drift Velocities of Surface Films Over Waves,
W77-08193 5B

DRILL HOLES
Resurvey of the 'Byrd' Station, Antarctica, Drill Hole,
W77-08227 2C

DRILL KELLYS
Kelly Care Extends Service Life,
W77-08311 8C

DRILLING EQUIPMENT
Kelly Care Extends Service Life,
W77-08311 8C

Better Protection for Casing and Tool Joints,
W77-08315 8G

Air, Mist and Foam Drilling, A Look at the Latest Techniques, Part 2,
W77-08326 8C

DRILLING FLUIDS
Air, Mist and Foam Drilling, A Look at the Latest Techniques, Part 2,
W77-08326 8C

Cementing Oil and Gas Wells, Part 3,
W77-08328 8F

DRYING
Filters and Sludge Drying Beds,
W77-08586 5D

DUAL MEDIA FILTERS
Performance of Dual-Media Filters--I,
W77-08273 5D

Performance of Dual-Media Filters--II,
W77-08274 5D

DYES
Characterization and Treatment of Textile Dyeing Wastewaters,
W77-08278 5D

DYNAMIC PROGRAMMING
Implementation of an Optimization Model for Operation of a Metropolitan Reservoir System,
W77-08211 4A

Water Allocation and Pricing for Control of Irrigation-Related Salinity in a River Basin,
W77-08213 5G

Optimal Layout and Design of Storm Sewer Systems,
W77-08334 5D

EARTHQUAKE ENGINEERING
An Earthquake Risk Model That Incorporates Local Near Surface Site Conditions,
W77-08348 8E

EARTHQUAKES
An Earthquake Risk Model That Incorporates Local Near Surface Site Conditions,
W77-08348 8E

EASEMENTS
Anderson V Yearous (Rights of Dominant Owners to Unobstructed Use of Drainage Easements).
W77-08392 6E

EAST FORK RIVER (WYO)
Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

EAST FORK TRINITY RIVER (TEX)
Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

ECOLOGY
Lake Naivasha and Lake Nakuru: An Ecological Comparison Between Two Bird Lakes in East Africa, (In Swedish),
W77-08324 2H

The Ecological Significance of Antibiotic Substances Excreted by Algae in Waters, (In Polish),
W77-08463 5C

ECONOMIC EFFICENCY
Water and Energy Systems: A Planning Model,
W77-08212 6A

ECONOMIC EFFICIENCY
Implementation of an Optimization Model for Operation of a Metropolitan Reservoir System,
W77-08211 4A

Water Allocation and Pricing for Control of Irrigation-Related Salinity in a River Basin,
W77-08213 5G

Minimizing Costs in Well Field Design in Relation to Aquifer Models,
W77-08214 4B

Ticket to Thermidor: A Commentary on the Proposed California Coastal Plan,
W77-08379 6B

ECONOMIC FEASIBILITY
An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

ECONOMIC IMPACT
Economic Impacts of Controlling Water Quality in an Irrigated River Basin,
W77-08332 5G

ECONOMIC JUSTIFICATION
Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

ECONOMICS
Production of Energy From Concentrated Brines by Pressure-Retarded Osmosis, 1. Preliminary Technical and Economic Correlations,
W77-08233 3A

Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-08329 5B

Input-Output Modeling in Water Resources System Planning,
W77-08346 6A

ECONOMICS

Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

ECOSYSTEMS

A Comparative Interregional Analysis of Selected Data from LANDSAT-1 and EREP for the Inventory and Monitoring of Natural Ecosystems,
W77-08436 7C

Phytoplankton Production and Enumeration in Northern San Francisco Bay During 1972,
W77-08488 5C

EDUCATION

University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

EFFLUENT LIMITATIONS

PL 92-500: Phoenix V. the EPA,
W77-08128 5G

Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Nitric Acid Subcategory.
W77-08360 5G

Proposed Effluent Guidelines and Standards for Iron and Steel Manufaturing,
W77-08370 5G

Effluent Guidelines and Standards for Canned and Preserved Fruits and Vegetables Point Source Category,
W77-08371 5G

EFFLUENTS

Standards of Performance and Pretreatment Standards for the Explosives Manufacturing Point Source Category (Proposed Rules),
W77-08113 5G

Proposed Effluent Guidelines and Standards for Iron and Steel Manufaturing,
W77-08370 5G

American Frozen Food v Train ('Guidelines' and 'Effluent Limitations' for the Potato Process Industry Pursuant to the Federal Water Pollution Control Act Amendments of 1972).
W77-08386 6E

ELECTRIC CONVERTERS

Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

ELECTRIC GENERATOR

Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

ELECTRIC POWER PRODUCTION

Production of Energy From Concentrated Brines by Pressure-Retarded Osmosis, 1. Preliminary Technical and Economic Correlations,
W77-08233 3A

Appropriation of Water for Power (Hydroelectric Power Projects).
W77-08395 6E

ELECTRICAL DESIGN

Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

ELECTRICAL EQUIPMENT

Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

ELECTROLYSIS

Effluent Emphasis Underlines Environmental Effort at Enpocon,
W77-08579 5D

ELECTROMAGNETIC WAVES

Radio-Echo Sounding of Temperate Glaciers: Ice Properties and Sounder Design Criteria,
W77-08229 2C

Measurement of the Attenuation of Electromagnetic Radiation by Water in the Visible Region of the Spectrum,
W77-08293 1A

ELECTRON SPIN RESONANCE

Fulvic Acid-Metal Ion Interactions in Water,
W77-08102 5A

ELECTRONIC THERMOMETER

Subsurface-Temperature Data for Some Wells in Western Utah,
W77-08166 7C

ELM FORK TRINITY RIVER (TEX)

Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

EMINENT DOMAIN

Wood V. Board of Commissioners for the Pontchartrain Levee District (Land Appropriation for Levees),
W77-08144 6E

Russo V. New York Dept. of Environmental Conservation (Limits of State Regulations Restricting Alteration of Wetlands).
W77-08388 6E

ENERGY

Water and Energy Systems: A Planning Model,
W77-08212 6A

A Preliminary Analysis of the Energy and Water Requirements for Developing Geothermal Energy in Arizona,
W77-08351 4B

Coastal Energy Impact Program.
W77-08358 6E

ENERGY EQUATION

Effect of Lateral Inflow on Steady Open Channel Flows,
W77-08290 2E

ENERGY LOSS

Effect of Lateral Inflow on Steady Open Channel Flows,
W77-08290 2E

ENGINEERING STRUCTURES

Post-Tensioned Sewer River Crossing.
W77-08552 8E

ENGLISHTOWN FORMATION (NJ)

Geohydrology of the Englishtown Formation in the Northern Coastal Plain of New Jersey,
W77-08175 2F

ENTERIC BACTERIA

Comparative Examination of Enterococci Obtained from Drinking Water, Foodstuffs and Urine, (In German),
W77-08179 5A

Biochemical Transformation and Detoxification of Mercury in Aquatic Environment,
W77-08289 5C

ENTEROBACTER AEROGENES

Biochemical Transformation and Detoxification of Mercury in Aquatic Environment,
W77-08289 5C

ENTEROCOCCI

Comparative Examination of Enterococci Obtained from Drinking Water, Foodstuffs and Urine, (In German),
W77-08179 5A

ENVIRONMENT

Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Volume I-A, Technical Session Presentations, Agriculture-Environment.
W77-08408 7B

An Overview of the Development of Remote Sensing Techniques for the Screwworm Eradication Program,
W77-08427 3F

Application of EREP, LANDSAT and Aircraft Image Data to Environmental Problems Related to Coal Mining,
W77-08429 5A

Remote Sensing Applications in the Inventory and Analysis of Environmental Problems,
W77-08438 5A

ENVIRONMENTAL CONTROL

Sierra Club V Stamm (National Environmental Policy Act Does Not Require Comprehensive Environmental Impact Statement on Large Reclamation Project When EIS have been Prepared for Viable Portion of Project).
W77-08147 6I

EPA Focuses on Municipal Enforcement,
W77-08355 6I

Emerging Legal Concepts in the Harmonization of Water Resources Development and Environmental Protection,
W77-08378 6I

Progress in MHI's Integrated Techniques for Environmental Protection,
W77-08533 5I

ENVIRONMENTAL EFFECTS

U.S. Environmental Protection Agency Environmental Research Outlook FY 197 Through 1980 (Report to Congress).
W77-08120 6

Belford V. City of New Haven (Individual Challenge to City's Dredging and Construction),
W77-08143 6

Sierra Club V Stamm (National Environmental Policy Act Does Not Require Comprehensive Environmental Impact Statement on Lar

Reclamation Project When EIS have been Prepared for Viable Portion of Project).
W77-08147 6E

Summary of Some Current and Possible Future Environmental Problems Related to Geology and Hydrology at Memphis, Tennessee,
W77-08174 4C

Pumped Storage Potential of the Hells Canyon Area,
W77-08196 8C

The Environmental Problem of the Oceans: An International Stepchild of National Egotism,
W77-08367 6E

Emerging Legal Concepts in the Harmonization of Water Resources Development and Environmental Protection,
W77-08378 6E

Public Hearing Regarding 180-Day Notice to the Santa Fe Land Improvement Company of Violation of State and Federal Water Quality Standards for the Interstate Waters of the Kansas and Missouri Rivers, Held at Kansas City, Kansas on 13 July 1971.
W77-08381 5G

State V Corps of Engineers (Cost/Benefit Analysis Under NEPA and the Flood Control Act).
W77-08400 6E

Reclamation and Use of Disturbed Land in the Southwest.
W77-08452 5G

Determination of Water-Resources Policies in Arid Lands,
W77-08453 6B

ENVIRONMENTAL IMPACT STATEMENT

Sierra Club V Stamm (National Environmental Policy Act Does Not Require Comprehensive Environmental Impact Statement on Large Reclamation Project When EIS have been Prepared for Viable Portion of Project).
W77-08147 6E

Natural Resources Defense Council V Stamm (National Environmental Policy Act Not Satisfied When EIS Fails to Discuss All Reasonable Alternatives to the Project).
W77-08148 6E

State V Corps of Engineers (Cost/Benefit Analysis Under NEPA and the Flood Control Act).
W77-08400 6E

ENVIRONMENTAL PROTECTION AGENCY (EPA)

Standards of Performance and Pretreatment Standards for the Explosives Manufacturing Point Source Category (Proposed Rules),
W77-08113 5G

ENVIRONMENTAL QUALITY

Multiple Objective Planning: Small Watersheds,
W77-08350 6B

ENZYMATIC TREATMENT

Enzymatic Treatment of Primary Municipal Sludge with Trichoderma Viride Cellulase,
W77-08529 5D

EQUATIONS

On the Relationship Between the Finite Element and Finite Difference Methods,
W77-08168 7A

EQUIPMENT

Dewatering Machines (Entwasserungsmachinen),
W77-08544 5D

Mechanical Surface Aerator for Effluent Purification--Has the Liquid Scooped by the Curved Elements and Ejected into the Air Above,
W77-08558 5D

Sludge Collector and Light Liquid, Separator--from Sewage with Two Tanks in Single Housing and Cover.
W77-08560 5D

EQUITABLE APPOINTMENT

Allocating Buried Treasure: Federal Litigation Involving Interstate Ground Water,
W77-08491 6E

EQUITABLE APPORTIONMENT

Can a State Embargo the Export of Water by Transbasin Diversions,
W77-08129 6E

EROSION CONTROL

Sediment Yield and Land Use in Southwest United States,
W77-08178 4D

Chemical and Vegetative Stabilization of Soils,
W77-08512 8D

ESTIMATING

Estimating Vegetative Biomass from LANDSAT-1 Imagery for Range Management,
W77-08409 4A

ESTOPPEL

Aubert V Town of Fruita (Senior Direct Flow Rights Favored in Dispute Over Dam).
W77-08390 6E

ESTUARIES

Methodology for Applying the Finite Element Method to Partially Stratified Estuaries,
W77-08198 2L

Effects of 40-Foot Charleston Harbor Project on Tides, Currents, and Salinities; Hydraulic Model Investigation,
W77-08222 2L

A Controllable Automated Environmental Data Acquisition and Monitoring System,
W77-08441 7C

ESTUARINE ENVIRONMENT

Coastal Zone Legislation: Louisiana Landmarks, Labyrinths and Logrolling,
W77-08186 6E

Longitudinal Distribution of Selected Micronutrients in Northern San Francisco Bay During 1973,
W77-08487 5C

Phytoplankton Production and Enumeration in Northern San Francisco Bay During 1972,
W77-08488 5C

Implications of Seasonal Chemical and Physical Factors on the Production of Phytoplankton in Northern San Francisco Bay,
W77-08489 5C

ETHYLBUTYLAMINE

Some Experimental Data on the Study of the Biological Action of Ethylbutylamine as a Water Pollution Factor, (In Russian),
W77-08439 5A

ETHYLENEDIAMINETRAACETIC ACID

Improved Method for the Determination of Ethylenediaminetetraacetic Acid in Aqueous Environmental Samples by Gas-Liquid Chromatography,
W77-08521 5A

EUTAW FORMATION (MISS)

The Eutaw-McShan Aquifer in Mississippi,
W77-08466 7C

EUTROPHICATION

A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

Hypophthalmichthys Molitrix (Val.)) for Increasing Fish Productivity and Decreasing the Level of Eutrophication of Dnieper Reservoirs, (In Russian),
W77-08364 5C

Availability of Aluminum Phosphate Complexes to a Green Alga in Various Culture Media,
W77-08496 5D

A Predictive Phosphorus Model for Lakes - Sensitivity Analysis and Applications,
W77-08499 5C

The Limnology of a North Carolina Millpond with Special Reference to Historical Changes as Evidenced by Sediment Core Analysis,
W77-08507 5C

EVALUATION

Classification and Test of Public Participation Concepts Applied to Local Resource Planning,
W77-08295 6B

Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

An Estimation of the Efficiency of a Waste Water Treatment Plant, as Measured by Several Parameters Including Lipid Biodegradation (Essai d'evaluation de l'efficacite d'une station d'epuration a l'aide de plusieurs parametres dont la biodegradation des lipides),
W77-08548 5D

EVAPOTRANSPIRATION

Estimating Evapotranspiration in the North Platte Basin of Wyoming,
W77-08505 2D

EXCAVATION

Deep Wells For Dewatering Offer Real Advantages, Part II,
W77-08325 4B

EXCLUSIVE RIGHTS

Mc Cardel V Smolen (The Rights of Riparian and Nonriparian Owners to Recreational Use of Navigable Inland Lakes).
W77-08138 6E

EXPLOSIVES

Standards of Performance and Pretreatment Standards for the Explosives Manufacturing Point Source Category (Proposed Rules),
W77-08113 5G

Removing Explosives from Wastewater,
W77-08266 5D

EXTENDED AERATION
Occupational Characteristics and Biological Kinetic Constants of Extended Aeration Process,
W77-08270 5D

FACIES
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

FACTIONATION (IRON)
Fractionation and Control of Iron in Channelized and Swamp Drainage Streams in North Carolina,
W77-08510 5B

FALLOUT
The Fallout of Nitrogen and Phosphorus Compounds from the Atmosphere at Ngapuna, Near Rotorua, New Zealand,
W77-08243 5A

FALSE COLOR INFRARED IMAGERY
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

FEASIBILITY STUDIES
An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

FEDERAL GOVERNMENT
U.S. Environmental Protection Agency Environmental Research Outlook FY 1976 Through 1980 (Report to Congress).
W77-08120 6G

The Winters Doctrine and How It Grew: Federal Reservation of Rights to Use of Water,
W77-08375 6E

American Petroleum Institute V Environmental Protection Agency (Challenge to EPA Standards for Refineries Under the FWPCA Amendments of 1972).
W77-08394 6E

FEDERAL JURISDICTION
Federal Statutory Modification of Private Water Rights in South Florida,
W77-08112 6E

Federal Control Over Wetland Areas: The Corps of Engineers Expands its Jurisdiction,
W77-08123 5G

Oil and Water--A New Look at the Uniformity Doctrine,
W77-08125 6E

Sierra Club V Stamm (National Environmental Policy Act Does Not Require Comprehensive Environmental Impact Statement on Large Reclamation Project When EIS have been Prepared for Viable Portion of Project).
W77-08147 6E

Remembering Maine: Offshore Federalism in the United States and Canada,
W77-08363 6E

FEDERAL RECLAMATION LAW
United States V Tulare Lake Canal Company (Reclamation Laws Concerning Sale of Land in Excess of 160 Acres).
W77-08151 6E

FEDERAL-SSTATE WATER RIGHTS CONFLICTS
Remembering Maine: Offshore Federalism in the United States and Canada,
W77-08363 6E

FEDERAL-STATE WATER RIGHTS CONFLICTS
Federal Statutory Modification of Private Water Rights in South Florida,
W77-08112 6E

States Need Freedom to Innovate (Comment on PL 92-500).
W77-08119 6E

States' Rights in the Outer Continental Shelf Denied by the United States Supreme Court,
W77-08365 6E

FEDERAL WATER POLLUTION CONTROL ACT
Standards of Performance and Pretreatment Standards for the Explosives Manufacturing Point Source Category (Proposed Rules),
W77-08113 5G

Leadville Mine Drainage Tunnel Act of 1976.
W77-08115 6E

Federal Water Pollution Control Act Amendments of 1972 Reach Polluting Activities Occurring Above Mean-High Water Line (Comment on U. S. V. Holland).
W77-08118 5G

Federal Control Over Wetland Areas: The Corps of Engineers Expands its Jurisdiction,
W77-08123 5G

PL 92-500: Phoenix V. the EPA,
W77-08128 5G

Compliance with the Provisions of the Federal Water Pollution Control Act as Amended in 1972.
W77-08153 6E

Effluent Guidelines and Standards for Canned and Preserved Fruits and Vegetables Point Source Category,
W77-08371 5G

The 1972 Water Pollution Control Act: Unforeseen Implications for Land Use Planning,
W77-08373 5G

Effluent Limitations and Guidelines for Existing Sources and Standards of Performance and Pretreatment Standards for New Sources for the Bleached Kraft, Groundwood, Sulfite, Soda, Deink and Non-Integrated Paper Mills Segment of the Pulp, Paper, and Paperboard Point Source Category.
W77-08383 5G

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972
Operation and Impact of NPDES in Region II, Part I,
W77-08117 5G

Federal Water Pollution Control Act Amendments of 1972 Reach Polluting Activities Occurring Above Mean-High Water Line (Comment on U. S. V. Holland).
W77-08118 5G

Toward Cleaner Water in the Pacific Northwest and Alaska--The National Water Permit Program.
W77-08121 5G

The 1972 Water Pollution Control Act: Unforeseen Implications for Land Use Planning,
W77-08373 5G

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 (AMENDMENTS OF 1972)
American Frozen Food v Train ('Guidelines' and 'Effluent Limitations' for the Potato Process Industry Pursuant to the Federal Water Pollution Control Act Amendments of 1972).
W77-08386 6E

FEDERAL WATER POLLUTION CONTROL ACT (FWPCA)
Operation and Impact of NPDES in Region II Part I,
W77-08117 5G

Timber Products Processing Point Source Category Effluent Guidelines and Standards,
W77-08356 5G

Nonferrous Metals Manufacturing Point Source Category Pretreatment Standards.
W77-08357 5G

Toxic Pollutant Effluent Standards fo Benzidine.
W77-08359 5G

FEDERAL WATER POLLUTION CONTROL ACT (FWPCA) AMENDMENTS OF 1972
Effluent Limitations and Guidelines for Existing Sources and Standards of Performance an Pretreatment Standards for New Sources fo the Bleached Kraft, Groundwood, Sulfite Soda, Deink and Non-Integrated Paper Mill Segment of the Pulp, Paper, and Paperboar Point Source Category.
W77-08383 5G

American Petroleum Institute V Environmenta Protection Agency (Challenge to EPA Standards for Refineries Under the FWPC Amendments of 1972).
W77-08394 6

FELLMONGERY WASTES
Bacterial Growth Kinetics in the Complete Mixed Activated Sludge Treatment of Fellmo gery Effluent,
W77-08281 5

FERMENTATION
Breaking Down Solid and Liquid Waste Form a Fertilizer--By Inoculation with Selecte Fungi and Fermentation.
W77-08559 5

FERNS
Chromosome Mutations in a Fern Populati Growing in a Polluted Environment: A Bioa say for Mutagens in Aquatic Environments,
W77-08305 5

FERTILIZATION
Forest Fertilization and Water Quality in t North Carolina Piedmont,
W77-08508

FERTILIZERS
Diffuse Agricultural Pollution: The Econon Analysis of Alternative Controls,
W77-08329

Effluent Guidelines and Standards for Fer izer Manufacturing Point Source Catego Nitric Acid Subcategory.
W77-08360

Breaking Down Solid and Liquid Waste to Form a Fertilizer--By Inoculation with Selected Fungi and Fermentation.
W77-08559 5E

FILL AND DREDGE PERMITS
Federal Control Over Wetland Areas: The Corps of Engineers Expands its Jurisdiction,
W77-08123 5G

FILL PERMITS
Federal Water Pollution Control Act Amendments of 1972 Reach Polluting Activities Occurring Above Mean-High Water Line (Comment on U. S. V. Holland).
W77-08118 5G

FILMS
Drift Velocities of Surface Films Over Waves,
W77-08193 5B

FILTERS
Performance of Dual-Media Filters--I,
W77-08273 5D

Treatment of High Strength Acidic Waste Water with a Completely Mixed Anaerobic Filter,
W77-08524 5D

Unstratified-Bed Filtration of Waste Water,
W77-08537 5D

Travelling Grate-Type Filtration System Uses Pulverized Coal to Lower BOD of Wastewater.
W77-08577 5D

Filters and Sludge Drying Beds,
W77-08586 5D

Horsham's Sewage Works,
W77-08595 5D

FILTRATION
Performance of Dual-Media Filters--I,
W77-08273 5D

Performance of Dual-Media Filters--II,
W77-08274 5D

Role of Polyelectrolytes in the Filtration of Colloidal Particles from Water and Wastewater,
W77-08339 5D

Confirmation of the Single-Step Membrane Filtration Procedure for Estimating Pseudomonas Aeruginosa Densities in Water,
W77-08518 5A

Treatment of High Strength Acidic Waste Water with a Completely Mixed Anaerobic Filter,
W77-08524 5D

Dewatering: A New Method Bows,
W77-08528 5D

Unstratified-Bed Filtration of Waste Water,
W77-08537 5D

Screening Apparatus for Removal of Solids--from Sewage with Rotating Screen and Vertical Lift for Residues.
W77-08562 5D

Travelling Grate-Type Filtration System Uses Pulverized Coal to Lower BOD of Wastewater.
W77-08577 5D

Horsham's Sewage Works,
W77-08595 5D

FINITE DIFFERENCE METHOD
On the Relationship Between the Finite Element and Finite Difference Methods,
W77-08168 7A

FINITE ELEMENT ANALYSIS
On the Relationship Between the Finite Element and Finite Difference Methods,
W77-08168 7A

Methodology for Applying the Finite Element Method to Partially Stratified Estuaries,
W77-08198 2L

A Finite Element Model to Determine the Effect of Land-Use Changes on Flood Hydrographs,
W77-08450 8B

FIRST ORDER KINETICS
The Mathematical Description of the BOD Reaction in Stream Water,
W77-08493 5B

A Comparison of the Methods for Calculating the Constants for the First Order BOD Equation,
W77-08494 5B

FISH
27th Northwest Fish Culture Conference.
W77-08309 2I

FISH CULTURE
27th Northwest Fish Culture Conference.
W77-08309 2I

FISH HATCHERIES
27th Northwest Fish Culture Conference.
W77-08309 2I

Reproduction Rate and Productivity of Bacteria in the Ponds of the Karamet-Niyaz Fishery Farm, (In Russian),
W77-08462 5C

FISH PARASITES
Population Dynamics and Species Diversity of Ichthyo-Parasitofauna of the Buffalo National River,
W77-08446 5C

FLAMBEAU RIVER (WIS)
Simulation of Streamflow of Flambeau River at Park Falls, Wisconsin to Define Low-Flow Characteristics,
W77-08172 2E

FLASH FLOODS
Flash Floods in the Western Mediterranean (Les Crues Catastrophiques sur la Mediterranee Occidentale),
W77-08245 2E

Flash Floods in Spain (Les Crues Brutales En Espagne),
W77-08247 2E

The Operation of a Flood Warning Network: Its Use for Studying Flash Floods (Exploitation D'un Reseau D'alerte: Son Utilisation Pour L'etude Des Crues Brutales),
W77-08248 2E

A Methodology for Measuring Flash Floods (Methodologie Pour La Mesure Des Crues Brutales),
W77-08249 2E

Recent Flash Floods of the Dison Brook (Crues Brutales Recentes Du 'Ruisseau' De Dison (Belgique): Observations Et Previsions),
W77-08250 4A

FLEXIBILITY
States Need Freedom to Innovate (Comment on PL 92-500).
W77-08119 6E

FLOCCULATION
Effluent Emphasis Underlines Environmental Effort at Enpocon,
W77-08579 5D

FLOOD CONTROL
Wood V. Board of Commissioners for the Pontchartrain Levee District (Land Appropriation for Levees),
W77-08144 6E

Hydrologic Effects of the Tampa Bypass Canal System,
W77-08182 4A

Flood Management: Who Benefits and Who Pays,
W77-08303 6F

Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

Flood Plains for Open Space and Recreation.
W77-08374 6F

Report on Water Resources Problems of Western Collier County, Florida as Affected by the GAC Corporation's Canal System in Its Golden Gate Development Project,
W77-08380 6E

FLOOD DAMAGE
Mitchell V. City of High Point (Municipal Liability for Damage from Overflow of Privately-Owned Stream).
W77-08145 6E

FLOOD DATA
Small-Stream Flood Investigations in Minnesota, October 1958 to September 1975,
W77-08481 2E

FLOOD DISCHARGE
Flash Floods in Spain (Les Crues Brutales En Espagne),
W77-08247 2E

FLOOD MANAGEMENT
Flood Management: Who Benefits and Who Pays,
W77-08303 6F

FLOOD PLAINS
Flood Plains for Open Space and Recreation.
W77-08374 6F

FLOOD PROFILES
Floods of November 12, 1974, in the Charlotte Amalie Area, St. Thomas, U.S. Virgin Islands,
W77-08470 7C

FLOOD PROTECTION
Analyses of Water, Core Material, and Elutriate Samples Collected Near New Orleans, Louisiana (Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project),
W77-08165 8D

Flood Management: Who Benefits and Who Pays,
W77-08303 6F

FLOOD RECURRENCE INTERVAL
Floods of November 12, 1974, in the Charlotte Amalie Area, St. Thomas, U.S. Virgin Islands,
W77-08470 7C

FLOOD WARNING NETWORKS
The Operation of a Flood Warning Network: Its Use for Studying Flash Floods (Exploitation D'un Reseau D'alerte: Son Utilisation Pour L'etude Des Crues Brutales),
W77-08248 2E

FLOODING
Anderson V Yearous (Rights of Dominant Owners to Unobstructed Use of Drainage Easements).
W77-08392 6E

FLOODS
Measurement of Flash Floods in the United States--State of the Art,
W77-08161 2E

The Flooding of Rivers in the USSR and the Measures Taken to Control Ice Jams (Les Inondations Fluviales En URSS Et La Lutte Contre Les Crues Causees Par Les Embacles),
W77-08246 2C

Floods of November 12, 1974, in the Charlotte Amalie Area, St. Thomas, U.S. Virgin Islands,
W77-08470 7C

Annual Peak Discharges from Small Drainage Areas in Montana Through September 1976,
W77-08482 2E

FLORIDA
Federal Statutory Modification of Private Water Rights in South Florida,
W77-08112 6E

Water Resources of the Myakka River Basin Area, Southwest Florida,
W77-08167 4B

Hydrologic Effects of the Tampa Bypass Canal System,
W77-08182 4A

Report on Water Resources Problems of Western Collier County, Florida as Affected by the GAC Corporation's Canal System in Its Golden Gate Development Project,
W77-08380 6E

Dissolved Solids, Hardness, and Orthophosphate of Surface-Water Runoff in the Northwest Florida Water Management District,
W77-08467 7C

FLOTATION
Air Flotation of Oily Waste Waters with Organic Coagulants,
W77-08282 5D

Effluent Emphasis Underlines Environmental Effort at Enpocon,
W77-08579 5D

FLOW CHARACTERISTICS
Simulation of Streamflow of Flambeau River at Park Falls, Wisconsin to Define Low-Flow Characteristics,
W77-08172 2E

The Effect of Aeration of Water Jet Spreading,
W77-08197 8B

Effect of Lateral Inflow on Steady Open Channel Flows,
W77-08290 2E

FLOW CONTROL
Aubert V Town of Fruita (Senior Direct Flow Rights Favored in Dispute Over Dam).
W77-08390 6E

Computer Program for Reservoir-Water Budgets,
W77-08464 4A

FLOW SYSTEM
Ground Water Recharge in Eastern Connecticut Based on Simulation Modeling,
W77-08344 2F

FLUID FRICTION
It's Your Loss,
W77-08319 8G

FLUORESCENCE
Spectroanalytical Parameters of Fungal Metabolites: Oosporein and Desmethoxyviridiol,
W77-08449 2K

FLUORESCENT DYE
Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

FLUORIDE
Sanitary and Hygienic Characteristics of Subsurface Waters of the Tselinograd and Turgai Oblasts, (In Russian),
W77-08253 5B

FLUORIDE ANALYSIS
Fluoride Analysis of Water-Treatment-Plant Sludges,
W77-08342 5F

FLUORIDES
Fluoride Analysis of Water-Treatment-Plant Sludges,
W77-08342 5F

FOOD CHAINS
Biochemical Transformation and Detoxification of Mercury in Aquatic Environment,
W77-08289 5C

Characteristics of the Biotic Cycle of Lake Baikal, (In Russian),
W77-08321 2H

FOOD PROCESSING INDUSTRY
Waste Impoundment Efficiency at Sugar Mill,
W77-08268 5D

Bacteriological Investigation of Alberta Meat-Packing Plant Wastes with Emphasis on Salmonella Isolation,
W77-08269 5D

Occupational Characteristics and Biological Kinetic Constants of Extended Aeration Process,
W77-08270 5D

American Frozen Food v Train ('Guidelines' and 'Effluent Limitations' for the Potato Process Industry Pursuant to the Federal Water Pollution Control Act Amendments of 1972).
W77-08386 6E

Investigation of Coagulation - Precipitation and Ultrafiltration for the Regeneration of Brines in the Cucumber Pickle Industry,
W77-08511 5D

FOODS
Comparative Examination of Enterococci Obtained from Drinking Water, Foodstuffs and Urine, (In German),
W77-08179 5A

Improving Food Crop Production in the Sudan Savanna Zone of Northern Nigeria,
W77-08459 3F

FORECASTING
A Simulation of an Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W77-08343 3F

A Predictive Phosphorus Model for Lakes - Sensitivity Analysis and Applications,
W77-08499 5C

FOREIGN COUNTRIES
The Use of LANDSAT-1 Imagery for Water Quality Studies in Southern Scandinavia,
W77-08435 5A

FOREST FIRES
Mapping of the Wildland Fuel Characteristics of the Santa Monica Mountains of Southern California,
W77-08419 7C

FOREST MANAGEMENT
Operational Considerations for the Application of Remotely Sensed Forest Data from LANDSAT or Other Airborne Platforms,
W77-08417 7C

Timber Type Separability in Southeastern United States on LANDSAT-1 MSS Data,
W77-08418 4A

Mapping of the Wildland Fuel Characteristics of the Santa Monica Mountains of Southern California,
W77-08419 7C

Computer Analysis and Mapping of Gypsy Moth Defoliation Levels in Pennsylvania Using LANDSAT-1 Digital Data,
W77-08420 7C

Computer Implemented Classification of Vegetation Using Aircraft Acquired Multispectral Scanner Data,
W77-08421 4A

FOREST SOILS
Spray Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soil,
W77-08202 5D

FOREST WATERSHEDS
Forest Fertilization and Water Quality in the North Carolina Piedmont,
W77-08508 5B

FORESTS
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2C

FORWARD OSMOSIS
Forward Osmosis Extractors,
W77-08340 3A

FOULING ORGANISMS
The Productivity of Fouling Organism Associations in Lake Zelenetskoe, (In Russian),
W77-08323 5C

FOX CHAIN OF LAKES (ILL)
Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2B

FRACTURED BEDROCK
Ground Water Recharge in Eastern Connecticut Based on Simulation Modeling,
W77-08344 2F

FRACTURES (GEOLOGY)
100 Mesh Sand Improves Hydraulic Frac Results.
W77-08312 4B

FRAGIPAN HORIZON (SOILS)
Root Growth, Strength, and Chemical Properties of a Hobson Fragipan,
W77-08285 2G

FRANCE
Measurement of Ice Movement in Subglacial Cavities: A New Cavitometer Beneath the Glacier D'Argentiere (Mt Blanc, France),
W77-08238 2C

A Methodology for Measuring Flash Floods (Methodologie Pour La Mesure Des Crues Brutales),
W77-08249 2E

FRANCE (FRANCHE-COMTE)
Deep Water Resources of the Limestones of Franche-Comte: Problems of Quantity and Quality, (In French),
W77-08122 4B

FREEZING
Determination of BOD After Freezing Water Samples (Bestimmung des BSB nach Einfrierung der Wasserproben),
W77-08546 5A

FREQUENCY ANALYSIS
A Note on the Study of Rainy Days and Wet Spells at Bijapur,
W77-08455 2B

FRESHWATER
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

FRICTION LOSS
It's Your Loss,
W77-08319 8G

FRONT RANGE MOUNTAIN RESERVOIRS (COLO)
Inventory of Colorado's Front Range Mountain Reservoirs,
W77-08107 6B

FROST
On Depth Hoar and the Strength of Snow,
W77-08239 2C

FULVIC ACIDS
Fulvic Acid-Metal Ion Interactions in Water,
W77-08102 5A

FUNGAL METABOLITES
Spectroanalytical Parameters of Fungal Metabolites: Oosporein and Desmethoxyviridiol,
W77-08449 2K

FUNGI
Breaking Down Solid and Liquid Waste to Form a Fertilizer–By Inoculation with Selected Fungi and Fermentation.
W77-08559 5E

FUTURE PLANNING (PROJECTED)
Input-Output Modeling in Water Resources System Planning,
W77-08346 6A

GALERKIN-FINITE ELEMENT METHOD
On the Relationship Between the Finite Element and Finite Difference Methods,
W77-08168 7A

GALVESTON COUNTY (TEX)
The Rationale for Attempting to Define Salt Marsh Mosquito-Breeding Areas in Galveston County by Remote Sensing the Associated Vegetation.
W77-08428 4A

GAMMA RAYS
Rainfall Infiltration Characteristics for a Semi-Arid Watershed Soil,
W77-08206 2G

GAS EXCHANGE
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

GASES
Higher Gas Yields and Reduced Retention Times Obtained from Anaerobic Digester,
W77-08600 5D

GENERALIZED PLANNING SYSTEM
Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6B

GEOCHEMISTRY
Groundwater Resources of Guam: Occurrence and Development,
W77-08448 4B

GEOGRAPHICAL METHODS
Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

GEOMORPHOLOGY
Channelization: Environmental, Geomorphic and Engineering Aspects,
W77-08352 8D

GEORGIA
Ponce de Leon Condominiums v Digirolamo (Developer Responsible for Control of Surface Runoff).
W77-08136 6E

GEOTHERMAL PROGRAM (ERDA)
The ERDA Geothermal Program,
W77-08314 4B

GEOTHERMAL RESERVOIRS
True-Temperature Determination of Geothermal Reservoirs,
W77-08318 7B

GEOTHERMAL STUDIES
Subsurface-Temperature Data for Some Wells in Western Utah,
W77-08166 7C

An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

The ERDA Geothermal Program,
W77-08314 4B

True-Temperature Determination of Geothermal Reservoirs,
W77-08318 7B

A Preliminary Analysis of the Energy and Water Requirements for Developing Geothermal Energy in Arizona,
W77-08351 4B

GLACIATION
Delineation of the Boundaries of a Buried Pre-Glacial Valley with LANDSAT-1 Data,
W77-08415 2G

GLACIER D'ARGENTIERE (FRANCE)
Measurement of Ice Movement in Subglacial Cavities: A New Cavitometer Beneath the Glacier D'Argentiere (Mt Blanc, France),
W77-08238 2C

GLACIERS
Radio-Echo Sounding of Temperate Glaciers: Ice Properties and Sounder Design Criteria,
W77-08229 2C

Radio-Echo Sounding: Reflections from Internal Layers in Ice Sheets,
W77-08230 2C

A New Climatic Model for Glacier Behavior of the Austrian Alps,
W77-08235 2C

Stress in an Elastic Bedrock Hump Due to Glacier Flow,
W77-08236 2C

Measurement of Ice Movement in Subglacial Cavities: A New Cavitometer Beneath the Glacier D'Argentiere (Mt Blanc, France),
W77-08238 2C

Relocation of Buried Markers,
W77-08240 2C

Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

GLACIOLOGY
Vertical Strain-Rate Measurements in an Arctic Ice Cap and Deductions from Them,
W77-08226 2C

A Further Comparison of Glacier Velocities Measured by Radio-Echo and Survey Methods,
W77-08228 2C

GLENWOOD SPRINGS (COLO)
An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

GOVERNMENT SUPPORTS
The ERDA Geothermal Program,
W77-08314 4B

GOVERNMENTAL INTERRELATIONS
Water Resource Policies and Authorities, Coastal Zone Management Program Implementation,
W77-08114 6E

States Need Freedom to Innovate (Comment on PL 92-500).
W77-08119 6E

Can a State Embargo the Export of Water by Transbasin Diversions,
W77-08129 6E

Sovereignty and the Control of Water Pollution,
W77-08366 5G

Ticket to Thermidor: A Commentary on the Proposed California Coastal Plan,
W77-08379 6B

City of York V. Pennsylvania Department of Environmental Resources (Delegation of Authority Under the Pennsylvania Waste Management Act).
W77-08403 6E

GRASSES
Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

Growth of Tropical and Temperate Grasses at Palmerston North I. Warm-Season Yields With and Without Irrigation,
W77-08457 3F

Potential of New Summer Grasses in Northland: I. Warm-Season Yields Under Dry-land and Irrigation,
W77-08458 3F

GRASSLANDS
Usefulness of LANDSAT Data for Monitoring Plant Development and Range Conditions in California's Annual Grassland,
W77-08411 4A

GRAVEL PACKING
Resin-Coated Gravel is Used to Help Control Sand,
W77-08316 8G

GRAVELS
Resin-Coated Gravel is Used to Help Control Sand,
W77-08316 8G

GREAT BRITAIN
Trends in Small Sewage Treatment Plants,
W77-08569 5D

GREAT LAKES
Beach Profile Changes: East Coast of Lake Michigan, 1970-72,
W77-08440 2J

GREAT PLAINS
Monitoring Vegetation Conditions from LANDSAT for Use in Range Management,
W77-08412 4A

GREAT SALT LAKE
Solar Salt Company V Southern Pacific Transportation Company (Alteration of Saline Content of Great Salt Lake is Not Pollution Under Utah Statute).
W77-08146 6E

Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

Great Salt Lake Management and Development.
W77-08407 6E

GROUNDWATER
Water Resources Data for Indiana, Water Year 1975,
W77-08162 7C

Selected Water-Level Records for Western Oklahoma, 1950-1975,
W77-08163 7C

Ground-Water Data for 1974-75 in Joshua Tree National Monument, California,
W77-08164 7C

U S Geological Survey, Water Resources Division, Radiocarbon Measurements I,
W77-08169 4B

Water Resources Data for Illinois, Water Year 1975,
W77-08184 7C

Water Resources Data for Nevada, Water Year 1975,
W77-08185 7C

Effect of Dip on the Subsurface Storage or Disposal of Fluid in Saline Aquifers,
W77-08204 4B

Effect of Viscosity Ratio on the Recovery of Fresh Water Stored in Saline Aquifers,
W77-08205 4B

Applications of Surface Resistivity Methods,
W77-08244 2F

Sanitary and Hygienic Characteristics of Subsurface Waters of the Tselinograd and Turgai Oblasts, (In Russian),
W77-08253 5B

Water-Level Decline and Pumpage in Deep Wells in the Chicago Region, 1971-1975,
W77-08302 2F

Water-Resources Investigations in South Dakota, 1976.
W77-08468 7C

Water Resources Data for Connecticut, Water Year 1975,
W77-08480 7C

Water Resources Data for New York, Water Year 1975.
W77-08485 7C

Allocating Buried Treasure: Federal Litigation Involving Interstate Ground Water,
W77-08491 6E

GROUNDWATER AVAILABILITY
Ground-Water Resources of Vanderburgh County, Indiana,
W77-08170 4B

GROUNDWATER LAW
Water Supply and Control Developments Summarized, (Arizona).
W77-08313 6E

GROUNDWATER LEGISLATION
Water Supply and Control Developments Summarized, (Arizona).
W77-08313 6E

GROUNDWATER MANAGEMENT
Farmers Investment Company V Bettwy (Doctrine of Reasonable Use as Applied to Groundwaters).
W77-08137 6E

Wood V. Board of Commissioners for the Pontchartrain Levee District (Land Appropriation for Levees),
W77-08144 6E

Water Rights Generally; Appropriation.
W77-08393 6E

GROUNDWATER MOVEMENT
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

Effect of Dip on the Storage of Fresh Water (or the Disposal of Waste) in a Saline Aquifer,
W77-08288 4B

GROUNDWATER RECHARGE
Effect of Dip on the Storage of Fresh Water (or the Disposal of Waste) in a Saline Aquifer,
W77-08288 4B

Ground Water Recharge in Eastern Connecticut Based on Simulation Modeling,
W77-08344 2F

GROUNDWATER RESOURCES
Deep Water Resources of the Limestones of Franche-Comte: Problems of Quantity and Quality, (In French),
W77-08122 4B

Farmers Investment Company V Bettwy (Doctrine of Reasonable Use as Applied to Groundwaters).
W77-08137 6E

Water Resources of the Myakka River Basin Area, Southwest Florida,
W77-08167 4E

Ground-Water Resources of Vanderburgh County, Indiana,
W77-08170 4E

Ground Water in the San Juan Metropolitan Area, Puerto Rico,
W77-08173 4E

Ground-Water Basic Data for Ramsey County, North Dakota,
W77-08177 7C

Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

Groundwater Resources of Guam: Occurrence and Development,
W77-08448 4J

Bacteriological Pollution in the Drinking-Water of Jordan,
W77-08454 5B

The Eutaw-McShan Aquifer in Mississippi,
W77-08466 7C

Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975,
W77-08469 4B

Maps Showing Ground-Water COnditions in the Puerco-Zuni Area, Apache and Navajo Counties, Arizona--1975,
W77-08471 7C

Digital-Model Analysis of the Effects of Water Use Alternatives on Spring Discharges, Gooding and Jerome Counties, Idaho,
W77-08484 4B

GROUNDWATER RESOURCES (GUAM)
Groundwater Resources of Guam: Occurrence and Development,
W77-08448 4J

GROWTH RATES
A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

GUAM
Groundwater Resources of Guam: Occurrence and Development,
W77-08448 4J

GULF COASTAL PLAIN
Water Quality in the Texas Coastal Basins,
W77-08465

DEPART U. OF I. URBANA-CHAMP

GYPSY MOTHS DEFOLIATION
Computer Analysis and Mapping of Gypsy Moth Defoliation Levels in Pennsylvania Using LANDSAT-1 Digital Data,
W77-08420 7C

HARBORS
Effects of 40-Foot Charleston Harbor Project on Tides, Currents, and Salinities; Hydraulic Model Investigation,
W77-08222 2L

HARDNESS (WATER)
Dissolved Solids, Hardness, and Orthophosphate of Surface-Water Runoff in the Northwest Florida Water Management District,
W77-08467 7C

HAZARDOUS SUBSTANCES (POLLUTION)
The Import - Export Clause and Control of Oil Pollution: Regulatory Fee Imposed Pursuant to the Police Power,
W77-08354 5G

Oil Spills and Spills of Hazardous Substances.
W77-08385 5G

HEATED WATER
Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

HEATING
An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

HEAVY METALS
A Survey of Cadmium Occurrence and Concentration in Fish from Eleven Major Reservoirs in South Carolina,
W77-08192 5A

Chelating Agent Analysis by High Speed Liquid Chromatography,
W77-08286 5A

The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

Development of a Column Chromatography Method for Field of Pre-Concentration of Trace Metals with Application to the Haw-Cape Fear Rivers, N.C.,
W77-08299 5A

HELLS CANYON
Pumped Storage Potential of the Hells Canyon Area,
W77-08196 8C

HEXACHLOROBENZENE
Sources, Characteristics and Treatment and Disposal of Industrial Wastes Containing Hexachlorobenzene,
W77-08265 5D

HIGH WATER TABLE SOILS
A Water Management Model for High Water Table Soils,
W77-08301 3F

HISARS MANUAL
A Guide to the Use of HISARS -- A Hydrologic Information Storage and Retrieval System,
W77-08445 7C

HONG KONG
Kowloon Sewage Treatment and Disposal,
W77-08573 5D

HOST PLANTS
The Use of Skylab Data to Study the Early Detection of Insect Infestations and Density and Distribution of Host Plants,
W77-08422 7C

HUMAN DISEASES
Bacteriological Pollution in the Drinking-Water of Jordan,
W77-08454 5B

HUMIC ACIDS
Fulvic Acid-Metal Ion Interactions in Water,
W77-08102 5A

Detection of Phosphate Adsorption onto Coal Humic Acids,
W77-08294 5A

HUMUS
Horsham's Sewage Works,
W77-08595 5D

HYDRAULIC CONDUCTIVITY
Root Growth, Strength, and Chemical Properties of a Hobson Fragipan,
W77-08285 2G

Ground Water Recharge in Eastern Connecticut Based on Simulation Modeling,
W77-08344 2F

Drainable Porosity Evaluation and its Relationship to Hydraulic Conductivity and Exchangeable Cations Under Different Bulk Densities,
W77-08461 4A

HYDRAULIC FRACTURING
100 Mesh Sand Improves Hydraulic Frac Results.
W77-08312 4B

HYDRAULIC GRADIENT
Ground Water Recharge in Eastern Connecticut Based on Simulation Modeling,
W77-08344 2F

HYDRAULIC MODELS
Effects of 40-Foot Charleston Harbor Project on Tides, Currents, and Salinities; Hydraulic Model Investigation,
W77-08222 2L

Ground Water Recharge in Eastern Connecticut Based on Simulation Modeling,
W77-08344 2F

HYDRODYNAMICS
The Effect of Aeration of Water Jet Spreading,
W77-08197 8B

HYDROELECTRIC PLANTS
Pumped Storage Potential of the Hells Canyon Area,
W77-08196 8C

HYDROELECTRIC POWER
Pumped-Storage in the Pacific Northwest, An Inventory.
W77-08224 2H

HYDROELECTRIC POWER LICENSING
Appropriation of Water for Power (Hydroelectric Power Projects).
W77-08395 6E

HYDROGEN ION CONCENTRATION
Effects of pH and Inorganic Carbon Concentrations Upon Competition Between Anabaena flos-aquae and Selenastrum capricornutum,
W77-08200 5C

Is pH Pretreatment Necessary,
W77-08276 5D

Reliable pH Measurement When Effluent Conditions Get Tough,
W77-08592 5A

HYDROGEOLOGY
Summary of Some Current and Possible Future Environmental Problems Related to Geology and Hydrology at Memphis, Tennessee,
W77-08174 4C

Geohydrology of the Englishtown Formation in the Northern Coastal Plain of New Jersey,
W77-08175 2F

Ground Water Recharge in Eastern Connecticut Based on Simulation Modeling,
W77-08344 2F

Groundwater Resources of Guam: Occurrence and Development,
W77-08448 4B

The Eutaw-McShan Aquifer in Mississippi,
W77-08466 7C

HYDROLOGIC ASPECTS
Summary of Some Current and Possible Future Environmental Problems Related to Geology and Hydrology at Memphis, Tennessee,
W77-08174 4C

HYDROLOGIC BOUNDARIES
Hydrologic Unit Map--1974, State of Texas.
W77-08474 7C

Hydrologic Unit Map--1974, State of Oklahoma.
W77-08475 7C

Hydrologic Unit Map--1974, State of South Dakota.
W77-08476 7C

Hydrologic Unit Map--1974, State of Kansas.
W77-08477 7C

HYDROLOGIC BUDGET
Computer Program for Reservoir-Water Budgets,
W77-08464 4A

HYDROLOGIC DATA
Water Resources Data for Indiana, Water Year 1975,
W77-08162 7C

Ground-Water Basic Data for Ramsey County, North Dakota,
W77-08177 7C

Selected Hydrologic Data, Uinta Basin Area, Utah and Colorado,
W77-08183 7C

Water Resources Data for Illinois, Water Year 1975,
W77-08184 7C

Water Resources Data for Nevada, Water Year 1975,
W77-08185 7C

Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2H

HYDROLOGIC DATA

A Guide to the Use of HISARS -- A Hydrologic Information Storage and Retrieval System,
W77-08445 7C

Water-Resources Investigations in South Dakota, 1976.
W77-08468 7C

Water Resources Data for Connecticut, Water Year 1975,
W77-08480 7C

Water Resources Data for New York, Water Year 1975.
W77-08485 7C

HYDROLOGIC PROPERTIES

Geohydrology of the Englishtown Formation in the Northern Coastal Plain of New Jersey,
W77-08175 2F

HYDROLOGIC UNIT MAPS (KANS)

Hydrologic Unit Map--1974, State of Kansas.
W77-08477 7C

HYDROLOGIC UNIT MAPS (OKLA)

Hydrologic Unit Map--1974, State of Oklahoma.
W77-08475 7C

HYDROLOGIC UNIT MAPS (S DAK)

Hydrologic Unit Map--1974, State of South Dakota.
W77-08476 7C

HYDROLOGIC UNIT MAPS (TEX)

Hydrologic Unit Map--1974, State of Texas.
W77-08474 7C

HYDROLOGY

Application of Three Daily-Rainfall Runoff Models to Four Australian Catchments,
W77-08218 2A

Channelization: Environmental, Geomorphic and Engineering Aspects,
W77-08352 8D

Hydrologic Unit Map--1974, State of Texas.
W77-08474 7C

Hydrologic Unit Map--1974, State of Oklahoma.
W77-08475 7C

Hydrologic Unit Map--1974, State of South Dakota.
W77-08476 7C

Hydrologic Unit Map--1974, State of Kansas.
W77-08477 7C

HYPOPHTHALMICHTHYS-MOLITRIX

Hypophthalmichthys Molitrix (Val.)) for Increasing Fish Productivity and Decreasing the Level of Eutrophication of Dnieper Reservoirs, (In Russian),
W77-08364 5C

ICE

Vertical Strain-Rate Measurements in an Arctic Ice Cap and Deductions from Them,
W77-08226 2C

Resurvey of the 'Byrd' Station, Antarctica, Drill Hole,
W77-08227 2C

A Further Comparison of Glacier Velocities Measured by Radio-Echo and Survey Methods,
W77-08228 2C

Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

ICE JAMS

The Flooding of Rivers in the USSR and the Measures Taken to Control Ice Jams (Les Inondations Fluviales En URSS Et La Lutte Contre Les Crues Causees Par Les Embacles),
W77-08246 2C

ICE SHEETS

Radio-Echo Sounding: Reflections from Internal Layers in Ice Sheets,
W77-08230 2C

ICI DEEP SHAFT EFFLUENT TREATMENT SYSTEM

ICI Effluent System to be Used in Essex.
W77-08590 5D

IDAHO

Sale of Water Rights,
W77-08140 6E

Department of Water Resources,
W77-08141 6E

Bear River Compact,
W77-08155 6E

The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

Should Rivers Have Running. Toward Extension of the Reserved Rights Doctrine to Include Minimum Stream Flows,
W77-08372 6E

Water Rights Generally; Appropriation.
W77-08393 6E

Artesian Wells.
W77-08397 6E

Digital-Model Analysis of the Effects of Water-Use Alternatives on Spring Discharges, Gooding and Jerome Counties, Idaho,
W77-08484 4B

ILLINOIS

Let's Have Achievable 'Safe' Drinking Water,
W77-08127 5G

Water Resources Data for Illinois, Water Year 1975,
W77-08184 7C

Water and Energy Systems: A Planning Model,
W77-08212 6A

Water-Level Decline and Pumpage in Deep Wells in the Chicago Region, 1971-1975,
W77-08302 2F

From Good Husbandry to Reasonable Use: Illinois Surface Water Drainage Law Evolves in Subdivision Case,
W77-08353 4A

Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2H

Digital-Computer Model of the Sandstone Aquifer in Southeastern Wisconsin,
W77-08478 2F

IMPOUNDMENTS

Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

INCINERATION

S. W.'s Sludge Incineration scheme,
W77-08570 5E

Incineration Solves Tough Waste Problems.
W77-08576 5E

Fluid Bed for Sewage Sludge Burn Up,
W77-08582 5E

INDIA (BIJAPUR)

A Note on the Study of Rainy Days and Wet Spells at Bijapur,
W77-08455 2E

INDIAN RESERVATIONS

The Winters Doctrine and How It Grew Federal Reservation of Rights to Use of Water
W77-08375 6E

INDIAN WATER RIGHTS

The Winters Doctrine and How It Grew Federal Reservation of Rights to Use of Water
W77-08375 6E

INDIANA

Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6

Discriminant Analysis of Characteristics Determining Acceptance or Rejection of Nuclear Power,
W77-08109 6

Water Resources Data for Indiana, Water Year 1975,
W77-08162 7

Ground-Water Resources of Vanderburg County, Indiana,
W77-08170 4

Delineation of the Boundaries of a Buried Pr Glacial Valley with LANDSAT-1 Data,
W77-08415 2

Application of EREP, LANDSAT and Aircra Image Data to Environmental Problems Relate to Coal Mining,
W77-08429 5

INDUSTRIAL PRODUCTION

American Petroleum Institute V Environment Protection Agency (Challenge to EPA Standards for Refineries Under the FWPC Amendments of 1972).
W77-08394

INDUSTRIAL WASTES

Standards of Performance and Pretreatme Standards for the Explosives Manufacturi Point Source Category (Proposed Rules),
W77-08113

Involvement of Free Radicals in the Cataly Oxidation of Phenol in Aqueous Solution,
W77-08201

Method of Purification of Waste Water Treatment with Zirconium Salt,
W77-08255

Kraft Mill Recovery System,
W77-08258

Bacteriological Investigation of Alberta Meat-Packing Plant Wastes with Emphasis on Salmonella Isolation,
W77-08269 5D

Characterization and Treatment of Textile Dyeing Wastewaters,
W77-08278 5D

Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

Taking Acres Out of Pollution-Control Plans,
W77-08283 5D

American Frozen Food v Train ('Guidelines' and 'Effluent Limitations' for the Potato Process Industry Pursuant to the Federal Water Pollution Control Act Amendments of 1972).
W77-08386 6E

Possibilities and Role of Biological Analysis in Evaluating the Degree of Pollution of Water Bodies, (In Russian),
W77-08430 5A

Removing Soluble Metals from Waste Water,
W77-08591 5D

INDUSTRIAL WATER
Year Round Cooling Water from the Cold Weather of Winter,
W77-08251 5D

INDUSTRIES
Summary of Some Current and Possible Future Environmental Problems Related to Geology and Hydrology at Memphis, Tennessee,
W77-08174 4C

INFILTRATION
Rainfall Infiltration Characteristics for a Semi-Arid Watershed Soil,
W77-08206 2G

INFORMATION RETRIEVAL
A Computerized Information System Relating to Arizona's Water Resources,
W77-08307 7C

A Guide to the Use of HISARS -- A Hydrologic Information Storage and Retrieval System,
W77-08445 7C

INFORMATION SYSTEMS
A Computerized Information System Relating to Arizona's Water Resources,
W77-08307 7C

INFRARED RADIATION
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

INJECTION WELLS
Effect of Dip on the Storage of Fresh Water (or the Disposal of Waste) in a Saline Aquifer,
W77-08288 4B

INJUNCTIONS (PROHIBITORY)
Environmental Protection Through the Common Law,
W77-08133 6G

INJUNCTIVE RELIEF
Sierra Club V Stamm (National Environmental Policy Act Does Not Require Comprehensive Environmental Impact Statement on Large Reclamation Project When EIS have been Prepared for Viable Portion of Project).
W77-08147 6E

Natural Resources Defense Council V Stamm (National Environmental Policy Act Not Satisfied When EIS Fails to Discuss All Reasonable Alternatives to the Project).
W77-08148 6E

Water Resources Commission V. Connecticut Sand and Stone Corporation (Judicial Review of Administrative Factual Determination).
W77-08404 6E

INLAND LAKE DEMONSTRATION PROJECT
University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

INLAND WETLAND IDENTIFICATION
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

INPUT-OUTPUT ANALYSIS
Input-Output Modeling in Water Resources System Planning,
W77-08346 6A

INSECT CONTROL
An Overview of the Development of Remote Sensing Techniques for the Screwworm Eradication Program,
W77-08427 3F

The Rationale for Attempting to Define Salt Marsh Mosquito-Breeding Areas in Galveston County by Remote Sensing the Associated Vegetation.
W77-08428 4A

INSECT INFESTATIONS
The Use of Skylab Data to Study the Early Detection of Insect Infestations and Density and Distribution of Host Plants,
W77-08422 7C

INSPECTION
Cementing Oil and Gas Wells, Part 2 - Casing Inspection and Pipe Handling Methods, Including Thread Make-Up Control,
W77-08327 8F

INSTITUTIONAL CONSTRAINTS
Improving Institutional Arrangements for Water Development in the State of Washington: Developmental and Environmental Trade-Offs and Constraints,
W77-08284 6E

INSTITUTIONS
University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

Improving Institutional Arrangements for Water Development in the State of Washington: Developmental and Environmental Trade-Offs and Constraints,
W77-08284 6E

Planning Challenges in the Management of Coastal Zone Water Resources,
W77-08376 6B

INSTREAM FLOW
Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

INSTRUMENTATION
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5A

Measurement of Ice Movement in Subglacial Cavities: A New Cavitometer Beneath the Glacier D'Argentiere (Mt Blanc, France),
W77-08238 2C

A Controllable Automated Environmental Data Acquisition and Monitoring System,
W77-08441 7C

Invertebrate Colonization of Artificial Substrates in San Leandro Creek,
W77-08443 5A

INTAKES
Marine Life Protector,
W77-08262 8I

INTER-BASIN TRANSFER
Can a State Embargo the Export of Water by Transbasin Diversions,
W77-08129 6E

Determination of Water-Resources Policies in Arid Lands,
W77-08453 6B

INTERNATIONAL BOUNDARY AND WATER COMMISSION
Restless River: International Law and the Behavior of the Rio Grande,
W77-08384 6E

INTERNATIONAL COMMISSIONS
The Environmental Problem of the Oceans: An International Stepchild of National Egotism,
W77-08367 6E

Emerging Legal Concepts in the Harmonization of Water Resources Development and Environmental Protection,
W77-08378 6E

INTERNATIONAL HYDROLOGICAL DECADE
Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

INTERNATIONAL LAW
Final Report of Committee VII (Final Recommendations of the International Conference on Water Law and Administration),
W77-08187 6E

INTERNATIONAL WATERS
Remembering Maine: Offshore Federalism in the United States and Canada,
W77-08363 6E

INTERSTATE COMMERCE
Federal Control Over Wetland Areas: The Corps of Engineers Expands its Jurisdiction,
W77-08123 5G

INTERSTATE COMMISSIONS
Interstate Stream Commission (Creation, Membership, General Powers).
W77-08402 6E

INTERSTATE COMPACTS
Can a State Embargo the Export of Water by Transbasin Diversions,
W77-08129 6E

INTERSTATE RIVERS
Can a State Embargo the Export of Water by Transbasin Diversions,
W77-08129 6E

Compliance with the Provisions of the Federal Water Pollution Control Act as Amended in 1972.
W77-08153 6E

Interstate Stream Commission (Creation, Membership, General Powers).
W77-08402 6E

INVERTEBRATES
The Influence of Brackish-Water Intrusion on Macroinvertebrate Associations of the Lower Tchefuncte River, Louisiana,
W77-08292 5B

Invertebrate Colonization of Artificial Substrates in San Leandro Creek,
W77-08443 5A

ION EXCHANGE
Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

IOWA
Anderson V Yearous (Rights of Dominant Owners to Unobstructed Use of Drainage Easements).
W77-08392 6E

Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

IRON
Sanitary and Hygienic Characteristics of Subsurface Waters of the Tselinograd and Turgai Oblasts, (In Russian),
W77-08253 5B

Proposed Effluent Guidelines and Standards for Iron and Steel Manufaturing,
W77-08370 5G

Fractionation and Control of Iron in Channelized and Swamp Drainage Streams in North Carolina,
W77-08510 5B

IRON ALLOYS
Proposed Effluent Guidelines and Standards for Iron and Steel Manufaturing,
W77-08370 5G

IRRADIATION
Sewage Sludge Disinfected by Electron-Beam Bombardment.
W77-08580 5D

IRRIGATION
Irrigated Agriculture: Nonpoint and Point Source Water Pollution,
W77-08116 5G

Water Allocation and Pricing for Control of Irrigation-Related Salinity in a River Basin,
W77-08213 5G

Year Round Cooling Water from the Cold Weather of Winter,
W77-08251 5D

A Simulation of an Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W77-08343 3F

Irrigation and Irrigation Districts.
W77-08396 6E

IRRIGATION DISTRICTS
Irrigation and Irrigation Districts.
W77-08396 6E

Interstate Stream Commission (Creation, Membership, General Powers).
W77-08402 6E

IRRIGATION EFFECTS
Water for Food - Or for More Important Purposes. (Reallocation of Irrigation Water to Cities and Industries),
W77-08377 6E

Potential of New Summer Grasses in Northland: I. Warm-Season Yields Under Dryland and Irrigation,
W77-08458 3F

IRRIGATION EFFICIENCY
Irrigated Agriculture: Nonpoint and Point Source Water Pollution,
W77-08116 5G

Economic Impacts of Controlling Water Quality in an Irrigated River Basin,
W77-08332 5G

IRRIGATION PERMITS
Sale of Water Rights,
W77-08140 6E

IRRIGATION PROGRAMS
United States V Tulare Lake Canal Company (Reclamation Laws Concerning Sale of Land in Excess of 160 Acres).
W77-08151 6E

IRRIGATION SCHEDULING MODELS
A Simulation of an Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W77-08343 3F

IRRIGATION SYSTEMS
Reclamation and Use of Disturbed Land in the Southwest.
W77-08452 5G

IRRIGATION WATER
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3F

Agricultural Water Demand in Wake County, North Carolina,
W77-08297 6D

Water for Food - Or for More Important Purposes. (Reallocation of Irrigation Water to Cities and Industries),
W77-08377 6E

Water Quality in the Texas Coastal Basins,
W77-08465 5B

IRRIGATION WELLS
Geohydrology of the Albin and La Grange Areas, Southeastern Wyoming,
W77-08176 4B

ISLANDS
Hibiscus Harbor, Inc. V. State (Metes and Bounds Description Favored Over Low Water Mark in Determining Outcome of Boundary Dispute).
W77-08389 6E

ISOHYETS
Determining Areal Precipitation in the Basin and Range Province of Southern Arizona - Sonoita Creek Basin,
W77-08308 2B

ISOLATION
Bacteriological Investigation of Alberta Meat-Packing Plant Wastes with Emphasis on Salmonella Isolation,
W77-08269 5D

ISRAEL
Production of Energy From Concentrated Brines by Pressure-Retarded Osmosis, 1. Preliminary Technical and Economic Correlations,
W77-08233 3A

Enterovirus Types in Israel Sewage,
W77-08519 5A

JET TRAJECTORY
The Effect of Aeration of Water Jet Spreading,
W77-08197 8B

JETS
The Effect of Aeration of Water Jet Spreading,
W77-08197 8B

JOINTS (CONNECTIONS)
Plain-End Pipe 'Collars' Problem Sewer Connections,
W77-08553 8G

JORDAN
Bacteriological Pollution in the Drinking-Water of Jordan,
W77-08454 5B

JOSHUA TREE NATIONAL MONUMENT (CALIF)
Ground-Water Data for 1974-75 in Joshua Tree National Monument, California,
W77-08164 7C

JUDICIAL DECISIONS
United States V Osage Company (Removal of Sunken Boats Obstructing Navigable Waters Owner's Responsibility).
W77-08150 6E

Winkle V Mitera (Riparian Rights of An Island Owner),
W77-08159 6E

Environmental Law-Application of the Refuse Act of 1899 to Continual Industrial Discharges Is Upheld Without Formalized Permit Procedures,
W77-08382 5G

Ohio Liquid Disposal, Inc V Dawe (Defining 'Waters of the State' Within Water Pollution Control Statute).
W77-08401 6E

KANSAS
Irrigation and Irrigation Districts.
W77-08396 6E

Quantitative Water Quality with Landsat and Skylab.
W77-08431 5A

Remote Sensing Applications in Kansas,
W77-08437 4A

Hydrologic Unit Map--1974, State of Kansas.
W77-08477 7C

KANSAS IRRIGATION DISTRICTS
Irrigation and Irrigation Districts.
W77-08396 6E

KANSAS RIVER
Public Hearing Regarding 180-Day Notice to the Santa Fe Land Improvement Company of Violation of State and Federal Water Quality Standards for the Interstate Waters of the Kansas and Missouri Rivers, Held at Kansas City, Kansas on 13 July 1971.
W77-08381 5G

KENTUCKY
Application of EREP, LANDSAT and Aircraft Image Data to Environmental Problems Related to Coal Mining,
W77-08429 5A

KENYA
U S Geological Survey, Water Resources Division, Radiocarbon Measurements I,
W77-08169 4B

KINETICS
Involvement of Free Radicals in the Catalytic Oxidation of Phenol in Aqueous Solution,
W77-08201 5D

Occupational Characteristics and Biological Kinetic Constants of Extended Aeration Process,
W77-08270 5D

Bacterial Growth Kinetics in the Completely Mixed Activated Sludge Treatment of Fellmongery Effluent,
W77-08281 5D

A Comparison of the Methods for Calculating the Constants for the First Order BOD Equation,
W77-08494 5B

Biological Treatment Kinetics of Landfill Leachate,
W77-08532 5D

KOBE (JAPAN)
The Sanitary Landfill Leachate Control Plant in Kobe.
W77-08534 5D

LABORATORY TESTS
Mathematical and Experimental Investigation of Nonsteady State Thickening of an Ideal Slurry,
W77-08207 5D

Transference: A Comprehensive Parameter Governing Permeation of Solutes Through Membranes,
W77-08231 3A

Sorption and Flow of Carbon Dioxide and Some Hydrocarbons in a Microporous Carbon Membrane,
W77-08232 5A

Impurity Concentrations in Sea Ice,
W77-08237 2C

LAKE BAIKAL (USSR)
Characteristics of the Biotic Cycle of Lake Baikal, (In Russian),
W77-08321 2H

LAKE ERIE
Lake Erie International Jetport Model Feasibility Investigation; The Wind-Driven Currents and Contaminant Dispersion in the Near-Shore of Large Lakes,
W77-08220 5B

LAKE JOCASSEE (SC)
A Statistical Analysis of the Mercury Concentrations in Fish from Lake Jocassee, South Carolina,
W77-08190 5A

LAKE LAHONTAN (NEV)
Pluvial Lakes of Nevada and Estimated Full Pluvial Climates,
W77-08199 2H

LAKE MICHIGAN
Beach Profile Changes: East Coast of Lake Michigan, 1970-72,
W77-08440 2J

LAKE NAIVASHA (EAST AFRICA)
Lake Naivasha and Lake Nakuru: An Ecological Comparison Between Two Bird Lakes in East Africa, (In Swedish),
W77-08324 2H

LAKE NAKURU (EAST AFRICA)
Lake Naivasha and Lake Nakuru: An Ecological Comparison Between Two Bird Lakes in East Africa, (In Swedish),
W77-08324 2H

LAKE PONTCHARTRAIN AREA (LA)
Analyses of Water, Core Material, and Elutriate Samples Collected Near New Orleans, Louisiana (Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project),
W77-08165 8D

LAKE ROTORUA (NEW ZEALAND)
Nitrogen and Phosphorus Analyses of Rainfall at Rotorua, New Zealand,
W77-08242 5A

The Fallout of Nitrogen and Phosphorus Compounds from the Atmosphere at Ngapuna, Near Rotorua, New Zealand,
W77-08243 5A

LAKE SEDIMENTS
The Utility of Paleolimnological Analyses of Lake Sediments for Evaluating Acid Precipitation Effects on Dilute Lakes,
W77-08103 5A

Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

Laminated Sediments in Holomictic Berkshire Lakes,
W77-08341 2J

LAKE SHELLENBARGER (MICH)
Michigan Conference Association of Seventh-Day Adventists V Commission of Natural Resources (Private Lakes with No Obvious Public Access Closed to the Public).
W77-08149 6E

LAKE SHORES
Mc Cardel V Smolen (The Rights of Riparian and Nonriparian Owners to Recreational Use of Navigable Inland Lakes).
W77-08138 6E

Pluvial Lakes of Nevada and Estimated Full Pluvial Climates,
W77-08199 2H

LAKE ZELENETSKOE (USSR)
The Productivity of Fouling Organism Associations in Lake Zelenetskoe, (In Russian),
W77-08323 5C

LAKES
Michigan Conference Association of Seventh-Day Adventists V Commission of Natural Resources (Private Lakes with No Obvious Public Access Closed to the Public).
W77-08149 6E

Transient Three-Dimensional Circulation of Lakes,
W77-08181 2H

Lake Naivasha and Lake Nakuru: An Ecological Comparison Between Two Bird Lakes in East Africa, (In Swedish),
W77-08324 2H

The LANDSAT-1 Multispectral Scanner as a Tool in the Classification of Inland Lakes,
W77-08433 5A

Trophic Status of Inland Lakes from LANDSAT,
W77-08434 5A

The Use of LANDSAT-1 Imagery for Water Quality Studies in Southern Scandinavia,
W77-08435 5A

Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2H

LAMINATED SEDIMENTS
Laminated Sediments in Holomictic Berkshire Lakes,
W77-08341 2J

LAND AND WATER CONSERVATION FUND PROGRAM
Flood Plains for Open Space and Recreation.
W77-08374 6F

LAND DEVELOPMENT
Remote Sensing Applications in Kansas,
W77-08437 4A

LAND DISPOSAL
Spray Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soil,
W77-08202 5D

LAND FORMING
State v. Matzen (Use of Historical Maps to Settle Claims to Accretion Lands).
W77-08139 6E

LAND IRRIGATION
Spray Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soil,
W77-08202 5D

LAND SUBSIDENCE
Winkle V Mitera (Riparian Rights of An Island Owner),
W77-08159 6E

LAND TENURE
United States V Tulare Lake Canal Company (Reclamation Laws Concerning Sale of Land in Excess of 160 Acres).
W77-08151 6E

LAND USE
Sediment Yield and Land Use in Southwest United States,
W77-08178 4D

University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

The 1972 Water Pollution Control Act: Unforeseen Implications for Land Use Planning,
W77-08373 5G

Wildlife Management by Habitat Units--A Preliminary Plan of Action,
W77-08426 4A

LANDSAT-1 Data as it has Been Applied for Land Use and Water Quality Data By the Virginia State Water Control Board,
W77-08432 5A

A Finite Element Model to Determine the Effect of Land-Use Changes on Flood Hydrographs,
W77-08450 8B

LANDFILLS
Federal Control Over Wetland Areas: The Corps of Engineers Expands its Jurisdiction,
W77-08123 5G

Biological Treatment Kinetics of Landfill Leachate,
W77-08532 5D

The Sanitary Landfill Leachate Control Plant in Kobe.
W77-08534 5D

LANDSAT
Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Volume I-A, Technical Session Presentations, Agriculture-Environment.
W77-08408 7B

Estimating Vegetative Biomass from LANDSAT-1 Imagery for Range Management,
W77-08409 4A

Utilization of LANDSAT Imagery for Mapping Vegetation on the Millionth Scale,
W77-08413 7C

LASER RAMAN SPECTROMETRY
Investigation of Detection Limits for Solutes in Water Measured by Laser Raman Spectrometry,
W77-08171 2K

LATERAL INFLOW
Effect of Lateral Inflow on Steady Open Channel Flows,
W77-08290 2E

LAW ENFORCEMENT
Environmental Law-Application of the Refuse Act of 1899 to Continual Industrial Discharges Is Upheld Without Formalized Permit Procedures,
W77-08382 5G

LAW OF THE SEA
The Environmental Problem of the Oceans: An International Stepchild of National Egotism,
W77-08367 6E

LAW OF THE SEA CONFERENCE
The Environmental Problem of the Oceans: An International Stepchild of National Egotism,
W77-08367 6E

LEACHATE
Biological Treatment Kinetics of Landfill Leachate,
W77-08532 5D

The Sanitary Landfill Leachate Control Plant in Kobe.
W77-08534 5D

LEGAL ASPECTS
American Sedimentation Law and Physical Processes,
W77-08130 6E

Environmental Protection Through the Common Law,
W77-08133 6G

Wells, Pumping Plants, Conduits and Streams,
W77-08154 6E

Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

Report on Water Resources Problems of Western Collier County, Florida as Affected by the GAC Corporation's Canal System in Its Golden Gate Development Project,
W77-08380 6E

Water Districts and Commissioners.
W77-08406 6E

LEGISLATION
Operation and Impact of NPDES in Region II, Part I,
W77-08117 5G

Coastal Zone Legislation: Louisiana Landmarks, Labyrinths and Logrolling,
W77-08186 6E

New Water Legislation--Drafting for Development, Efficient Allocation and Environmental Protection,
W77-08188 6E

Water Supply and Control Developments Summarized, (Arizona).
W77-08313 6E

LETHAL LIMIT
Some Experimental Data on the Study of the Biological Action of Ethylbutylamine as a Water Pollution Factor, (In Russian),
W77-08439 5A

LEVEES
Wood V. Board of Commissioners for the Pontchartrain Levee District (Land Appropriation for Levees),
W77-08144 6E

Analyses of Water, Core Material, and Elutriate Samples Collected Near New Orleans, Louisiana (Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project),
W77-08165 8D

LIABILITY
Ponce de Leon Condominiums v Digirolamo (Developer Responsible for Control of Surface Runoff).
W77-08136 6E

LICENSES
Water Rights Generally; Appropriation.
W77-08393 6E

Appropriation of Water.
W77-08405 6E

LIGHTNIN TREATMENT SYSTEM
High Capacity Waste Water Treatment System,
W77-08566 5D

LIME
Aerobic Digestion of Sludges Precipitated from Waste Water by Lime Addition,
W77-08530 5D

LIME-SULFIDE EFFLUENT
Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

LIMESTONE
Deep Water Resources of the Limestones of Franche-Comte: Problems of Quantity and Quality, (In French),
W77-08122 4B

LIMESTONES
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

LIMNOLOGY
The Limnology of a North Carolina Millpond with Special Reference to Historical Changes as Evidenced by Sediment Core Analysis,
W77-08507 5C

LINEAR PROGAMMING
Water and Energy Systems: A Planning Model,
W77-08212 6A

LIPIDS
An Estimation of the Efficiency of a Waste Water Treatment Plant, as Measured by Several Parameters Including Lipid Biodegradation (Essai d'evaluation de l'efficacite d'une station d'epuration a l'aide de plusieurs parametres dont la biodegradation des lipides),
W77-08548 5D

LIQUID DIGESTED SLUDGE
Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

LIQUID WASTES
Ohio Liquid Disposal, Inc V Dawe (Defining 'Waters of the State' Within Water Pollution Control Statute).
W77-08401 6E

Breaking Down Solid and Liquid Waste to Form a Fertilizer--By Inoculation with Selected Fungi and Fermentation.
W77-08559 5E

Sludge Collector and Light Liquid, Separator--from Sewage with Two Tanks in Single Housing and Cover.
W77-08560 5D

LITERATURE REVIEW
Mineral Cycling in Reservoirs,
W77-08217 5C

LOCAL GOVERNMENTS
Mitchell V. City of High Point (Municipal Liability for Damage from Overflow of Privately-Owned Stream).
W77-08145 6E

Sovereignty and the Control of Water Pollution,
W77-08366 5G

LOS ANGELES (CALIF)
An Earthquake Risk Model That Incorporates Local Near Surface Site Conditions,
W77-08348 8E

LOUISIANA
Wood V. Board of Commissioners for the Pontchartrain Levee District (Land Appropriation for Levees),
W77-08144 6E

Coastal Zone Legislation: Louisiana Landmarks, Labyrinths and Logrolling,
W77-08186 6E

The Influence of Brackish-Water Intrusion on Macroinvertebrate Associations of the Lower Tchefuncte River, Louisiana,
W77-08292 5B

LOW FLOW
Simulation of Streamflow of Flambeau River at Park Falls, Wisconsin to Define Low-Flow Characteristics,
W77-08172 2E

Low Flow Analyses of Streams: Details of Computational Procedures and Annotated Bibliography,
W77-08219 2E

The Effects of Urbanization on Low Flows and Total Runoff,
W77-08335 2A

Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

LOW-TEMPERATURE GEOTHERMAL SOURCES
An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

LUMBERING
Boom Companies; Construction, Powers Of,
W77-08157 6E

Timber Products Processing Point Source Category Effluent Guidelines and Standards,
W77-08356 5G

Are Clear-Cut Areas Estimated from LANDSAT Imagery Reliable,
W77-08416 4A

Operational Considerations for the Application of Remotely Sensed Forest Data from LANDSAT or Other Airborne Platforms,
W77-08417 7C

MACLURE GLACIER (CALIF)
Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

MAGNESIUM
Effect of Some Chemical Elements on the Accumulation of Cesium-137 in Freshwater Fish, (In Russian),
W77-08322 5C

MAINE
The Import - Export Clause and Control of Oil Pollution: Regulatory Fee Imposed Pursuant to the Police Power,
W77-08354 5G

States' Rights in the Outer Continental Shelf Denied by the United States Supreme Court,
W77-08365 6E

MAINTENANCE
Kelly Care Extends Service Life,
W77-08311 8C

Ideas Aplenty-But Still Sewers Face Cash Neglect.
W77-08554 8G

MAINTENANCE COSTS
Construction and Maintenance Costs of Sewer Systems (Bau- und Betriebskosten von Kanalisationsanlagen),
W77-08542 8A

MAMMALS
Organochlorine Residues in New Zealand Birds and Mammals 2. Polychlorinated Biphenyls,
W77-08210 5C

MANAGEMENT
Coastal Zone Legislation: Louisiana Landmarks, Labyrinths and Logrolling,
W77-08186 6E

Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-08329 5B

Coastal Energy Impact Program.
W77-08358 6E

MANUFACTURING OPERATIONS
Standards of Performance and Pretreatment Standards for the Explosives Manufacturing Point Source Category (Proposed Rules),
W77-08113 5G

MAPPING
Utilization of LANDSAT Imagery for Mapping Vegetation on the Millionth Scale,
W77-08413 7C

LANDSAT-1 Data, Its Use in a Soil Survey Program,
W77-08414 2G

Mapping of the Wildland Fuel Characteristics of the Santa Monica Mountains of Southern California,
W77-08419 7C

Computer Analysis and Mapping of Gypsy Moth Defoliation Levels in Pennsylvania Using LANDSAT-1 Digital Data,
W77-08420 7C

Computer Implemented Classification of Vegetation Using Aircraft Acquired Multispectral Scanner Data,
W77-08421 4A

Agricultural Applications of Remote Sensing--A True Life Adventure,
W77-08424 3F

Practical Application of Remote Sensing in Agriculture,
W77-08425 3F

MAPS
The Eutaw-McShan Aquifer in Mississippi,
W77-08466 7C

Dissolved Solids, Hardness, and Orthophosphate of Surface-Water Runoff in the Northwest Florida Water Management District,
W77-08467 7C

Water-Resources Investigations in South Dakota, 1976.
W77-08468 7C

Floods of November 12, 1974, in the Charlotte Amalie Area, St. Thomas, U.S. Virgin Islands,
W77-08470 7C

Maps Showing Ground-Water COnditions in the Puerco-Zuni Area, Apache and Navajo Counties, Arizona--1975,
W77-08471 7C

Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

Hydrologic Unit Map--1974, State of Texas.
W77-08474 7C

Hydrologic Unit Map--1974, State of Oklahoma.
W77-08475 7C

Hydrologic Unit Map--1974, State of South Dakota.
W77-08476 7C

Hydrologic Unit Map--1974, State of Kansas.
W77-08477 7C

MARINE ALGAE
Effect of Metals on Photosynthesis of Marine Phytoplankton, (In Russian),
W77-08160 5C

MARYLAND
A Predictive Model for Transient Temperature Distributions in Unsteady Flows,
W77-08221 5B

MASSACHUSETTS
Governmental Interest in Protecting Beach from Environmental Damage Through Overuse Outweighs Due Process Right to Bath Nude,
W77-08124 6E

Chromosome Mutations in a Fern Population Growing in a Polluted Environment: A Bioassay for Mutagens in Aquatic Environments,
W77-08305 5A

Laminated Sediments in Holomictic Berkshire Lakes,
W77-08341 2J

Sovereignty and the Control of Water Pollution,
W77-08366 5G

MATHEMATICAL MODELS
Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

Methodology for Applying the Finite Element Method to Partially Stratified Estuaries,
W77-08198 2L

Mathematical and Experimental Investigation of Nonsteady State Thickening of an Ideal Slurry,
W77-08207 5D

The AFGWC Snow Cover Analysis Model,
W77-08223 2C

Transference: A Comprehensive Parameter Governing Permeation of Solutes Through Membranes,
W77-08231 3A

Computer Prediction of Stationary States of Membranes from Differential Permeabilities,
W77-08234 3A

Aquifer Modeling Helps Farmers.
W77-08317 2F

A Finite Element Model to Determine the Effect of Land-Use Changes on Flood Hydrographs,
W77-08450 8B

The Mathematical Description of the BOD Reaction in Stream Water,
W77-08493 5B

A Comparison of the Methods for Calculating the Constants for the First Order BOD Equation,
W77-08494 5B

Prediction Models of Reaeration Rate for Mountain Creeks,
W77-08501 5G

MCSHAN FORMATION (MISS)
The Eutaw-McShan Aquifer in Mississippi,
W77-08466 7C

MEANDERS
Effects of Meandering in Alluvial Streams,
W77-08216 2E

MEASUREMENT
Measurement of Flash Floods in the United States--State of the Art,
W77-08161 2E

A Methodology for Measuring Flash Floods (Methodologie Pour La Mesure Des Crues Brutales),
W77-08249 2E

Fluoride Analysis of Water-Treatment-Plant Sludges,
W77-08342 5F

Improved Galvanic Dissolved Oxygen Sensor for Activated Sludge,
W77-08539 5A

Suspended Solids Measurement Gives Improved Control,
W77-08568 5A

Reliable pH Measurement When Effluent Conditions Get Tough,
W77-08592 5A

MEAT PACKING PLANT WASTES
Bacteriological Investigation of Alberta Meat-Packing Plant Wastes with Emphasis on Salmonella Isolation,
W77-08269 5D

MECHANICALLY-GENERATED WAVES
Drift Velocities of Surface Films Over Waves,
W77-08193 5B

MEMBRANE FILTER TECHNIQUE
Bacterial Growth on Dissolved Organic Compounds in Fresh-Water Reservoirs, (In Russian),
W77-08498 5A

A Method for Quantitative Determination of Ammonifying and Denitrifying Bacteria in Water with Applied Examples from Gravel-Pit Pools, (In Czech),
W77-08509 5A

MEMBRANE PROCESSES
Transference: A Comprehensive Parameter Governing Permeation of Solutes Through Membranes,
W77-08231 3A

Sorption and Flow of Carbon Dioxide and Some Hydrocarbons in a Microporous Carbon Membrane,
W77-08232 5A

Production of Energy From Concentrated Brines by Pressure-Retarded Osmosis, 1. Preliminary Technical and Economic Correlations,
W77-08233 3A

Computer Prediction of Stationary States of Membranes from Differential Permeabilities,
W77-08234 3A

MEMBRANES
Sorption and Flow of Carbon Dioxide and Some Hydrocarbons in a Microporous Carbon Membrane,
W77-08232 5A

Computer Prediction of Stationary States of Membranes from Differential Permeabilities,
W77-08234 3A

Confirmation of the Single-Step Membrane Filtration Procedure for Estimating Pseudomonas Aeruginosa Densities in Water,
W77-08518 5A

MEMPHIS AREA (TENN)
Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975,
W77-08469 4B

MEMPHIS (TENN)
Summary of Some Current and Possible Future Environmental Problems Related to Geology and Hydrology at Memphis, Tennessee,
W77-08174 4C

MERCURY
Effect of Metals on Photosynthesis of Marine Phytoplankton, (In Russian),
W77-08160 5C

A Statistical Analysis of the Mercury Concentrations in Fish from Lake Jocassee, South Carolina,
W77-08190 5A

Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

MERCURY ISOLATION
Biochemical Transformation and Detoxification of Mercury in Aquatic Environment,
W77-08289 5C

METAL IONS
Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

METALS
The Effect of Different Flocculants on the Elimination of Trace Elements and Polycylic Hydrocarbons in the Water Purification Process, (In German),
W77-08256 5D

Closed-Loop System Separates Oil from Prewash Overflow,
W77-08271 5D

Development of a Column Chromatography Method for Field of Pre-Concentration of Trace Metals with Application to the Haw-Cape Fear Rivers, N.C.,
W77-08299 5A

Nonferrous Metals Manufacturing Point Source Category Pretreatment Standards.
W77-08357 5G

Removing Soluble Metals from Waste Water,
W77-08591 5D

METEOROLOGY
Flash Floods in the Western Mediterranean (Les Crues Catastrophiques sur la Mediterranee Occidentale),
W77-08245 2E

METES AND BOUNDS
Hibiscus Harbor, Inc. V. State (Metes and Bounds Description Favored Over Low Water Mark in Determining Outcome of Boundary Dispute).
W77-08389 6E

METHODOLOGY
Determination of Pyridine in Farm Crops and Fish, (In Russian),
W77-08126 5A

A Methodology for Measuring Flash Floods (Methodologie Pour La Mesure Des Crues Brutales),
W77-08249 2E

Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5C

METHYLMERCURY
Biochemical Transformation and Detoxification of Mercury in Aquatic Environment,
W77-08289 5C

MEXICO
Restless River: International Law and the Behavior of the Rio Grande,
W77-08384 6

An Overview of the Development of Remote Sensing Techniques for the Screwworm Eradication Program,
W77-08427 3

MICHIGAN
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5

Mc Cardel V Smolen (The Rights of Riparian and Nonriparian Owners to Recreational Use of Navigable Inland Lakes).
W77-08138 6

Michigan Conference Association of Seventh Day Adventists V Commission of Natural Resources (Private Lakes with No Obvious Public Access Closed to the Public).
W77-08149 6

The LANDSAT-1 Multispectral Scanner as a Tool in the Classification of Inland Lakes,
W77-08433 5

MICROBIAL DEGRADATION
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2

The Effect of Soluble Organic Matter On the Utilization of Phenoxy Herbicides by Pseudomonas sp.,
W77-08504 5C

MICROCYSTIS AERUGINOSA
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

MILITARY ASPECTS
Treatment of Wastewater From Military Explosives and Propellants Production Industry by Physicochemical Processes,
W77-08337 5D

MILLERS RIVER (MASS)
Chromosome Mutations in a Fern Population Growing in a Polluted Environment: A Bioassay for Mutagens in Aquatic Environments,
W77-08305 5A

MINE DRAINAGE
Leadville Mine Drainage Tunnel Act of 1976.
W77-08115 6E

MINE WASTES
Reclamation and Use of Disturbed Land in the Southwest.
W77-08452 5G

MINING
Leadville Mine Drainage Tunnel Act of 1976.
W77-08115 6E

MINNESOTA
The LANDSAT-1 Multispectral Scanner as a Tool in the Classification of Inland Lakes,
W77-08433 5A

Small-Stream Flood Investigations in Minnesota, October 1958 to September 1975,
W77-08481 2E

MISSISSIPPI
Computer Implemented Classification of Vegetation Using Aircraft Acquired Multispectral Scanner Data,
W77-08421 4A

The Eutaw-McShan Aquifer in Mississippi,
W77-08466 7C

MISSOURI
Root Growth, Strength, and Chemical Properties of a Hobson Fragipan,
W77-08285 2G

Mercury Accumulation in Trout of Southern Missouri,
W77-08304 5C

United States V 3,727-91 Acres of Land in Pike County, State of Missouri (Compensation Allowed Drainage District for Condemned Property).
W77-08399 6E

MISSOURI RIVER
Public Hearing Regarding 180-Day Notice to the Santa Fe Land Improvement Company of Violation of State and Federal Water Quality Standards for the Interstate Waters of the Kansas and Missouri Rivers, Held at Kansas City, Kansas on 13 July 1971.
W77-08381 5G

MIST AND FOAM DRILLING
Air, Mist and Foam Drilling, A Look at the Latest Techniques, Part 2,
W77-08326 8C

MIXED ANAEROBIC FILTERS
Treatment of High Strength Acidic Waste Water with a Completely Mixed Anaerobic Filter,
W77-08524 5D

MODEL STUDIES
Transient Three-Dimensional Circulation of Lakes,
W77-08181 2H

Application of Three Daily-Rainfall Runoff Models to Four Australian Catchments,
W77-08218 2A

Lake Erie International Jetport Model Feasibility Investigation; The Wind-Driven Currents and Contaminant Dispersion in the Near-Shore of Large Lakes,
W77-08220 5B

A Predictive Model for Transient Temperature Distributions in Unsteady Flows,
W77-08221 5B

Effects of 40-Foot Charleston Harbor Project on Tides, Currents, and Salinities; Hydraulic Model Investigation,
W77-08222 2L

A New Climatic Model for Glacier Behavior of the Austrian Alps,
W77-08235 2C

A Water Management Model for High Water Table Soils,
W77-08301 3F

Optimal Layout and Design of Storm Sewer Systems,
W77-08334 5D

Input-Output Modeling in Water Resources System Planning,
W77-08346 6A

An Earthquake Risk Model That Incorporates Local Near Surface Site Conditions,
W77-08348 8E

Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

Digital-Computer Model of the Sandstone Aquifer in Southeastern Wisconsin,
W77-08478 2F

Digital-Model Analysis of the Effects of Water-Use Alternatives on Spring Discharges, Gooding and Jerome Counties, Idaho,
W77-08484 4B

A Predictive Phosphorus Model for Lakes - Sensitivity Analysis and Applications,
W77-08499 5C

Water Quality Impacts of Urbanization--A Methodology,
W77-08514 5B

Design and Operation of Rain Retention Basins (Entwurf und Betrieb von Regenruckhaltebecken),
W77-08547 8A

MODIFIED MERCALLI INTENSITY
An Earthquake Risk Model That Incorporates Local Near Surface Site Conditions,
W77-08348 8E

MODUFLEX SYSTEM
Moduflex Sewage Treatment Plants Provide the Answer to Growth,
W77-08588 5D

MOISTURE DEFICIT
The Influences of Simulated Moisture Stress Conditions and Osmotic Substrates on Germination and Growth of Cultivated and Wild Safflowers,
W77-08460 2I

MOISTURE STRESS
The Influences of Simulated Moisture Stress Conditions and Osmotic Substrates on Germination and Growth of Cultivated and Wild Safflowers,
W77-08460 2I

MOISTURE TENSION
Drainable Porosity Evaluation and its Relationship to Hydraulic Conductivity and Exchangeable Cations Under Different Bulk Densities,
W77-08461 4A

MOLECULAR STRUCTURE
Crystal Structure Analysis of Selected Pesticides by Single Crystal X-Ray Diffraction: The Crystal and Molecular Structure of Padan,
W77-08503 5A

MOMENTUM EQUATION
Effect of Lateral Inflow on Steady Open Channel Flows,
W77-08290 2E

MONASH MODEL
Application of Three Daily-Rainfall Runoff Models to Four Australian Catchments,
W77-08218 2A

MONITORING
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5A

Let's Have Achievable 'Safe' Drinking Water,
W77-08127 5G

LANDSAT-1 Data as it has Been Applied for Land Use and Water Quality Data By the Virginia State Water Control Board,
W77-08432 5A

A Comparative Interregional Analysis of Selected Data from LANDSAT-1 and EREP for the Inventory and Monitoring of Natural Ecosystems,
W77-08436 7C

Remote Sensing Applications in the Inventory and Analysis of Environmental Problems,
W77-08438 5A

A Controllable Automated Environmental Data Acquisition and Monitoring System,
W77-08441 7C

Design of a Water Quality Monitoring Network,
W77-08497 5A

Improved Galvanic Dissolved Oxygen Sensor for Activated Sludge,
W77-08539 5A

Suspended Solids Measurement Gives Improved Control,
W77-08568 5A

Automatic Control of Whitlingham Sewage Treatment Works Norwich,
W77-08585 5D

MONSOONS
A Note on the Study of Rainy Days and Wet Spells at Bijapur,
W77-08455 2B

MONTANA
Annual Peak Discharges from Small Drainage Areas in Montana Through September 1976,
W77-08482 2E

MOSQUITOS
The Rationale for Attempting to Define Salt Marsh Mosquito-Breeding Areas in Galveston County by Remote Sensing the Associated Vegetation.
W77-08428 4A

MOUNTAIN CREEKS
Prediction Models of Reaeration Rate for Mountain Creeks,
W77-08501 5G

MOVEMENT
Measurement of Ice Movement in Subglacial Cavities: A New Cavitometer Beneath the Glacier D'Argentiere (Mt Blanc, France),
W77-08238 2C

MULTIPLE PURPOSE PROJECTS
Multiple Objective Planning: Small Watersheds,
W77-08350 6B

MULTIPLE RESERVOIRS
Implementation of an Optimization Model for Operation of a Metropolitan Reservoir System,
W77-08211 4A

MUNICIPAL ENFORCEMENT
EPA Focuses on Municipal Enforcement,
W77-08355 6E

MUNICIPAL WASTES
Operation and Impact of NPDES in Region II, Part I,
W77-08117 5G

PL 92-500: Phoenix V. the EPA,
W77-08128 5G

EPA Focuses on Municipal Enforcement,
W77-08355 6E

MUNICIPAL WATER
Pollution Indicator Bacteria Associated with Municipal Raw and Drinking Water Supplies,
W77-08516 5A

MYAKKA RIVER BASIN (FLA)
Water Resources of the Myakka River Basin Area, Southwest Florida,
W77-08167 4B

MYCOBACTERIUM
Bacterial Growth on Dissolved Organic Compounds in Fresh-Water Reservoirs, (In Russian),
W77-08498 5A

MYCOBACTERIUM BOVIS BCG
Persistence of Mycobacterium Bovis BCG in Soil and on Vegetables Spray-Irrigated with Sewage Effluent and Sludge,
W77-08525 5C

NARRAGANSETT BAY (RI)
Phosphorus Exchange at the Sediment-Water Interface of Selected Narragansett Bay Sediments,
W77-08502 5C

NATIONAL ENVIRONMENTAL POLICY ACT
Standards of Performance and Pretreatment Standards for the Explosives Manufacturing Point Source Category (Proposed Rules),
W77-08113 5G

Sierra Club V Stamm (National Environmental Policy Act Does Not Require Comprehensive Environmental Impact Statement on Large Reclamation Project When EIS have been Prepared for Viable Portion of Project).
W77-08147 6E

Natural Resources Defense Council V Stamm (National Environmental Policy Act Not Satisfied When EIS Fails to Discuss All Reasonable Alternatives to the Project).
W77-08148 6E

Emerging Legal Concepts in the Harmonization of Water Resources Development and Environmental Protection,
W77-08378 6E

NATIONAL PARKS
Governmental Interest in Protecting Beach from Environmental Damage Through Overuse Outweighs Due Process Right to Bath Nude,
W77-08124 6E

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
Toward Cleaner Water in the Pacific Northwest and Alaska--The National Water Permit Program.
W77-08121 5G

NATIONAL WATER PERMIT PROGRAM
Toward Cleaner Water in the Pacific Northwest and Alaska--The National Water Permit Program.
W77-08121 5G

NATURAL FLOW DOCTRINE
From Good Husbandry to Reasonable Use: Illinois Surface Water Drainage Law Evolves in Subdivision Case,
W77-08353 4A

NATURAL RESOURCES
University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

Utilization of LANDSAT Imagery for Mapping Vegetation on the Millionth Scale,
W77-08413 7C

NAVIGABILITY TESTS
Public Rights in Pennsylvania Waters,
W77-08362 6E

NAVIGABLE WATERS
Federal Water Pollution Control Act Amendments of 1972 Reach Polluting Activities Occurring Above Mean-High Water Line (Comment on U. S. V. Holland).
W77-08118 5G

Federal Control Over Wetland Areas: The Corps of Engineers Expands its Jurisdiction,
W77-08123 5G

Michigan Conference Association of Seventh-Day Adventists V Commission of Natural Resources (Private Lakes with No Obvious Public Access Closed to the Public).
W77-08149 6E

Canadian Pacific (Bermuda) Limited V United States (No Duty to Survey or Dredge Channel at Any Particular Time).
W77-08152 6E

Public Rights in Pennsylvania Waters,
W77-08362 6E

Aquaculture: Problems of Implementation Under Existing Law,
W77-08369 6E

NAVIGATION OBSTRUCTIONS
United States V Osage Company (Removal of Sunken Boats Obstructing Navigable Waters Owner's Responsibility).
W77-08150 6E

Environmental Law-Application of the Refuse Act of 1899 to Continual Industrial Discharges Is Upheld Without Formalized Permit Procedures,
W77-08382 5G

NAVIGATIONAL SERVITUDE
Public Rights in Pennsylvania Waters,
W77-08362 6E

NEBRASKA
State v. Matzen (Use of Historical Maps to Settle Claims to Accretion Lands).
W77-08139 6E

Winkle V Mitera (Riparian Rights of An Island Owner),
W77-08159 6E

Estimating Vegetative Biomass from LANDSAT-1 Imagery for Range Management,
W77-08409 4A

NEGLIGENCE
Environmental Protection Through the Common Law,
W77-08133 6G

Liability for Damages to Adjacent Land or Building Caused by Dredging,
W77-08387 6E

NET NATIONAL BENEFITS
Multiple Objective Planning: Small Watersheds,
W77-08350 6B

NETWORK EVALUATIONS
Network Evaluation of Wastewater Collection Economics,
W77-08331 5D

NETWORKS
The Operation of a Flood Warning Network: Its Use for Studying Flash Floods (Exploitation D'un Reseau D'alerte: Son Utilisation Pour L'etude Des Crues Brutales),
W77-08248 2E

Design of a Water Quality Monitoring Network,
W77-08497 5A

NEVADA
Water Resources Data for Nevada, Water Year 1975,
W77-08185 7C

Pluvial Lakes of Nevada and Estimated Full Pluvial Climates,
W77-08199 2H

A Comparative Interregional Analysis of Selected Data from LANDSAT-1 and EREP for the Inventory and Monitoring of Natural Ecosystems,
W77-08436 7C

NEW ENGLAND RIVER BASINS COMMISSION
Citizen Participation in Comprehensive Water Resources Planning,
W77-08105 6B

NEW GUINEA
Alternative Measures of River Channel Shape and Their Significance,
W77-08241 8B

NEW HAMPSHIRE
Fulvic Acid-Metal Ion Interactions in Water,
W77-08102 5A

Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

NEW JERSEY
Geohydrology of the Englishtown Formation in the Northern Coastal Plain of New Jersey,
W77-08175 2F

The Influence of Precipitation on Biochemical Oxygen Demand on Nine Streams in New Jersey,
W77-08203 5B

NEW MEXICO
Interstate Stream Commission (Creation, Membership, General Powers).
W77-08402 6E

NEW YORK
Russo V. New York Dept. of Environmental Conservation (Limits of State Regulations Restricting Alteration of Wetlands).
W77-08388 6E

Hibiscus Harbor, Inc. V. State (Metes and Bounds Description Favored Over Low Water Mark in Determining Outcome of Boundary Dispute).
W77-08389 6E

The LANDSAT-1 Multispectral Scanner as a Tool in the Classification of Inland Lakes,
W77-08433 5A

Water Resources Data for New York, Water Year 1975.
W77-08485 7C

NEW YORK CITY
City of York V. Pennsylvania Department of Environmental Resources (Delegation of Authority Under the Pennsylvania Waste Management Act).
W77-08403 6E

NEW YORK TIDAL WETLANDS ACT
Russo V. New York Dept. of Environmental Conservation (Limits of State Regulations Restricting Alteration of Wetlands).
W77-08388 6E

NEW ZEALAND
Organochlorine Residues in New Zealand Birds and Mammals 2. Polychlorinated Biphenyls,
W77-08210 5C

Growth of Tropical and Temperate Grasses at Palmerston North I. Warm-Season Yields With and Without Irrigation,
W77-08457 3F

NEWTON CREEK (NY)
Oxygen Aeration at Newton Creek,
W77-08526 5D

NICKEL
Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

NIGERIA (SUDAN SAVANNA ZONE)
Improving Food Crop Production in the Sudan Savanna Zone of Northern Nigeria,
W77-08459 3F

NITRATE NITROGEN
Economic Impacts of Controlling Water Quality in an Irrigated River Basin,
W77-08332 5G

NITRATE RESPIRATION
Process Design of Single-Sludge Activated Sludge Systems Using Nitrate Respiration,
W77-08336 5D

NITRATES
A Quantitative Study of Organic Carbon Decomposition and Nitrogen Transformations in Sewage Sludge-Soil Systems,
W77-08291 5B

Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-08329 5B

Water Quality in the Texas Coastal Basins,
W77-08465 5B

Factors Affecting the Denitrification Rate in Two Water-Sediment Systems,
W77-08517 5B

NITRIFICATION
Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

NITROCELLULOSE-MANUFACTURING WASTEWATER
Treatment of Wastewater From Military Explosives and Propellants Production Industry by Physicochemical Processes,
W77-08337 5D

Investigation of the Effectiveness of Polymers in the Treatment of Nirocellulose-Manufacturing Wastewater,
W77-08338 5D

NITROGEN
Mineral Cycling in Reservoirs,
W77-08217 5C

Nitrogen and Phosphorus Analyses of Rainfall at Rotorua, New Zealand,
W77-08242 5A

The Fallout of Nitrogen and Phosphorus Compounds from the Atmosphere at Ngapuna, Near Rotorua, New Zealand,
W77-08243 5A

Characteristics of the Biotic Cycle of Lake Baikal, (In Russian),
W77-08321 2H

A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

NITROGEN COMPOUNDS
Nitrogen and Phosphorus Analyses of Rainfall at Rotorua, New Zealand,
W77-08242 5A

The Fallout of Nitrogen and Phosphorus Compounds from the Atmosphere at Ngapuna, Near Rotorua, New Zealand,
W77-08243 5A

Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Nitric Acid Subcategory.
W77-08360 5G

NITROGEN PERCENTAGE
Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

NITROGEN SOURCES
Mineral Cycling in Reservoirs,
W77-08217 5C

NON-NAVIGABLE WATERS
Michigan Conference Association of Seventh-Day Adventists V Commission of Natural Resources (Private Lakes with No Obvious Public Access Closed to the Public).
W77-08149 6E

NON-POINT POLLUTION SOURCES
Economic Impacts of Controlling Water Quality in an Irrigated River Basin,
W77-08332 5G

NON-RIPARIAN OWNERS
Mc Cardel V Smolen (The Rights of Riparian and Nonriparian Owners to Recreational Use of Navigable Inland Lakes).
W77-08138 6E

NONFERROUS METALS MANUFACTURING
Nonferrous Metals Manufacturing Point Source Category Pretreatment Standards.
W77-08357 5G

NONPOINT SOURCES
Irrigated Agriculture: Nonpoint and Point Source Water Pollution,
W77-08116 5G

NONUNIFORM FLOW
Effect of Lateral Inflow on Steady Open Channel Flows,
W77-08290 2E

NORTH CAROLINA
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3F

Mitchell V. City of High Point (Municipal Liability for Damage from Overflow of Privately-Owned Stream).
W77-08145 6E

Agricultural Water Demand in Wake County, North Carolina,
W77-08297 6D

A Water Management Model for High Water Table Soils,
W77-08301 3F

NORTH CAROLINA

The Limnology of a North Carolina Millpond with Special Reference to Historical Changes as Evidenced by Sediment Core Analysis,
W77-08507 5C

Forest Fertilization and Water Quality in the North Carolina Piedmont,
W77-08508 5B

Fractionation and Control of Iron in Channelized and Swamp Drainage Streams in North Carolina,
W77-08510 5B

Investigation of Coagulation - Precipitation and Ultrafiltration for the Regeneration of Brines in the Cucumber Pickle Industry,
W77-08511 5D

NORTH DAKOTA

Agricultural Inventory Capabilities of Machine Processed LANDSAT Digital Data,
W77-08423 3F

NORTH PLATTE RIVER BASIN (WYO)

Estimating Evapotranspiration in the North Platte Basin of Wyoming,
W77-08505 2D

NORTHWEST FLORIDA

Dissolved Solids, Hardness, and Orthophosphate of Surface-Water Runoff in the Northwest Florida Water Management District,
W77-08467 7C

NUCLEAR POWERPLANTS

Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6B

Discriminant Analysis of Characteristics Determining Acceptance or Rejection of Nuclear Power,
W77-08109 6B

NUISANCE (LEGAL ASPECTS)

Environmental Protection Through the Common Law,
W77-08133 6G

NUMERICAL ANALYSIS

Transient Three-Dimensional Circulation of Lakes,
W77-08181 2H

NUTRIENT FLUX

Phosphorus Exchange at the Sediment-Water Interface of Selected Narragansett Bay Sediments,
W77-08502 5C

NUTRIENT LOSSES

Forest Fertilization and Water Quality in the North Carolina Piedmont,
W77-08508 5B

NUTRIENT REMOVAL

The Solubility of Particulate Phosphorus in the Effluent From Alum Treatment of Wastewater and Phosphorus Solutions,
W77-08500 5D

NUTRIENTS

Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-08329 5B

Longitudinal Distribution of Selected Micronutrients in Northern San Francisco Bay During 1973,
W77-08487 5C

Implications of Seasonal Chemical and Physical Factors on the Production of Phytoplankton in Northern San Francisco Bay,
W77-08489 5C

OATS

Response of Oat and Spinach to Sewage Sludge Application in Soil,
W77-08495 5C

OBSERVATION WELLS

Geohydrology of the Albin and La Grange Areas, Southeastern Wyoming,
W77-08176 4B

OCEAN CURRENTS

Thermal Sensor for Measurement of Ocean Current Direction,
W77-08257 2L

OCEANS

Remembering Maine: Offshore Federalism in the United States and Canada,
W77-08363 6E

The Environmental Problem of the Oceans: An International Stepchild of National Egotism,
W77-08367 6E

ODOR

Aerators Control Lift Station Odor and Corrosion,
W77-08567 5G

OHIO

Ohio Liquid Disposal, Inc V Dawe (Defining 'Waters of the State' Within Water Pollution Control Statute).
W77-08401 6E

OIL-FLUSHED TOILETS

Oil-Flushed Toilets Gain,
W77-08583 3D

OIL POLLUTION

Oil Spills and Spills of Hazardous Substances.
W77-08385 5G

OIL SLICKS

Drift Velocities of Surface Films Over Waves,
W77-08193 5B

Method of Dispersing Oil in Water,
W77-08260 5G

OIL SPILLS

Oil and Water--A New Look at the Uniformity Doctrine,
W77-08125 6E

Drift Velocities of Surface Films Over Waves,
W77-08193 5B

Method of Dispersing Oil in Water,
W77-08260 5G

The Import - Export Clause and Control of Oil Pollution: Regulatory Fee Imposed Pursuant to the Police Power,
W77-08354 5G

Oil Spills and Spills of Hazardous Substances.
W77-08385 5G

OIL WASTES

The Role of Protozoa in Biological Purification of Oil Industry Sewage, (In Russian),
W77-08254 5D

Closed-Loop System Separates Oil from Prewash Overflow,
W77-08271 5D

Performance of Dual-Media Filters--I,
W77-08273 5D

Performance of Dual-Media Filters--II,
W77-08274 5D

Air Flotation of Oily Waste Waters with Organic Coagulants,
W77-08282 5D

OIL-WATER INTERFACES

Drift Velocities of Surface Films Over Waves,
W77-08193 5B

OIL WELLS

Research on Cements for Geothermal and Deep Oil Wells,
W77-08320 8F

OILY WATER

Pump-Filter for Bilge Water,
W77-08261 5G

OKLAHOMA

Selected Water-Level Records for Western Oklahoma, 1950-1975,
W77-08163 7C

Mineral Cycling in Reservoirs,
W77-08217 5C

Hydrologic Unit Map--1974, State of Oklahoma.
W77-08475 7C

OLIGOTROPHY

The Limnology of a North Carolina Millpond with Special Reference to Historical Changes as Evidenced by Sediment Core Analysis,
W77-08507 5C

ON-SITE DATA COLLECTIONS

Water-Level Decline and Pumpage in Deep Wells in the Chicago Region, 1971-1975,
W77-08302 2F

Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2H

ON-SITE INVESTIGATIONS

Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2H

ON-SITE TESTS

Vertical Strain-Rate Measurements in an Arctic Ice Cap and Deductions from Them,
W77-08226 2C

A Further Comparison of Glacier Velocities Measured by Radio-Echo and Survey Methods,
W77-08228 2C

OOSPOREIN

Spectroanalytical Parameters of Fungal Metabolites: Oosporein and Desmethoxyviridiol,
W77-08449 2K

OPEN CHANNEL FLOW

Effect of Lateral Inflow on Steady Open Channel Flows,
W77-08290 2E

OPEN CHANNELS

Alternative Measures of River Channel Shape and Their Significance,
W77-08241 8B

OPERATING COSTS
Construction and Maintenance Costs of Sewer Systems (Bau- und Betriebskosten von Kanalisationsanlagen),
W77-08542 8A

OPERATION
Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

OPERATIONS
Implementation of an Optimization Model for Operation of a Metropolitan Reservoir System,
W77-08211 4A

Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

OPTIMAL OPERATION
Implementation of an Optimization Model for Operation of a Metropolitan Reservoir System,
W77-08211 4A

OPTIMIZATION
Implementation of an Optimization Model for Operation of a Metropolitan Reservoir System,
W77-08211 4A

Water and Energy Systems: A Planning Model,
W77-08212 6A

Minimizing Costs in Well Field Design in Relation to Aquifer Models,
W77-08214 4B

Optimal Layout and Design of Storm Sewer Systems,
W77-08334 5D

OREGON
Withdrawal of Certain Waters from Appropriation: Special Municipal and County Water Rights,
W77-08142 6E

Appropriation of Water for Power (Hydroelectric Power Projects).
W77-08395 6E

ORGANIC ACIDS
Improved Method for the Determination of Ethylenediaminetetraacetic Acid in Aqueous Environmental Samples by Gas-Liquid Chromatography,
W77-08521 5A

ORGANIC CARBON
A Quantitative Study of Organic Carbon Decomposition and Nitrogen Transformations in Sewage Sludge-Soil Systems,
W77-08291 5B

ORGANIC COMPOUNDS
Removing Explosives from Wastewater,
W77-08266 5D

Ozone Effect of Synthetic Rubber Waste Treatment,
W77-08267 5D

Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

Is pH Pretreatment Necessary,
W77-08276 5D

Bacterial Growth on Dissolved Organic Compounds in Fresh-Water Reservoirs, (In Russian),
W77-08498 5A

ORGANIC LOADING
Effects of High Organic Loading on Mixed Photosynthetic Waste Water Treatment,
W77-08540 5D

ORGANIC MATTER
Effects of High Organic Loading on Mixed Photosynthetic Waste Water Treatment,
W77-08540 5D

ORGANIC WASTES
Waste Impoundment Efficiency at Sugar Mill,
W77-08268 5D

ORGANOCHLORINES
The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

ORTHOPHOSPHATES
Dissolved Solids, Hardness, and Orthophosphate of Surface-Water Runoff in the Northwest Florida Water Management District,
W77-08467 7C

OSMOSIS
Production of Energy From Concentrated Brines by Pressure-Retarded Osmosis, 1. Preliminary Technical and Economic Correlations,
W77-08233 3A

Forward Osmosis Extractors,
W77-08340 3A

OSMOTIC POTENTIAL
The Influences of Simulated Moisture Stress Conditions and Osmotic Substrates on Germination and Growth of Cultivated and Wild Safflowers,
W77-08460 2I

OSMOTIC PRESSURE
The Influences of Simulated Moisture Stress Conditions and Osmotic Substrates on Germination and Growth of Cultivated and Wild Safflowers,
W77-08460 2I

OSMUNDA REGALIS
Chromosome Mutations in a Fern Population Growing in a Polluted Environment: A Bioassay for Mutagens in Aquatic Environments,
W77-08305 5A

OUTER CONTINENTAL SHELF
States' Rights in the Outer Continental Shelf Denied by the United States Supreme Court,
W77-08365 6E

OVERDRAFT
A Postscript to the Mutual Prescription Doctrine--City of Los Angeles V City of San Fernando,
W77-08490 6E

OWNERSHIP
Mc Cardel V Smolen (The Rights of Riparian and Nonriparian Owners to Recreational Use of Navigable Inland Lakes).
W77-08138 6E

OXIDATION
Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

OXIDATION DITCHES
History and Development of the Oxidation Ditch,
W77-08587 5D

OXIDATION LAGOONS
Waste Impoundment Efficiency at Sugar Mill,
W77-08268 5D

History and Development of the Oxidation Ditch,
W77-08587 5D

Plant Capacity to Increase,
W77-08597 5D

OXYGEN
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

Oxygen Aeration at Newton Creek,
W77-08526 5D

Aerobic Treatment of Liquid Wastes--With Oxygen Concentration Measured and Used to Control Pump Speed Used to Force Liquid Through Venturis.
W77-08557 5D

BOC Blows Bubbles in Dirty Bath Water,
W77-08564 5D

Pre-Treatment in the Sewer,
W77-08596 5D

Plant Capacity to Increase,
W77-08597 5D

OXYGEN DEMAND
The Mathematical Description of the BOD Reaction in Stream Water,
W77-08493 5B

A Comparison of the Methods for Calculating the Constants for the First Order BOD Equation,
W77-08494 5B

OXYGEN DEPLETION
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

OXYGENATION
Use of Oxygen in Activated Sludge Plants (Utilizzazione dell'ossigeno allo stato puro negli impianti a fanghi attivi),
W77-08545 5D

Oxygen System Activated Sludge Process.
W77-08575 5D

Prospects Strong for Waste Water Oxygenation,
W77-08578 5D

Effluent Emphasis Underlines Environmental Effort at Enpocon,
W77-08579 5D

History and Development of the Oxidation Ditch,
W77-08587 5D

Oxygen Injection for Bath's Sewers,
W77-08599 5D

OZONE
Ozone Effect of Synthetic Rubber Waste Treatment,
W77-08267 5D

Ozone and Chlorine in Waste Water Disinfection,
W77-08536 5D

PACIFIC NORTHWEST U.S.
Toward Cleaner Water in the Pacific Northwest and Alaska--The National Water Permit Program.
W77-08121 5G

27th Northwest Fish Culture Conference.
W77-08309 2I

PACIFIC NORTHWEST US
Pumped-Storage in the Pacific Northwest, An Inventory.
W77-08224 2H

PACIFIC OCEAN
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

PADAN
Crystal Structure Analysis of Selected Pesticides by Single Crystal X-Ray Diffraction: The Crystal and Molecular Structure of Padan,
W77-08503 5A

PALEOHYDROLOGY
Pluvial Lakes of Nevada and Estimated Full Pluvial Climates,
W77-08199 2H

PALEOLIMNOLOGY
The Utility of Paleolimnological Analyses of Lake Sediments for Evaluating Acid Precipitation Effects on Dilute Lakes,
W77-08103 5A

PARTICLE SIZE
Statistical Characterization of Dilute Particulate Suspensions in Turbulent Fluid Fields,
W77-08330 5B

Suspended-Particle Transport and Circulation in San Francisco Bay: An Overview,
W77-08486 2L

PARTICLE VELOCITY
An Earthquake Risk Model That Incorporates Local Near Surface Site Conditions,
W77-08348 8E

PARTICULATE TRANSPORT
Statistical Characterization of Dilute Particulate Suspensions in Turbulent Fluid Fields,
W77-08330 5B

PATENTS
Year Round Cooling Water from the Cold Weather of Winter,
W77-08251 5D

Thermocompression-Type Apparatus for Desalting Saline Water,
W77-08252 3A

Method of Purification of Waste Water By Treatment with Zirconium Salt,
W77-08255 5D

Thermal Sensor for Measurement of Ocean Current Direction,
W77-08257 2L

Kraft Mill Recovery System,
W77-08258 5D

Precoat for Permeability Separation Systems,
W77-08259 5D

Method of Dispersing Oil in Water,
W77-08260 5G

Pump-Filter for Bilge Water,
W77-08261 5G

Marine Life Protector,
W77-08262 8I

Liquid Waste Treatment Apparatus,
W77-08263 5D

Apparatus for Continuous Liquid-Liquid Extraction of Water with a Solvent,
W77-08264 5F

Treatment of Aqueous Condensates and Effluents from Coking Plants--With Alkali Salts of Weak Acids, to Expel Ammonia.
W77-08275 5D

Purifying Biological Effluent Rich in Carbohydrates or Protein--By Anaerobic Fermentation Separation, Aerobic Treatment and Then Separation.
W77-08277 5D

Aerobic Treatment of Liquid Wastes--With Oxygen Concentration Measured and Used to Control Pump Speed Used to Force Liquid Through Venturis.
W77-08557 5D

Mechanical Surface Aerator for Effluent Purification--Has the Liquid Scooped by the Curved Elements and Ejected into the Air Above,
W77-08558 5D

Breaking Down Solid and Liquid Waste to Form a Fertilizer--By Inoculation with Selected Fungi and Fermentation.
W77-08559 5E

Sludge Collector and Light Liquid, Separator--from Sewage with Two Tanks in Single Housing and Cover.
W77-08560 5D

Cleaning of Sewage Sludge System.
W77-08561 5D

Screening Apparatus for Removal of Solids--from Sewage with Rotating Screen and Vertical Lift for Residues.
W77-08562 5D

Sewage Disposal System.
W77-08563 5E

PATH OF POLLUTANTS
A Predictive Model for Transient Temperature Distributions in Unsteady Flows,
W77-08221 5B

PEAK DISCHARGE
Small-Stream Flood Investigations in Minnesota, October 1958 to September 1975,
W77-08481 2E

PEANUT HULLS
Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

PENALTIES (LEGAL)
A New Measure of Damage for Wrongfully Appropriated Water,
W77-08361 4A

PENNSYLVANIA
United States V Osage Company (Removal of Sunken Boats Obstructing Navigable Waters Owner's Responsibility).
W77-08150 6E

Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

A Predictive Model for Transient Temperature Distributions in Unsteady Flows,
W77-08221 5B

Public Rights in Pennsylvania Waters,
W77-08362 6E

Legal Control of Consumptive Water Use in Pennsylvania Power Plants,
W77-08368 3E

City of York V. Pennsylvania Department of Environmental Resources (Delegation of Authority Under the Pennsylvania Waste Management Act).
W77-08403 6E

Computer Analysis and Mapping of Gypsy Moth Defoliation Levels in Pennsylvania Using LANDSAT-1 Digital Data,
W77-08420 7C

PERFORMANCE
Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

Reverse Osmosis on Secondary Sewage Effluent: The Effect of Recovery,
W77-08523 5D

Unstratified-Bed Filtration of Waste Water,
W77-08537 5D

An Estimation of the Efficiency of a Waste Water Treatment Plant, as Measured by Several Parameters Including Lipid Biodegradation (Essai d'evaluation de l'efficacite d'une station d'epuration a l'aide de plusieurs parametres dont la biodegradation des lipides),
W77-08548 5D

The Trials and Tribulations of Treatment Works in Lower Trent.
W77-08593 5D

PERMEABILITY
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

Transference: A Comprehensive Parameter Governing Permeation of Solutes Through Membranes,
W77-08231 3A

PERMIT COMPLIANCE PROCESS
EPA Focuses on Municipal Enforcement,
W77-08355 6E

PERMITS
Operation and Impact of NPDES in Region II, Part I,
W77-08117 5G

Federal Water Pollution Control Act Amendments of 1972 Reach Polluting Activities Oc-

curring Above Mean-High Water Line (Comment on U. S. V. Holland).
W77-08118 5G

Compliance with the Provisions of the Federal Water Pollution Control Act as Amended in 1972.
W77-08153 6E

Reservoirs,
W77-08158 6E

American Petroleum Institute V Environmental Protection Agency (Challenge to EPA Standards for Refineries Under the FWPCA Amendments of 1972).
W77-08394 6E

Appropriation of Water for Power (Hydroelectric Power Projects).
W77-08395 6E

PERMSELECTIVE MEMBRANES
Forward Osmosis Extractors,
W77-08340 3A

PESTICIDE RESIDUES
The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

Crystal Structure Analysis of Selected Pesticides by Single Crystal X-Ray Diffraction: The Crystal and Molecular Structure of Padan,
W77-08503 5A

PESTICIDES
Sources, Characteristics and Treatment and Disposal of Industrial Wastes Containing Hexachlorobenzene,
W77-08265 5D

Crystal Structure Analysis of Selected Pesticides by Single Crystal X-Ray Diffraction: The Crystal and Molecular Structure of Padan,
W77-08503 5A

The Effect of Soluble Organic Matter On the Utilization of Phenoxy Herbicides by Pseudomonas sp.,
W77-08504 5C

PETROGRAPHY
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

PHAEOCYSTIS-POUCHETII
The Ecological Significance of Antibiotic Substances Excreted by Algae in Waters, (In Polish),
W77-08463 5C

PHENOL
Involvement of Free Radicals in the Catalytic Oxidation of Phenol in Aqueous Solution,
W77-08201 5D

PHENOLIC RESINS
Resin-Coated Gravel is Used to Help Control Sand,
W77-08316 8G

PHILLIPINES
New Water Legislation--Drafting for Development, Efficient Allocation and Environmental Protection,
W77-08188 6E

PHOSPHATES
Detection of Phosphate Adsorption onto Coal Humic Acids,
W77-08294 5A

Pyro- and Tripoly-Phosphate Contents of Sediments,
W77-08306 5A

Dissolved Solids, Hardness, and Orthophosphate of Surface-Water Runoff in the Northwest Florida Water Management District,
W77-08467 7C

Availability of Aluminum Phosphate Complexes to a Green Alga in Various Culture Media,
W77-08496 5D

PHOSPHORESCENCE
Spectroanalytical Parameters of Fungal Metabolites: Oosporein and Desmethoxyviridiol,
W77-08449 2K

PHOSPHORUS
Nitrogen and Phosphorus Analyses of Rainfall at Rotorua, New Zealand,
W77-08242 5A

The Fallout of Nitrogen and Phosphorus Compounds from the Atmosphere at Ngapuna, Near Rotorua, New Zealand,
W77-08243 5A

Characteristics of the Biotic Cycle of Lake Baikal, (In Russian),
W77-08321 2H

A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

A Predictive Phosphorus Model for Lakes - Sensitivity Analysis and Applications,
W77-08499 5C

Phosphorus Exchange at the Sediment-Water Interface of Selected Narragansett Bay Sediments,
W77-08502 5C

PHOSPHORUS COMPOUNDS
Nitrogen and Phosphorus Analyses of Rainfall at Rotorua, New Zealand,
W77-08242 5A

The Fallout of Nitrogen and Phosphorus Compounds from the Atmosphere at Ngapuna, Near Rotorua, New Zealand,
W77-08243 5A

PHOSPHORUS REMOVAL
Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

The Solubility of Particulate Phosphorus in the Effluent From Alum Treatment of Wastewater and Phosphorus Solutions,
W77-08500 5D

PHOTOSYNTHESIS
Effect of Metals on Photosynthesis of Marine Phytoplankton, (In Russian),
W77-08160 5C

Effects of pH and Inorganic Carbon Concentrations Upon Competition Between Anabaena flos-aquae and Selenastrum capricornutum,
W77-08200 5C

Growth of Tropical and Temperate Grasses at Palmerston North I. Warm-Season Yields With and Without Irrigation,
W77-08457 3F

Effects of High Organic Loading on Mixed Photosynthetic Waste Water Treatment,
W77-08540 5D

PHREATOPHYTES
Estimating Evapotranspiration in the North Platte Basin of Wyoming,
W77-08505 2D

PHYSICAL PROPERTIES
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5A

PHYTOPLANKTON
Effect of Metals on Photosynthesis of Marine Phytoplankton, (In Russian),
W77-08160 5C

Longitudinal Distribution of Selected Micronutrients in Northern San Francisco Bay During 1973,
W77-08487 5C

Phytoplankton Production and Enumeration in Northern San Francisco Bay During 1972,
W77-08488 5C

Implications of Seasonal Chemical and Physical Factors on the Production of Phytoplankton in Northern San Francisco Bay,
W77-08489 5C

PICKLE INDUSTRY
Investigation of Coagulation - Precipitation and Ultrafiltration for the Regeneration of Brines in the Cucumber Pickle Industry,
W77-08511 5D

PILOT PLANTS
Performance of Dual-Media Filters--I,
W77-08273 5D

Performance of Dual-Media Filters--II,
W77-08274 5D

Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

PIPELINES
The Protection and Repair of Underground Pipelines for Water and Sewage,
W77-08551 8G

PIPES
Perforated, Vitrified Clay Pipe Used in Peoria Facilities,
W77-08598 8G

PIPING
Plain-End Pipe 'Collars' Problem Sewer Connections,
W77-08553 8G

PLANAR AERATED JETS
The Effect of Aeration of Water Jet Spreading,
W77-08197 8B

PLANNING
Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6B

University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

PLANNING

RECSAD: A Computer Program for Recreation Planning,
W77-08300 6B

An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

Planning Challenges in the Management of Coastal Zone Water Resources,
W77-08376 6B

Seabed Sewers for Hong Kong,
W77-08555 5E

PLANT GROUPINGS

The Use of Skylab Data to Study the Early Detection of Insect Infestations and Density and Distribution of Host Plants,
W77-08422 7C

PLANT GROWTH

The Influences of Simulated Moisture Stress Conditions and Osmotic Substrates on Germination and Growth of Cultivated and Wild Safflowers,
W77-08460 2I

PLASTICS

Polyethylene Sewer Force Main Takes Varying Pressures.
W77-08549 8G

PLUVIAL CLIMATES

Pluvial Lakes of Nevada and Estimated Full Pluvial Climates,
W77-08199 2H

PLUVIAL LAKES

Pluvial Lakes of Nevada and Estimated Full Pluvial Climates,
W77-08199 2H

PODZOLS

Fulvic Acid-Metal Ion Interactions in Water,
W77-08102 5A

POINT SOURCE DISCHARGES

Standards of Performance and Pretreatment Standards for the Explosives Manufacturing Point Source Category (Proposed Rules),
W77-08113 5G

POINT SOURCES

Irrigated Agriculture: Nonpoint and Point Source Water Pollution,
W77-08116 5G

POLITICAL ASPECTS

The Environmental Problem of the Oceans: An International Stepchild of National Egotism,
W77-08367 6E

POLITICAL CONSTRAINTS

The Environmental Problem of the Oceans: An International Stepchild of National Egotism,
W77-08367 6E

POLLUTANT IDENTIFICATION

Fulvic Acid-Metal Ion Interactions in Water,
W77-08102 5A

Determination of Pyridine in Farm Crops and Fish, (In Russian),
W77-08126 5A

Comparative Examination of Enterococci Obtained from Drinking Water, Foodstuffs and Urine, (In German),
W77-08179 5A

Arsenic in Water and Fish from Lakes Hartwell, Keowee, and Jocassee, South Carolina,
W77-08191 5A

A Survey of Cadmium Occurrence and Concentration in Fish from Eleven Major Reservoirs in South Carolina,
W77-08192 5A

Nitrogen and Phosphorus Analyses of Rainfall at Rotorua, New Zealand,
W77-08242 5A

Chelating Agent Analysis by High Speed Liquid Chromatography,
W77-08286 5A

Detection of Phosphate Adsorption onto Coal Humic Acids,
W77-08294 5A

Pyro- and Tripoly-Phosphate Contents of Sediments,
W77-08306 5A

A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

Possibilities and Role of Biological Analysis in Evaluating the Degree of Pollution of Water Bodies, (In Russian),
W77-08430 5A

Some Experimental Data on the Study of the Biological Action of Ethylbutylamine as a Water Pollution Factor, (In Russian),
W77-08439 5A

Bacterial Growth on Dissolved Organic Compounds in Fresh-Water Reservoirs, (In Russian),
W77-08498 5A

Crystal Structure Analysis of Selected Pesticides by Single Crystal X-Ray Diffraction: The Crystal and Molecular Structure of Padan,
W77-08503 5A

A Method for Quantitative Determination of Ammonifying and Denitrifying Bacteria in Water with Applied Examples from Gravel-Pit Pools, (In Czech),
W77-08509 5A

Pollution Indicator Bacteria Associated with Municipal Raw and Drinking Water Supplies,
W77-08516 5A

Enterovirus Types in Israel Sewage,
W77-08519 5A

Rapid Agar Pour-Plate Technique for Detection and Enumeration of Faecal Coliforms in Sewage,
W77-08520 5A

Improved Method for the Determination of Ethylenediaminetetraacetic Acid in Aqueous Environmental Samples by Gas-Liquid Chromatography,
W77-08521 5A

Improved Galvanic Dissolved Oxygen Sensor for Activated Sludge,
W77-08539 5A

Determination of BOD After Freezing Water Samples (Bestimmung des BSB nach Einfrierung der Wasserproben),
W77-08546 5A

Reliable pH Measurement When Effluent Conditions Get Tough,
W77-08592 5A

POLLUTION ABATEMENT

Reorganizing Pollution Control in the U.K.
W77-08111 5G

Environmental Protection Through the Common Law,
W77-08133 6G

Biochemical Transformation and Detoxification of Mercury in Aquatic Environment,
W77-08289 5C

Progress in MHI's Integrated Techniques for Environmental Protection,
W77-08533 5D

POLYCHLORINATED BIPHENYLS

Organochlorine Residues in New Zealand Birds and Mammals 2. Polychlorinated Biphenyls,
W77-08210 5C

The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

Chlorobiphenyls and PCB's: Formation During Chlorination,
W77-08538 5A

Chlorine Combining with Sewage,
W77-08571 5D

POLYELECTROLYTES

Role of Polyelectrolytes in the Filtration of Colloidal Particles from Water and Wastewater,
W77-08339 5D

POLYMERS

Removing Explosives from Wastewater,
W77-08266 5D

Investigation of the Effectiveness of Polymers in the Treatment of Nirocellulose-Manufacturing Wastewater,
W77-08338 5D

POLYPHOSPHATES

Pyro- and Tripoly-Phosphate Contents of Sedi ments,
W77-08306 5A

POROSITY

Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2I

Drainable Porosity Evaluation and its Relationship to Hydraulic Conductivity and Exchangeable Cations Under Different Bulk Densities,
W77-08461 4A

POTABLE WATER

Let's Have Achievable 'Safe' Drinking Water,
W77-08127 5C

Comparative Examination of Enterococci Obtained from Drinking Water, Foodstuffs and Urine, (In German),
W77-08179 5A

Bacteriological Pollution in the Drinking-Water of Jordan,
W77-08454 5I

Pollution Indicator Bacteria Associated with Municipal Raw and Drinking Water Supplies,
W77-08516 5A

POTATO PROCESSORS OF IDAHO
American Frozen Food v Train ('Guidelines' and 'Effluent Limitations' for the Potato Process Industry Pursuant to the Federal Water Pollution Control Act Amendments of 1972).
W77-08386 6E

POTATOES
Determination of Pyridine in Farm Crops and Fish, (In Russian),
W77-08126 5A

POTENTIAL EVAPOTRANSPIRATION
Estimating Evapotranspiration in the North Platte Basin of Wyoming,
W77-08505 2D

POWDERED ACTIVATED CARBON
What Lies Ahead for PAC,
W77-08541 5D

POWER PLANTS
Legal Control of Consumptive Water Use in Pennsylvania Power Plants,
W77-08368 3E

POWER SYSTEM OPERATION
Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

POWER TRANSFORMERS
Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

PRE-TREATMENT (WATER)
PL 92-500: Phoenix V. the EPA,
W77-08128 5G

Pre-Treatment in the Sewer,
W77-08596 5D

PRECIPITATION (ATMOSPHERIC)
The Influence of Precipitation on Biochemical Oxygen Demand on Nine Streams in New Jersey,
W77-08203 5B

Determining Areal Precipitation in the Basin and Range Province of Southern Arizona - Sonoita Creek Basin,
W77-08308 2B

PREFERENCES (WATER RIGHTS)
A New Measure of Damage for Wrongfully Appropriated Water,
W77-08361 4A

Water for Food - Or for More Important Purposes. (Reallocation of Irrigation Water to Cities and Industries),
W77-08377 6E

Water Rights Generally; Appropriation.
W77-08393 6E

Appropriation of Water.
W77-08405 6E

PRESCRIPTIVE RIGHTS
Anderson V Yearous (Rights of Dominant Owners to Unobstructed Use of Drainage Easements).
W77-08392 6E

A Postscript to the Mutual Prescription Doctrine--City of Los Angeles V City of San Fernando,
W77-08490 6E

PRETREATMENT (INDUSTRIAL WASTES)
Is pH Pretreatment Necessary,
W77-08276 5D

PRIMARY PRODUCTIVITY
Characteristics of the Biotic Cycle of Lake Baikal, (In Russian),
W77-08321 2H

The Productivity of Fouling Organism Associations in Lake Zelenetskoe, (In Russian),
W77-08323 5C

PRIOR APPROPRIATION
Can a State Embargo the Export of Water by Transbasin Diversions,
W77-08129 6E

A New Measure of Damage for Wrongfully Appropriated Water,
W77-08361 4A

Aubert V Town of Fruita (Senior Direct Flow Rights Favored in Dispute Over Dam).
W77-08390 6E

PRIORITIES
Appropriation of Water.
W77-08405 6E

Design of a Water Quality Monitoring Network,
W77-08497 5A

PROCESS DESIGN
Process Design of Single-Sludge Activated Sludge Systems Using Nitrate Respiration,
W77-08336 5D

PRODUCTIVITY
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

Reproduction Rate and Productivity of Bacteria in the Ponds of the Karamet-Niyaz Fishery Farm, (In Russian),
W77-08462 5C

PROGRAMS
Activities of the Water Resources Division in California.
W77-08479 7C

PROJECT BENEFITS
Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

PROPERTY DISPUTES
State v. Matzen (Use of Historical Maps to Settle Claims to Accretion Lands).
W77-08139 6E

PROPERTY INTERESTS
Ponce de Leon Condominiums v Digirolamo (Developer Responsible for Control of Surface Runoff).
W77-08136 6E

Hibiscus Harbor, Inc. V. State (Metes and Bounds Description Favored Over Low Water Mark in Determining Outcome of Boundary Dispute).
W77-08389 6E

PROPERTY RIGHTS
Solar Salt Company V Southern Pacific Transportation Company (Alteration of Saline Content of Great Salt Lake is Not Pollution Under Utah Statute).
W77-08146 6E

PRORATION
A Postscript to the Mutual Prescription Doctrine--City of Los Angeles V City of San Fernando,
W77-08490 6E

PROTEINS
Purifying Biological Effluent Rich in Carbohydrates or Protein--By Anaerobic Fermentation Separation, Aerobic Treatment and Then Separation.
W77-08277 5D

PROTOZOA
The Role of Protozoa in Biological Purification of Oil Industry Sewage, (In Russian),
W77-08254 5D

PSEUDOMONAS
The Effect of Soluble Organic Matter On the Utilization of Phenoxy Herbicides by Pseudomonas sp.,
W77-08504 5C

Confirmation of the Single-Step Membrane Filtration Procedure for Estimating Pseudomonas Aeruginosa Densities in Water,
W77-08518 5A

PUBLIC ACCESS
Recreational Use of Texas Rivers--Recommendations for Adoption of the Texas Public Rivers Act,
W77-08134 6E

Mc Cardel V Smolen (The Rights of Riparian and Nonriparian Owners to Recreational Use of Navigable Inland Lakes).
W77-08138 6E

Bank of America National Trust and Saving Association V State Water Resources Control Board (Condition Placed on Water Permit Defeated for Lack of Evidence of Necessity).
W77-08391 6E

PUBLIC HEALTH
Health Considerations in Use of Tertiary Effluents,
W77-08513 5F

Pollution Indicator Bacteria Associated with Municipal Raw and Drinking Water Supplies,
W77-08516 5A

PUBLIC PARTICIPATION
Citizen Participation in Comprehensive Water Resources Planning,
W77-08105 6B

Classification and Test of Public Participation Concepts Applied to Local Resource Planning,
W77-08295 6B

PUBLIC RIGHTS
Public Rights in Pennsylvania Waters,
W77-08362 6E

PUBLIC TRUST DOCTRINE
Public Rights in Pennsylvania Waters,
W77-08362 6E

PUERCO-ZUNI AREA (ARIZ)
Maps Showing Ground-Water COnditions in the Puerco-Zuni Area, Apache and Navajo Counties, Arizona--1975,
W77-08471 7C

PUERTO RICO
Ground Water in the San Juan Metropolitan Area, Puerto Rico,
W77-08173 4B

PULP AND PAPER INDUSTRY
Kraft Mill Recovery System,
W77-08258 5D

Effluent Limitations and Guidelines for Existing Sources and Standards of Performance and Pretreatment Standards for New Sources for the Bleached Kraft, Groundwood, Sulfite, Soda, Deink and Non-Integrated Paper Mills Segment of the Pulp, Paper, and Paperboard Point Source Category.
W77-08383 5G

Operational Considerations for the Application of Remotely Sensed Forest Data from LANDSAT or Other Airborne Platforms,
W77-08417 7C

Timber Type Separability in Southeastern United States on LANDSAT-1 MSS Data,
W77-08418 4A

PULP WASTES
Method of Purification of Waste Water By Treatment with Zirconium Salt,
W77-08255 5D

Effluent Limitations and Guidelines for Existing Sources and Standards of Performance and Pretreatment Standards for New Sources for the Bleached Kraft, Groundwood, Sulfite, Soda, Deink and Non-Integrated Paper Mills Segment of the Pulp, Paper, and Paperboard Point Source Category.
W77-08383 5G

PUMPED STORAGE
Pumped Storage Potential of the Hells Canyon Area,
W77-08196 8C

Pumped-Storage in the Pacific Northwest, An Inventory.
W77-08224 2H

Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

PUMPED STORAGE INVENTORIES
Pumped-Storage in the Pacific Northwest, An Inventory.
W77-08224 2H

PUMPING
Geohydrology of the Albin and La Grange Areas, Southeastern Wyoming,
W77-08176 4B

Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975,
W77-08469 4B

PUMPING PLANTS
Sewage Pumping Station Built to Handle Future System Demands,
W77-08550 8C

PUMPS
It's Your Loss,
W77-08319 8G

Sewage Pumping Station Built to Handle Future System Demands,
W77-08550 8C

Aerobic Treatment of Liquid Wastes--With Oxygen Concentration Measured and Used to Control Pump Speed Used to Force Liquid Through Venturis.
W77-08557 5D

PYRIDINE
Determination of Pyridine in Farm Crops and Fish, (In Russian),
W77-08126 5A

PYROPHOSPHATES
Pyro- and Tripoly-Phosphate Contents of Sediments,
W77-08306 5A

QUIET TITLE
State v. Matzen (Use of Historical Maps to Settle Claims to Accretion Lands).
W77-08139 6E

RADIATION
Measurement of the Attenuation of Electromagnetic Radiation by Water in the Visible Region of the Spectrum,
W77-08293 1A

RADIO-ECHO SOUNDING
Radio-Echo Sounding of Temperate Glaciers: Ice Properties and Sounder Design Criteria,
W77-08229 2C

Radio-Echo Sounding: Reflections from Internal Layers in Ice Sheets,
W77-08230 2C

RADIO WAVES
Radio-Echo Sounding: Reflections from Internal Layers in Ice Sheets,
W77-08230 2C

RADIOACTIVE DATING
U S Geological Survey, Water Resources Division, Radiocarbon Measurements I,
W77-08169 4B

RAIN RETENTION BASINS
Design and Operation of Rain Retention Basins (Entwurf und Betrieb von Regenruckhaltebecken),
W77-08547 8A

RAINFALL
Nitrogen and Phosphorus Analyses of Rainfall at Rotorua, New Zealand,
W77-08242 5A

Recent Flash Floods of the Dison Brook (Crues Brutales Recentes Du 'Ruisseau' De Dison (Belgique): Observations Et Previsions),
W77-08250 4A

A Note on the Study of Rainy Days and Wet Spells at Bijapur,
W77-08455 2B

Improving Food Crop Production in the Sudan Savanna Zone of Northern Nigeria,
W77-08459 3F

RAINFALL DISPOSITION
Flash Floods in the Western Mediterranean (Les Crues Catastrophiques sur la Mediterranee Occidentale),
W77-08245 2E

RAINFALL INFILTRATION
Rainfall Infiltration Characteristics for a Semi-Arid Watershed Soil,
W77-08206 2G

RAINFALL-RUNOFF RELATIONSHIPS
Application of Three Daily-Rainfall Runoff Models to Four Australian Catchments,
W77-08218 2A

The Effects of Urbanization on Low Flows and Total Runoff,
W77-08335 2A

RAINFALL SIMULATORS
Rainfall Infiltration Characteristics for a Semi-Arid Watershed Soil,
W77-08206 2G

RAMSEY COUNTY (N DAK)
Ground-Water Basic Data for Ramsey County, North Dakota,
W77-08177 7C

RANGE MANAGEMENT
Estimating Vegetative Biomass from LANDSAT-1 Imagery for Range Management,
W77-08409 4A

Discriminating Coastal Rangeland Production and Improvements with Computer Aided Techniques,
W77-08410 4A

Usefulness of LANDSAT Data for Monitoring Plant Development and Range Conditions in California's Annual Grassland,
W77-08411 4A

Monitoring Vegetation Conditions from LANDSAT for Use in Range Management,
W77-08412 4A

Potential of New Summer Grasses in Northland: I. Warm-Season Yields Under Dryland and Irrigation,
W77-08458 3F

REAERATION
Prediction Models of Reaeration Rate for Mountain Creeks,
W77-08501 5G

REASONABLE USE
Farmers Investment Company V Bettwy (Doctrine of Reasonable Use as Applied to Groundwaters).
W77-08137 6E

From Good Husbandry to Reasonable Use: Illinois Surface Water Drainage Law Evolves in Subdivision Case,
W77-08353 4A

RECLAMATION
Reclamation and Use of Disturbed Land in the Southwest.
W77-08452 5G

RECREATION
Inventory of Colorado's Front Range Mountain Reservoirs,
W77-08107 6B

Governmental Interest in Protecting Beach from Environmental Damage Through Overuse Outweighs Due Process Right to Bath Nude,
W77-08124 6E

Public Rights in Pennsylvania Waters,
W77-08362 6E

Flood Plains for Open Space and Recreation.
W77-08374 6F

RECREATION DEMAND
RECSAD: A Computer Program for Recreation Planning,
W77-08300 6B

RECREATION FACILITIES
Belford V. City of New Haven (Individual's Challenge to City's Dredging and Construction),
W77-08143 6E

RECYCLING
Kraft Mill Recovery System,
W77-08258 5D

Closed-Loop System Separates Oil from Prewash Overflow,
W77-08271 5D

Taking Acres Out of Pollution-Control Plans,
W77-08283 5D

An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

RED CEDAR RIVER (MICH)
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5A

REFINERY WASTES
Performance of Dual-Media Filters--I,
W77-08273 5D

Performance of Dual-Media Filters--II,
W77-08274 5D

Air Flotation of Oily Waste Waters with Organic Coagulants,
W77-08282 5D

REFLECTANCE
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

REFRACTIVITY
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

REFUSE ACT OF 1899
Environmental Law-Application of the Refuse Act of 1899 to Continual Industrial Discharges Is Upheld Without Formalized Permit Procedures,
W77-08382 5G

REGIONAL ANALYSIS
Water and Energy Systems: A Planning Model,
W77-08212 6A

Low Flow Analyses of Streams: Details of Computational Procedures and Annotated Bibliography,
W77-08219 2E

An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

REGIONAL DEVELOPMENT
Classification and Test of Public Participation Concepts Applied to Local Resource Planning,
W77-08295 6B

REGIONAL PLANNING
Water and Energy Systems: A Planning Model,
W77-08212 6A

REGRESSION ANALYSIS
Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

The Mathematical Description of the BOD Reaction in Stream Water,
W77-08493 5B

A Comparison of the Methods for Calculating the Constants for the First Order BOD Equation,
W77-08494 5B

REGULATION
Toward Cleaner Water in the Pacific Northwest and Alaska--The National Water Permit Program.
W77-08121 5G

Let's Have Achievable 'Safe' Drinking Water,
W77-08127 5G

Natural Resources Defense Council V Stamm (National Environmental Policy Act Not Satisfied When EIS Fails to Discuss All Reasonable Alternatives to the Project).
W77-08148 6E

Timber Products Processing Point Source Category Effluent Guidelines and Standards,
W77-08356 5G

Legal Control of Consumptive Water Use in Pennsylvania Power Plants,
W77-08368 3E

Effluent Guidelines and Standards for Canned and Preserved Fruits and Vegetables Point Source Category,
W77-08371 5G

Oil Spills and Spills of Hazardous Substances.
W77-08385 5G

RELICTION
Riparian Owner's Right to New Land Created by Reliction or by Accretion Influenced by Artificial Condition Not Produced by Such Owner.
W77-08398 6E

RELOCATION
Relocation of Buried Markers,
W77-08240 2C

REMEDIES
A New Measure of Damage for Wrongfully Appropriated Water,
W77-08361 4A

Legal Control of Consumptive Water Use in Pennsylvania Power Plants,
W77-08368 3E

REMOTE SENSING
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

Radio-Echo Sounding: Reflections from Internal Layers in Ice Sheets,
W77-08230 2C

Relocation of Buried Markers,
W77-08240 2C

Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Volume I-A, Technical Session Presentations, Agriculture-Environment.
W77-08408 7B

Estimating Vegetative Biomass from LANDSAT-1 Imagery for Range Management,
W77-08409 4A

Discriminating Coastal Rangeland Production and Improvements with Computer Aided Techniques,
W77-08410 4A

Usefulness of LANDSAT Data for Monitoring Plant Development and Range Conditions in California's Annual Grassland,
W77-08411 4A

Monitoring Vegetation Conditions from LANDSAT for Use in Range Management,
W77-08412 4A

Utilization of LANDSAT Imagery for Mapping Vegetation on the Millionth Scale,
W77-08413 7C

LANDSAT-1 Data, Its Use in a Soil Survey Program,
W77-08414 2G

Delineation of the Boundaries of a Buried Pre-Glacial Valley with LANDSAT-1 Data,
W77-08415 2G

Are Clear-Cut Areas Estimated from LANDSAT Imagery Reliable,
W77-08416 4A

Operational Considerations for the Application of Remotely Sensed Forest Data from LANDSAT or Other Airborne Platforms,
W77-08417 7C

Timber Type Separability in Southeastern United States on LANDSAT-1 MSS Data,
W77-08418 4A

Mapping of the Wildland Fuel Characteristics of the Santa Monica Mountains of Southern California,
W77-08419 7C

Computer Analysis and Mapping of Gypsy Moth Defoliation Levels in Pennsylvania Using LANDSAT-1 Digital Data,
W77-08420 7C

Computer Implemented Classification of Vegetation Using Aircraft Acquired Multispectral Scanner Data,
W77-08421 4A

The Use of Skylab Data to Study the Early Detection of Insect Infestations and Density and Distribution of Host Plants,
W77-08422 7C

Agricultural Inventory Capabilities of Machine Processed LANDSAT Digital Data,
W77-08423 3F

Agricultural Applications of Remote Sensing--A True Life Adventure,
W77-08424 3F

Practical Application of Remote Sensing in Agriculture,
W77-08425 3F

Wildlife Management by Habitat Units--A Preliminary Plan of Action,
W77-08426 4A

An Overview of the Development of Remote Sensing Techniques for the Screwworm Eradication Program,
W77-08427 3F

The Rationale for Attempting to Define Salt Marsh Mosquito-Breeding Areas in Galveston County by Remote Sensing the Associated Vegetation.
W77-08428 4A

Application of EREP, LANDSAT and Aircraft Image Data to Environmental Problems Related to Coal Mining,
W77-08429 5A

Quantitative Water Quality with Landsat and Skylab.
W77-08431 5A

LANDSAT-1 Data as it has Been Applied for Land Use and Water Quality Data By the Virginia State Water Control Board,
W77-08432 5A

The LANDSAT-1 Multispectral Scanner as a Tool in the Classification of Inland Lakes,
W77-08433 5A

Trophic Status of Inland Lakes from LANDSAT,
W77-08434 5A

The Use of LANDSAT-1 Imagery for Water Quality Studies in Southern Scandinavia,
W77-08435 5A

A Comparative Interregional Analysis of Selected Data from LANDSAT-1 and EREP for the Inventory and Monitoring of Natural Ecosystems,
W77-08436 7C

Remote Sensing Applications in Kansas,
W77-08437 4A

Remote Sensing Applications in the Inventory and Analysis of Environmental Problems,
W77-08438 5A

REPAIR
Ideas Aplenty-But Still Sewers Face Cash Neglect.
W77-08554 8G

REPRODUCTION
Reproduction Rate and Productivity of Bacteria in the Ponds of the Karamet-Niyaz Fishery Farm, (In Russian),
W77-08462 5C

RESEARCH AND DEVELOPMENT
U.S. Environmental Protection Agency Environmental Research Outlook FY 1976 Through 1980 (Report to Congress).
W77-08120 6G

The ERDA Geothermal Program,
W77-08314 4B

Inventory of Water Resources Research at the University of Wyoming, Fiscal Year 1975,
W77-08506 9A

RESEARCH FACILITIES
Reorganizing Pollution Control in the U.K.
W77-08111 5G

RESEARCH PRIORITIES
U.S. Environmental Protection Agency Environmental Research Outlook FY 1976 Through 1980 (Report to Congress).
W77-08120 6G

RESERVATION DOCTRINE
Should Rivers Have Running. Toward Extension of the Reserved Rights Doctrine to Include Minimum Stream Flows,
W77-08372 6E

The Winters Doctrine and How It Grew: Federal Reservation of Rights to Use of Water,
W77-08375 6E

RESERVOIR OPERATIONS
Pumped Storage Potential of the Hells Canyon Area,
W77-08196 8C

RESERVOIRS
Inventory of Colorado's Front Range Mountain Reservoirs,
W77-08107 6B

A Statistical Analysis of the Mercury Concentrations in Fish from Lake Jocassee, South Carolina,
W77-08190 5A

A Survey of Cadmium Occurrence and Concentration in Fish from Eleven Major Reservoirs in South Carolina,
W77-08192 5A

Implementation of an Optimization Model for Operation of a Metropolitan Reservoir System,
W77-08211 4A

Mineral Cycling in Reservoirs,
W77-08217 5C

The Flooding of Rivers in the USSR and the Measures Taken to Control Ice Jams (Les Inondations Fluviales En URSS Et La Lutte Contre Les Crues Causees Par Les Embacles),
W77-08246 2C

Bank of America National Trust and Saving Association V State Water Resources Control Board (Condition Placed on Water Permit Defeated for Lack of Evidence of Necessity).
W77-08391 6E

Computer Program for Reservoir-Water Budgets,
W77-08464 4A

Water-Quality Records for Selected Reservoirs in Texas, 1974-75 Water Years,
W77-08483 5A

RESIDENTIAL WATER CONSERVATION
What We Can Do Before the Well Runs Dry--A Summary of WRC Report No. 35 --Residential Water conservation-Milne,
W77-08101 3D

RESINS
Resin-Coated Gravel is Used to Help Control Sand,
W77-08316 8G

Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

RESISTIVITY
Applications of Surface Resistivity Methods,
W77-08244 2F

True-Temperature Determination of Geothermal Reservoirs,
W77-08318 7B

RESOURCES
Classification and Test of Public Participation Concepts Applied to Local Resource Planning,
W77-08295 6B

RESOURCES DEVELOPMENT
Department of Water Resources,
W77-08141 6E

Remote Sensing Applications in Kansas,
W77-08437 4A

RESPIRATION
Process Design of Single-Sludge Activated Sludge Systems Using Nitrate Respiration,
W77-08336 5D

RETARDATION EQUATIONS
The Mathematical Description of the BOD Reaction in Stream Water,
W77-08493 5B

RETURN FLOW
Economic Impacts of Controlling Water Quality in an Irrigated River Basin,
W77-08332 5G

REVEGETATION
Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

REVERSE OSMOSIS
Status of Reverse Osmosis Desalination Technology,
W77-08225 3A

Reverse Osmosis on Secondary Sewage Effluent: The Effect of Recovery,
W77-08523 5D

REVIEWS
Measurement of Flash Floods in the United States--State of the Art,
W77-08161 2E

Low Flow Analyses of Streams: Details of Computational Procedures and Annotated Bibliography,
W77-08219 2E

Status of Reverse Osmosis Desalination Technology,
W77-08225 3A

State of the Art in Sewage Treatment Plant Control,
W77-08515 5D

RHINE RIVER (GERMANY)
The Effect of Different Flocculants on the Elimination of Trace Elements and Polycyclic Hydrocarbons in the Water Purification Process, (In German),
W77-08256 5D

RHODE ISLAND
Phosphorus Exchange at the Sediment-Water Interface of Selected Narragansett Bay Sediments,
W77-08502 5C

RIO GRANDE RIVER
Restless River: International Law and the Behavior of the Rio Grande,
W77-08384 6E

RIPARIAN RIGHTS
Mc Cardel V Smolen (The Rights of Riparian and Nonriparian Owners to Recreational Use of Navigable Inland Lakes).
W77-08138 6E

Michigan Conference Association of Seventh-Day Adventists V Commission of Natural Resources (Private Lakes with No Obvious Public Access Closed to the Public).
W77-08149 6E

Aquaculture: Problems of Implementation Under Existing Law,
W77-08369 6E

Riparian Owner's Right to New Land Created by Reliction or by Accretion Influenced by Artificial Condition Not Produced by Such Owner.
W77-08398 6E

RISKS
An Earthquake Risk Model That Incorporates Local Near Surface Site Conditions,
W77-08348 8E

RIVER BASIN COMMISSION
Citizen Participation in Comprehensive Water Resources Planning,
W77-08105 6B

RIVER BEDS
Recreational Use of Texas Rivers--Recommendations for Adoption of the Texas Public Rivers Act,
W77-08134 6E

RIVERS
Recreational Use of Texas Rivers--Recommendations for Adoption of the Texas Public Rivers Act,
W77-08134 6E

Alternative Measures of River Channel Shape and Their Significance,
W77-08241 8B

The Flooding of Rivers in the USSR and the Measures Taken to Control Ice Jams (Les Inondations Fluviales En URSS Et La Lutte Contre Les Crues Causees Par Les Embacles),
W77-08246 2C

Flood Plains for Open Space and Recreation.
W77-08374 6F

Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

RIVERS AND HARBORS ACT
Federal Water Pollution Control Act Amendments of 1972 Reach Polluting Activities Occurring Above Mean-High Water Line (Comment on U. S. V. Holland).
W77-08118 5G

Public Hearing Regarding 180-Day Notice to the Santa Fe Land Improvement Company of Violation of State and Federal Water Quality Standards for the Interstate Waters of the Kansas and Missouri Rivers, Held at Kansas City, Kansas on 13 July 1971.
W77-08381 5G

ROANOKE RIVER (VA)
A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

ROOT GROWTH
Root Growth, Strength, and Chemical Properties of a Hobson Fragipan,
W77-08285 2G

ROTARY DRILLING
Kelly Care Extends Service Life,
W77-08311 8C

Better Protection for Casing and Tool Joints,
W77-08315 8G

Air, Mist and Foam Drilling, A Look at the Latest Techniques, Part 2,
W77-08326 8C

ROTORUA (NEW ZEALAND)
Nitrogen and Phosphorus Analyses of Rainfall at Rotorua, New Zealand,
W77-08242 5A

The Fallout of Nitrogen and Phosphorus Compounds from the Atmosphere at Ngapuna, Near Rotorua, New Zealand,
W77-08243 5A

ROUTING
Simulation of Streamflow of Flambeau River at Park Falls, Wisconsin to Define Low-Flow Characteristics,
W77-08172 2E

RUBBER
Asphalt-Rubber Mixtures for Seepage Control,
W77-08195 4A

RUNOFF
Ponce de Leon Condominiums v Digirolamo (Developer Responsible for Control of Surface Runoff).
W77-08136 6E

Computer Program for Reservoir-Water Budgets,
W77-08464 4A

RYBINSK RESERVOIR (USSR)
Bacterial Growth on Dissolved Organic Compounds in Fresh-Water Reservoirs, (In Russian),
W77-08498 5A

SALINE AQUIFERS
Effect of Dip on the Subsurface Storage or Disposal of Fluid in Saline Aquifers,
W77-08204 4B

Effect of Viscosity Ratio on the Recovery of Fresh Water Stored in Saline Aquifers,
W77-08205 4B

SALINE LAKES
Solar Salt Company V Southern Pacific Transportation Company (Alteration of Saline Content of Great Salt Lake is Not Pollution Under Utah Statute).
W77-08146 6E

SALINE WATER
Solar Salt Company V Southern Pacific Transportation Company (Alteration of Saline Content of Great Salt Lake is Not Pollution Under Utah Statute).
W77-08146 6E

Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

Thermocompression-Type Apparatus for Desalting Saline Water,
W77-08252 3A

SALINE WATER INTRUSION
The Influence of Brackish-Water Intrusion on Macroinvertebrate Associations of the Lower Tchefuncte River, Louisiana,
W77-08292 5B

Report on Water Resources Problems of Western Collier County, Florida as Affected by the GAC Corporation's Canal System in Its Golden Gate Development Project,
W77-08380 6E

SALINITY
Solar Salt Company V Southern Pacific Transportation Company (Alteration of Saline Content of Great Salt Lake is Not Pollution Under Utah Statute).
W77-08146 6E

Water Allocation and Pricing for Control of Irrigation-Related Salinity in a River Basin,
W77-08213 5G

Effects of 40-Foot Charleston Harbor Project on Tides, Currents, and Salinities; Hydraulic Model Investigation,
W77-08222 2L

SALMONELLA
Bacteriological Investigation of Alberta Meat-Packing Plant Wastes with Emphasis on Salmonella Isolation,
W77-08269 5D

SALT LAKE COUNTY (UTAH)
An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

SALT MARSHES
The Rationale for Attempting to Define Salt Marsh Mosquito-Breeding Areas in Galveston County by Remote Sensing the Associated Vegetation.
W77-08428 4A

SAN FRANCISCO BAY
Suspended-Particle Transport and Circulation in San Francisco Bay: An Overview,
W77-08486 2L

SAN FRANCISCO BAY (CALIF)
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

SAN FRANCISCO BAY ESTUARY
Longitudinal Distribution of Selected Micronutrients in Northern San Francisco Bay During 1973,
W77-08487 5C

Phytoplankton Production and Enumeration in Northern San Francisco Bay During 1972,
W77-08488 5C

Implications of Seasonal Chemical and Physical Factors on the Production of Phytoplankton in Northern San Francisco Bay,
W77-08489 5C

SAN JOAQUIN VALLEY (CALIF)
Agricultural Applications of Remote Sensing--A True Life Adventure,
W77-08424 3F

SAN JUAN AREA (PR)
Ground Water in the San Juan Metropolitan Area, Puerto Rico,
W77-08173 4B

SAN LEANDRO CREEK (CALIF)
Invertebrate Colonization of Artificial Substrates in San Leandro Creek,
W77-08443 5A

SANDS
Water Resources Commission V. Connecticut Sand and Stone Corporation (Judicial Review of Administrative Factual Determination).
W77-08404 6E

SANITARY ENGINEERING
EPA Focuses on Municipal Enforcement,
W77-08355 6E

Oil-Flushed Toilets Gain,
W77-08583 3D

SASKATCHEWAN (CANADA)
Agricultural Inventory Capabilities of Machine Processed LANDSAT Digital Data,
W77-08423 3F

SCREWWORM ERADICATION
An Overview of the Development of Remote Sensing Techniques for the Screwworm Eradication Program,
W77-08427 3F

SEA ICE
Impurity Concentrations in Sea Ice,
W77-08237 2C

SEABEDS
Remembering Maine: Offshore Federalism in the United States and Canada,
W77-08363 6E

SECOND ORDER KINETICS
The Mathematical Description of the BOD Reaction in Stream Water,
W77-08493 5B

SEDIMENT ANALYSIS
Pyro- and Tripoly-Phosphate Contents of Sediments,
W77-08306 5A

SEDIMENT DISTRIBUTION
American Sedimentation Law and Physical Processes,
W77-08130 6E

SEDIMENT LOSS
Economic Impacts of Controlling Water Quality in an Irrigated River Basin,
W77-08332 5G

SEDIMENT TRANSPORT
Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

Suspended-Particle Transport and Circulation in San Francisco Bay: An Overview,
W77-08486 2L

SEDIMENT-WATER INTERFACES
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

Phosphorus Exchange at the Sediment-Water Interface of Selected Narragansett Bay Sediments,
W77-08502 5C

SEDIMENT YIELD
Sediment Yield and Land Use in Southwest United States,
W77-08178 4D

SEDIMENTATION
American Sedimentation Law and Physical Processes,
W77-08130 6E

Effects of Meandering in Alluvial Streams,
W77-08216 2E

Statistical Characterization of Dilute Particulate Suspensions in Turbulent Fluid Fields,
W77-08330 5B

SEDIMENTATION RATES
American Sedimentation Law and Physical Processes,
W77-08130 6E

SEDIMENTS
Pyro- and Tripoly-Phosphate Contents of Sediments,
W77-08306 5A

Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-08329 5B

Phosphorus Exchange at the Sediment-Water Interface of Selected Narragansett Bay Sediments,
W77-08502 5C

SEEPAGE CONTROL
Asphalt-Rubber Mixtures for Seepage Control,
W77-08195 4A

SELECTIVE WITHDRAWAL
Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

SELENASTRUM CAPRICORNUTUM
Effects of pH and Inorganic Carbon Concentrations Upon Competition Between Anabaena flos-aquae and Selenastrum capricornutum,
W77-08200 5C

Availability of Aluminum Phosphate Complexes to a Green Alga in Various Culture Media,
W77-08496 5D

SEPARATION TECHNIQUES
Precoat for Permeability Separation Systems,
W77-08259 5D

Apparatus for Continuous Liquid-Liquid Extraction of Water with a Solvent,
W77-08264 5F

Forward Osmosis Extractors,
W77-08340 3A

Sludge Collector and Light Liquid, Separator--from Sewage with Two Tanks in Single Housing and Cover.
W77-08560 5D

Screening Apparatus for Removal of Solids--from Sewage with Rotating Screen and Vertical Lift for Residues.
W77-08562 5D

SEPTIC TANKS
Trends in Small Sewage Treatment Plants,
W77-08569 5D

SERVIENT OWNERS
Anderson V Yearous (Rights of Dominant Owners to Unobstructed Use of Drainage Easements).
W77-08392 6E

SERVIENT TRACTS
Anderson V Yearous (Rights of Dominant Owners to Unobstructed Use of Drainage Easements).
W77-08392 6E

SETTLING BASINS
Mathematical and Experimental Investigation of Nonsteady State Thickening of an Ideal Slurry,
W77-08207 5D

SEWAGE DISPOSAL
Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

A Quantitative Study of Organic Carbon Decomposition and Nitrogen Transformations in Sewage Sludge-Soil Systems,
W77-08291 5B

Public Hearing Regarding 180-Day Notice to the Santa Fe Land Improvement Company of Violation of State and Federal Water Quality Standards for the Interstate Waters of the Kansas and Missouri Rivers, Held at Kansas City, Kansas on 13 July 1971.
W77-08381 5G

Sewage Disposal System.
W77-08563 5E

Kowloon Sewage Treatment and Disposal,
W77-08573 5D

SEWAGE EFFLUENT DISPOSAL
Spray Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soil,
W77-08202 5D

SEWAGE EFFLUENTS
Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

Spray Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soil,
W77-08202 5D

Persistence of Mycobacterium Bovis BCG in Soil and on Vegetables Spray-Irrigated with Sewage Effluent and Sludge,
W77-08525 5C

BOC Blows Bubbles in Dirty Bath Water,
W77-08564 5D

SEWAGE SLUDGE
Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

Response of Oat and Spinach to Sewage Sludge Application in Soil,
W77-08495 5C

Cleaning of Sewage Sludge System.
W77-08561 5D

SEWAGE TREATMENT
The 1972 Water Pollution Control Act: Unforeseen Implications for Land Use Planning,
W77-08373 5C

Public Hearing Regarding 180-Day Notice to the Santa Fe Land Improvement Company of Violation of State and Federal Water Quality Standards for the Interstate Waters of the Kansas and Missouri Rivers, Held at Kansas City, Kansas on 13 July 1971.
W77-08381 5C

Reverse Osmosis on Secondary Sewage Effluent: The Effect of Recovery,
W77-08523 5

Chlorine Combining with Sewage,
W77-08571 5

Everything from a Pipe Filter to a Turnkey Project,
W77-08572 5

Kowloon Sewage Treatment and Disposal,
W77-08573 5D

Sewage Works is Above Ground Level,
W77-08574 5D

1.17 Million (Pound) Works and Sewage Scheme Completed at Market Rasen.
W77-08584 5D

Automatic Control of Whitlingham Sewage Treatment Works Norwich,
W77-08585 5D

Moduflex Sewage Treatment Plants Provide the Answer to Growth,
W77-08588 5D

Pre-Treatment in the Sewer,
W77-08596 5D

Oxygen Injection for Bath's Sewers,
W77-08599 5D

SEWERS
Optimal Layout and Design of Storm Sewer Systems,
W77-08334 5D

Construction and Maintenance Costs of Sewer Systems (Bau- und Betriebskosten von Kanalisationsanlagen),
W77-08542 8A

Polyethylene Sewer Force Main Takes Varying Pressures.
W77-08549 8G

The Protection and Repair of Underground Pipelines for Water and Sewage,
W77-08551 8G

Post-Tensioned Sewer River Crossing.
W77-08552 8E

Plain-End Pipe 'Collars' Problem Sewer Connections,
W77-08553 8G

Ideas Aplenty-But Still Sewers Face Cash Neglect.
W77-08554 8G

Seabed Sewers for Hong Kong,
W77-08555 5E

Concrete Bucket Distributes Crushed Bedding Evenly on Sewer Job.
W77-08556 8F

BOC Blows Bubbles in Dirty Bath Water,
W77-08564 5D

Pre-Treatment in the Sewer,
W77-08596 5D

Oxygen Injection for Bath's Sewers,
W77-08599 5D

SHAPE
Alternative Measures of River Channel Shape and Their Significance,
W77-08241 8B

SHIPS
United States V Osage Company (Removal of Sunken Boats Obstructing Navigable Waters Owner's Responsibility).
W77-08150 6E

SHOALS
Canadian Pacific (Bermuda) Limited V United States (No Duty to Survey or Dredge Channel at Any Particular Time).
W77-08152 6E

SHORE PROTECTION
Boundaries of the Coastal Zone: A Survey of State Laws,
W77-08132 6E

SHORELINE MANAGEMENT PROGRAM
University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

SHORES
Beach Profile Changes: East Coast of Lake Michigan, 1970-72,
W77-08440 2J

SILVER CARP
Hypophthalmichthys Molitrix (Val.)) for Increasing Fish Productivity and Decreasing the Level of Eutrophication of Dnieper Reservoirs, (In Russian),
W77-08364 5C

SILVER LAKE (NC)
The Limnology of a North Carolina Millpond with Special Reference to Historical Changes as Evidenced by Sediment Core Analysis,
W77-08507 5C

SIMULATED RAINFALL
Determining Areal Precipitation in the Basin and Range Province of Southern Arizona - Sonoita Creek Basin,
W77-08308 2B

SIMULATION ANALYSIS
Simulation of Streamflow of Flambeau River at Park Falls, Wisconsin to Define Low-Flow Characteristics,
W77-08172 2E

Regional Simulation of Streamflow Data,
W77-08298 2A

A Simulation of an Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W77-08343 3F

SIMULTANEOUS FIRST ORDER KINETICS
The Mathematical Description of the BOD Reaction in Stream Water,
W77-08493 5B

SITES
Pumped Storage Potential of the Hells Canyon Area,
W77-08196 8C

An Earthquake Risk Model That Incorporates Local Near Surface Site Conditions,
W77-08348 8E

SLOPE PROTECTION
Chemical and Vegetative Stabilization of Soils,
W77-08512 8D

SLUDGE
Mathematical and Experimental Investigation of Nonsteady State Thickening of an Ideal Slurry,
W77-08207 5D

Fluoride Analysis of Water-Treatment-Plant Sludges,
W77-08342 5F

SLUDGE DIGESTION
Aerobic Digestion of Waste Activated Sludge at Low Temperatures,
W77-08527 5D

Aerobic Digestion of Sludges Precipitated from Waste Water by Lime Addition,
W77-08530 5D

SLUDGE DISPOSAL
Persistence of Mycobacterium Bovis BCG in Soil and on Vegetables Spray-Irrigated with Sewage Effluent and Sludge,
W77-08525 5C

S. W.'s Sludge Incineration scheme,
W77-08570 5E

Fluid Bed for Sewage Sludge Burn Up,
W77-08582 5E

Trenching Sludge May be Safe.
W77-08594 5E

SLUDGE DRYING BEDS
Filters and Sludge Drying Beds,
W77-08586 5D

SLUDGE TREATMENT
Mathematical and Experimental Investigation of Nonsteady State Thickening of an Ideal Slurry,
W77-08207 5D

Split-Stream Chemical Treatment (A Patented Process by Chemlan Company, Inc.) of Tanning Industry Waste Water,
W77-08280 5D

Dewatering: A New Method Bows,
W77-08528 5D

Enzymatic Treatment of Primary Municipal Sludge with Trichoderma Viride Cellulase,
W77-08529 5D

Characterizing Sludge for Centrifugal Dewatering,
W77-08535 5D

Dewatering Machines (Entwasserungsmachinen),
W77-08544 5D

Sludge Collector and Light Liquid, Separator--from Sewage with Two Tanks in Single Housing and Cover.
W77-08560 5D

Cleaning of Sewage Sludge System.
W77-08561 5D

S. W.'s Sludge Incineration scheme,
W77-08570 5E

Oxygen System Activated Sludge Process.
W77-08575 5D

Sewage Sludge Disinfected by Electron-Beam Bombardment.
W77-08580 5D

Sludge Dewatering Press.
W77-08581 5E

Filters and Sludge Drying Beds,
W77-08586 5D

Perforated, Vitrified Clay Pipe Used in Peoria Facilities,
W77-08598 8G

Higher Gas Yields and Reduced Retention Times Obtained from Anaerobic Digester,
W77-08600 5D

SLURRIES
Mathematical and Experimental Investigation of Nonsteady State Thickening of an Ideal Slurry,
W77-08207 5D

SMALL WATERSHEDS
Multiple Objective Planning: Small Watersheds,
W77-08350 6B

Small-Stream Flood Investigations in Minnesota, October 1958 to September 1975,
W77-08481 2E

Annual Peak Discharges from Small Drainage Areas in Montana Through September 1976,
W77-08482 2E

SMITH MOUNTAIN LAKE (VA)
A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

SNAKE PLAIN AQUIFER (IDAHO)
Digital-Model Analysis of the Effects of Water-Use Alternatives on Spring Discharges, Gooding and Jerome Counties, Idaho,
W77-08484 4B

SNAKE RIVER
27th Northwest Fish Culture Conference.
W77-08309 2I

SNAKE RIVER PLAIN AQUIFER (IDAHO)
Aquifer Modeling Helps Farmers.
W77-08317 2F

SNOW
On Depth Hoar and the Strength of Snow,
W77-08239 2C

SNOW COVER
The AFGWC Snow Cover Analysis Model,
W77-08223 2C

SNOW COVER ANALYSIS
The AFGWC Snow Cover Analysis Model,
W77-08223 2C

SNOWMELT
Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

SNOWPACKS
On Depth Hoar and the Strength of Snow,
W77-08239 2C

SOCIAL ASPECT
Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6B

SOCIAL ASPECTS
Discriminant Analysis of Characteristics Determining Acceptance or Rejection of Nuclear Power,
W77-08109 6B

Multiple Objective Planning: Small Watersheds,
W77-08350 6B

SOCIAL IMPACT
Citizen Participation in Comprehensive Water Resources Planning,
W77-08105 6B

SOCIAL PARTICIPATION
Citizen Participation in Comprehensive Water Resources Planning,
W77-08105 6B

Classification and Test of Public Participation Concepts Applied to Local Resource Planning,
W77-08295 6B

SODIUM
Effect of Some Chemical Elements on the Accumulation of Cesium-137 in Freshwater Fish, (In Russian),
W77-08322 5C

SODIUM BICARBONATE
Sodium Bicarbonate Can Settle Many Waste Water Problem Upsets,
W77-08589 5D

SOFT-WATER BOG LAKE
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

SOIL ANALYSIS
Fulvic Acid-Metal Ion Interactions in Water,
W77-08102 5A

SOIL CHEMICAL PROPERTIES
Root Growth, Strength, and Chemical Properties of a Hobson Fragipan,
W77-08285 2G

SOIL CONTAMINATION
A Quantitative Study of Organic Carbon Decomposition and Nitrogen Transformations in Sewage Sludge-Soil Systems,
W77-08291 5B

SOIL HORIZONS
Root Growth, Strength, and Chemical Properties of a Hobson Fragipan,
W77-08285 2G

SOIL MOISTURE
A Simulation of an Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W77-08343 3F

Growth of Tropical and Temperate Grasses at Palmerston North I. Warm-Season Yields With and Without Irrigation,
W77-08457 3F

SOIL PROFILES
Root Growth, Strength, and Chemical Properties of a Hobson Fragipan,
W77-08285 2G

SOIL STABILIZATION
Chemical and Vegetative Stabilization of Soils,
W77-08512 8D

SOIL SURVEYS
LANDSAT-1 Data, Its Use in a Soil Survey Program,
W77-08414 2G

Delineation of the Boundaries of a Buried Pre-Glacial Valley with LANDSAT-1 Data,
W77-08415 2G

SOIL TYPES
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

SOIL WATER
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

SOIL WATER MOVEMENT
Root Growth, Strength, and Chemical Properties of a Hobson Fragipan,
W77-08285 2G

A Water Management Model for High Water Table Soils,
W77-08301 3F

SOLID WASTES
Breaking Down Solid and Liquid Waste to Form a Fertilizer--By Inoculation with Selected Fungi and Fermentation.
W77-08559 5E

Screening Apparatus for Removal of Solids--from Sewage with Rotating Screen and Vertical Lift for Residues.
W77-08562 5D

SOLUBLE METALS WASTE REMOVAL
Removing Soluble Metals from Waste Water,
W77-08591 5D

SOLUTES
Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

SONOITA CREEK BASIN (ARIZ)
Determining Areal Precipitation in the Basin and Range Province of Southern Arizona - Sonoita Creek Basin,
W77-08308 2E

SOUNDING
Radio-Echo Sounding of Temperate Glaciers: Ice Properties and Sounder Design Criteria,
W77-08229 2C

SOUTH CAROLINA
A Statistical Analysis of the Mercury Concentrations in Fish from Lake Jocassee, South Carolina,
W77-08190 5A

Arsenic in Water and Fish from Lakes Hartwell, Keowee, and Jocassee, South Carolina,
W77-08191 5A

Effects of 40-Foot Charleston Harbor Project on Tides, Currents, and Salinities; Hydraulic Model Investigation,
W77-08222 2L

SOUTH CASCADE GLACIER (WASH)
Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

SOUTH DAKOTA
LANDSAT-1 Data, Its Use in a Soil Survey Program,
W77-08414 2G

Water-Resources Investigations in South Dakota, 1976.
W77-08468 7C

Hydrologic Unit Map--1974, State of South Dakota.
W77-08476 7C

SOUTH PLATTE RIVER BASIN (COLO)
Input-Output Modeling in Water Resource System Planning,
W77-08346 6A

PERMANENT U.S. DEPT. OF INTERIOR LIBRARY

SOUTH RIVER WATERSHED (VA)
A Finite Element Model to Determine the Effect of Land-Use Changes on Flood Hydrographs,
W77-08450 8B

SOUTHEAST U.S.
Operational Considerations for the Application of Remotely Sensed Forest Data from LANDSAT or Other Airborne Platforms,
W77-08417 7C

Timber Type Separability in Southeastern United States on LANDSAT-1 MSS Data,
W77-08418 4A

SOUTHWEST U.S.
Sediment Yield and Land Use in Southwest United States,
W77-08178 4D

SOUTHWEST US
Reclamation and Use of Disturbed Land in the Southwest.
W77-08452 5G

SPAIN
Flash Floods in the Western Mediterranean (Les Crues Catastrophiques sur la Mediterranee Occidentale),
W77-08245 2E

Flash Floods in Spain (Les Crues Brutales En Espagne),
W77-08247 2E

SPECTROSCOPY
Investigation of Detection Limits for Solutes in Water Measured by Laser Raman Spectrometry,
W77-08171 2K

Spectroanalytical Parameters of Fungal Metabolites: Oosporein and Desmethoxyviridiol,
W77-08449 2K

SPINACH
Response of Oat and Spinach to Sewage Sludge Application in Soil,
W77-08495 5C

SPLIT STREAM CHEMICAL TREATMENT
Split-Stream Chemical Treatment (A Patented Process by Chemlan Company, Inc.) of Tanning Industry Waste Water,
W77-08280 5D

SPRAY IRRIGATION
Spray Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soil,
W77-08202 5D

SPRAYING
Application of Corrugated Sheet Sprayers for Water Purification (Die Anwendung von Wellbahnrieslern in der Wasseraufbereitung),
W77-08543 5F

SPRINGS
Digital-Model Analysis of the Effects of Water-Use Alternatives on Spring Discharges, Gooding and Jerome Counties, Idaho,
W77-08484 4B

ST THOMAS ISLAND
Floods of November 12, 1974, in the Charlotte Amalie Area, St. Thomas, U.S. Virgin Islands,
W77-08470 7C

STANDING (LEGAL)
Should Rivers Have Running. Toward Extension of the Reserved Rights Doctrine to Include Minimum Stream Flows,
W77-08372 6E

STANFORD WATERSHED MODEL
Application of Three Daily-Rainfall Runoff Models to Four Australian Catchments,
W77-08218 2A

STATE GOVERNMENTS
Water Resource Policies and Authorities, Coastal Zone Management Program Implementation,
W77-08114 6E

Sovereignty and the Control of Water Pollution,
W77-08366 5G

STATE JURISDICTION
Oil and Water--A New Look at the Uniformity Doctrine,
W77-08125 6E

Allocating Buried Treasure: Federal Litigation Involving Interstate Ground Water,
W77-08491 6E

STATIONS
Relocation of Buried Markers,
W77-08240 2C

STEEL
Proposed Effluent Guidelines and Standards for Iron and Steel Manufaturing,
W77-08370 5G

STEEL PIPES
Cementing Oil and Gas Wells, Part 2 - Casing Inspection and Pipe Handling Methods, Including Thread Make-Up Control,
W77-08327 8F

STOCKHOLM CONFERENCE OF THE HUMAN ENVIRONMENT
Emerging Legal Concepts in the Harmonization of Water Resources Development and Environmental Protection,
W77-08378 6E

STOKES WAVES
Drift Velocities of Surface Films Over Waves,
W77-08193 5B

STORM DRAINS
Optimal Layout and Design of Storm Sewer Systems,
W77-08334 5D

Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

STORM RUNOFF
Design and Operation of Rain Retention Basins (Entwurf und Betrieb von Regenruckhaltebecken),
W77-08547 8A

STRAIN MEASUREMENT
Vertical Strain-Rate Measurements in an Arctic Ice Cap and Deductions from Them,
W77-08226 2C

STRATIFICATION
Methodology for Applying the Finite Element Method to Partially Stratified Estuaries,
W77-08198 2L

STRATIFIED FLOW
Methodology for Applying the Finite Element Method to Partially Stratified Estuaries,
W77-08198 2L

Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

STREAMFLOW
The Influence of Precipitation on Biochemical Oxygen Demand on Nine Streams in New Jersey,
W77-08203 5B

Low Flow Analyses of Streams: Details of Computational Procedures and Annotated Bibliography,
W77-08219 2E

STREAMFLOW FORECASTING
Simulation of Streamflow of Flambeau River at Park Falls, Wisconsin to Define Low-Flow Characteristics,
W77-08172 2E

Regional Simulation of Streamflow Data,
W77-08298 2A

STREAMS
Wells, Pumping Plants, Conduits and Streams,
W77-08154 6E

Boom Companies; Construction, Powers Of,
W77-08157 6E

The Influence of Precipitation on Biochemical Oxygen Demand on Nine Streams in New Jersey,
W77-08203 5B

STREAMWISE VARIATION
Effect of Lateral Inflow on Steady Open Channel Flows,
W77-08290 2E

STREPTOCOCCI
Comparative Examination of Enterococci Obtained from Drinking Water, Foodstuffs and Urine, (In German),
W77-08179 5A

STRESS
Stress in an Elastic Bedrock Hump Due to Glacier Flow,
W77-08236 2C

STRICT LIABILITY
Liability for Damages to Adjacent Land or Building Caused by Dredging,
W77-08387 6E

STRIP MINE WASTES
Reclamation and Use of Disturbed Land in the Southwest.
W77-08452 5G

STRUCTURAL STEEL
Proposed Effluent Guidelines and Standards for Iron and Steel Manufaturing,
W77-08370 5G

SUBMERGED LANDS
States' Rights in the Outer Continental Shelf Denied by the United States Supreme Court,
W77-08365 6E

SUBMERGED LANDS ACT
Boundaries of the Coastal Zone: A Survey of State Laws,
W77-08132 6E

SUBMERGENCE
United States V Osage Company (Removal of Sunken Boats Obstructing Navigable Waters Owner's Responsibility).
W77-08150 6E

SUBSURFACE DRAINAGE
A Water Management Model for High Water Table Soils,
W77-08301 3F

SUBSURFACE INVESTIGATIONS
Subsurface-Temperature Data for Some Wells in Western Utah,
W77-08166 7C

SUBSURFACE IRRIGATION
A Water Management Model for High Water Table Soils,
W77-08301 3F

SUBSURFACE WATERS
Ohio Liquid Disposal, Inc V Dawe (Defining 'Waters of the State' Within Water Pollution Control Statute).
W77-08401 6E

SUGAR MILL WASTES
Waste Impoundment Efficiency at Sugar Mill,
W77-08268 5D

SULFATES
Effect of Some Chemical Elements on the Accumulation of Cesium-137 in Freshwater Fish, (In Russian),
W77-08322 5C

SULFITE LIQUORS
Effluent Limitations and Guidelines for Existing Sources and Standards of Performance and Pretreatment Standards for New Sources for the Bleached Kraft, Groundwood, Sulfite, Soda, Deink and Non-Integrated Paper Mills Segment of the Pulp, Paper, and Paperboard Point Source Category.
W77-08383 5G

SUMMIT CREEK (UTAH)
Prediction Models of Reaeration Rate for Mountain Creeks,
W77-08501 5G

SURFACE DRAINAGE
From Good Husbandry to Reasonable Use: Illinois Surface Water Drainage Law Evolves in Subdivision Case,
W77-08353 4A

SURFACE FILM CONVECTION
Drift Velocities of Surface Films Over Waves,
W77-08193 5B

SURFACE-GROUNDWATER RELATIONSHIPS
Hydrologic Effects of the Tampa Bypass Canal System,
W77-08182 4A

SURFACE RUNOFF
Ponce de Leon Condominiums v Digirolamo (Developer Responsible for Control of Surface Runoff).
W77-08136 6E

Anderson V Yearous (Rights of Dominant Owners to Unobstructed Use of Drainage Easements).
W77-08392 6E

Dissolved Solids, Hardness, and Orthophosphate of Surface-Water Runoff in the Northwest Florida Water Management District,
W77-08467 7C

SURFACE WATERS
Water Resources Data for Indiana, Water Year 1975,
W77-08162 7C

Water Resources of the Myakka River Basin Area, Southwest Florida,
W77-08167 4B

Water Resources Data for Illinois, Water Year 1975,
W77-08184 7C

Water Resources Data for Nevada, Water Year 1975,
W77-08185 7C

Quantitative Water Quality with Landsat and Skylab.
W77-08431 5A

Water-Resources Investigations in South Dakota, 1976.
W77-08468 7C

Water Resources Data for Connecticut, Water Year 1975,
W77-08480 7C

Water Resources Data for New York, Water Year 1975.
W77-08485 7C

SURFACTANTS
Clay Adsorption Treatment of Non-Ionic Surfactants in Waste Water,
W77-08522 5D

SURVEYS
State v. Matzen (Use of Historical Maps to Settle Claims to Accretion Lands).
W77-08139 6E

Resurvey of the 'Byrd' Station, Antarctica, Drill Hole,
W77-08227 2C

A Further Comparison of Glacier Velocities Measured by Radio-Echo and Survey Methods,
W77-08228 2C

Applications of Surface Resistivity Methods,
W77-08244 2F

SUSPENDED SOLIDS
Performance of Dual-Media Filters--I,
W77-08273 5D

Performance of Dual-Media Filters--II,
W77-08274 5D

Unstratified-Bed Filtration of Waste Water,
W77-08537 5D

Suspended Solids Measurement Gives Improved Control,
W77-08568 5A

SWAMPS
Fractionation and Control of Iron in Channelized and Swamp Drainage Streams in North Carolina,
W77-08510 5B

SWAZILAND
New Water Legislation--Drafting for Development, Efficient Allocation and Environmental Protection,
W77-08188 6E

SWEDEN
The Use of LANDSAT-1 Imagery for Water Quality Studies in Southern Scandinavia,
W77-08435 5A

TAILWATER RECOVERY
Irrigated Agriculture: Nonpoint and Point Source Water Pollution,
W77-08116 5G

TAMPA BYPASS CANAL (FLA)
Hydrologic Effects of the Tampa Bypass Canal System,
W77-08182 4A

TANNERY WASTES
Is pH Pretreatment Necessary,
W77-08276 5D

Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

Split-Stream Chemical Treatment (A Patented Process by Chemlan Company, Inc.) of Tanning Industry Waste Water,
W77-08280 5D

Bacterial Growth Kinetics in the Completely Mixed Activated Sludge Treatment of Fellmongery Effluent,
W77-08281 5D

TAR-NEUSE RIVER BASIN (NC)
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3

TCHEFUNCTE RIVER (LA)
The Influence of Brackish-Water Intrusion on Macroinvertebrate Associations of the Lower Tchefuncte River, Louisiana,
W77-08292 5

TEMPERATURE
Subsurface-Temperature Data for Some Wells in Western Utah,
W77-08166 7

Factors Affecting the Denitrification Rate in Two Water-Sediment Systems,
W77-08517 5

TEMPERATURE DISTRIBUTION
A Predictive Model for Transient Temperature Distributions in Unsteady Flows,
W77-08221 5

TEMPERATURE MEASUREMENT
True-Temperature Determination of Geothermal Reservoirs,
W77-08318 7

TENNESSEE
Summary of Some Current and Possible Future Environmental Problems Related to Geology and Hydrology at Memphis, Tennessee,
W77-08174 4

Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975,
W77-08469 4

TERRITORIAL SEAS (JURISDICTION)
Oil and Water--A New Look at the Uniformity Doctrine,
W77-08125 6

TERTIARY TREATMENT
The Solubility of Particulate Phosphorus in the Effluent From Alum Treatment of Wastewater and Phosphorus Solutions,
W77-08500 5

PERMANENT U. OF I. URBANA CHAMPAIGN

Michigan Treatment Plant Achieves Zero Discharge, Irrigates Cropland,
W77-08565 5D

TERTIARYTREATMENT
Health Considerations in Use of Tertiary Effluents,
W77-08513 5F

TESTING
Impurity Concentrations in Sea Ice,
W77-08237 2C

TESTING PROCEDURES
Classification and Test of Public Participation Concepts Applied to Local Resource Planning,
W77-08295 6B

TEXAS
Recreational Use of Texas Rivers--Recommendations for Adoption of the Texas Public Rivers Act,
W77-08134 6E

Implementation of an Optimization Model for Operation of a Metropolitan Reservoir System,
W77-08211 4A

Discriminating Coastal Rangeland Production and Improvements with Computer Aided Techniques,
W77-08410 4A

Monitoring Vegetation Conditions from LANDSAT for Use in Range Management,
W77-08412 4A

Timber Type Separability in Southeastern United States on LANDSAT-1 MSS Data,
W77-08418 4A

The Use of Skylab Data to Study the Early Detection of Insect Infestations and Density and Distribution of Host Plants,
W77-08422 7C

Wildlife Management by Habitat Units--A Preliminary Plan of Action,
W77-08426 4A

An Overview of the Development of Remote Sensing Techniques for the Screwworm Eradication Program,
W77-08427 3F

The Rationale for Attempting to Define Salt Marsh Mosquito-Breeding Areas in Galveston County by Remote Sensing the Associated Vegetation.
W77-08428 4A

Water Quality in the Texas Coastal Basins,
W77-08465 5B

Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

Hydrologic Unit Map--1974, State of Texas.
W77-08474 7C

Water-Quality Records for Selected Reservoirs in Texas, 1974-75 Water Years,
W77-08483 5A

TEXAS COASTAL BASINS
Water Quality in the Texas Coastal Basins,
W77-08465 5B

TEXAS PUBLIC RIVERS ACT
Recreational Use of Texas Rivers--Recommendations for Adoption of the Texas Public Rivers Act,
W77-08134 6E

TEXTILES
Is pH Pretreatment Necessary,
W77-08276 5D

Characterization and Treatment of Textile Dyeing Wastewaters,
W77-08278 5D

Taking Acres Out of Pollution-Control Plans,
W77-08283 5D

THEORETICAL ANALYSIS
Computer Prediction of Stationary States of Membranes from Differential Permeabilities,
W77-08234 3A

THERMAL POLLUTION
A Predictive Model for Transient Temperature Distributions in Unsteady Flows,
W77-08221 5B

Legal Control of Consumptive Water Use in Pennsylvania Power Plants,
W77-08368 3E

THERMAL POWER
The ERDA Geothermal Program,
W77-08314 4B

THERMAL PROPERTIES
Research on Cements for Geothermal and Deep Oil Wells,
W77-08320 8F

THERMAL RADIATION
A Study of Cooling Initially Uniform and Thermally Stratified Layers of Water,
W77-08444 5G

THERMAL STRATIFICATION
A Study of Cooling Initially Uniform and Thermally Stratified Layers of Water,
W77-08444 5G

THERMAL WATER
An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

True-Temperature Determination of Geothermal Reservoirs,
W77-08318 7B

A Preliminary Analysis of the Energy and Water Requirements for Developing Geothermal Energy in Arizona,
W77-08351 4B

THICKENING
Mathematical and Experimental Investigation of Nonsteady State Thickening of an Ideal Slurry,
W77-08207 5D

TIMBER PRODUCTS PROCESSING
Timber Products Processing Point Source Category Effluent Guidelines and Standards,
W77-08356 5G

TISSUE ANALYSIS
Organochlorine Residues in New Zealand Birds and Mammals 2. Polychlorinated Biphenyls,
W77-08210 5C

TITLE EXTINGUISHMENT
State v. Matzen (Use of Historical Maps to Settle Claims to Accretion Lands).
W77-08139 6E

TOMBIGBEE RIVER VALLEY WATER MANAGEMENT DISTRICT
State V Corps of Engineers (Cost/Benefit Analysis Under NEPA and the Flood Control Act).
W77-08400 6E

TOOL JOINT HARD FACINGS
Better Protection for Casing and Tool Joints,
W77-08315 8G

TOTAL INORGANIC CARBON
Effects of pH and Inorganic Carbon Concentrations Upon Competition Between Anabaena flos-aquae and Selenastrum capricornutum,
W77-08200 5C

TOXICITY
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

Sources, Characteristics and Treatment and Disposal of Industrial Wastes Containing Hexachlorobenzene,
W77-08265 5D

Removing Soluble Metals from Waste Water,
W77-08591 5D

TRACE ELEMENTS
The Effect of Different Flocculants on the Elimination of Trace Elements and Polycylic Hydrocarbons in the Water Purification Process, (In German),
W77-08256 5D

Development of a Column Chromatography Method for Field of Pre-Concentration of Trace Metals with Application to the Haw-Cape Fear Rivers, N.C.,
W77-08299 5A

TRACE METALS
Development of a Column Chromatography Method for Field of Pre-Concentration of Trace Metals with Application to the Haw-Cape Fear Rivers, N.C.,
W77-08299 5A

TRACKING TECHNIQUES
Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

TRADE-OFFS
Multiple Objective Planning: Small Watersheds,
W77-08350 6B

TRANSFERENCE (MEMBRANE PROCESSES)
Transference: A Comprehensive Parameter Governing Permeation of Solutes Through Membranes,
W77-08231 3A

TRAVEL TIME
Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

TRAVIS COUNTY (TEX)
Wildlife Management by Habitat Units--A Preliminary Plan of Action,
W77-08426 4A

TREATMENT FACILITIES
Is pH Pretreatment Necessary,
W77-08276 5D

Process Design of Single-Sludge Activated Sludge Systems Using Nitrate Respiration,
W77-08336 5D

Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

State of the Art in Sewage Treatment Plant Control,
W77-08515 5D

Reverse Osmosis on Secondary Sewage Effluent: The Effect of Recovery,
W77-08523 5D

Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

The Sanitary Landfill Leachate Control Plant in Kobe.
W77-08534 5D

An Estimation of the Efficiency of a Waste Water Treatment Plant, as Measured by Several Parameters Including Lipid Biodegradation (Essai d'evaluation de l'efficacite d'une station d'epuration a l'aide de plusieurs parametres dont la biodegradation des lipides),
W77-08548 5D

Michigan Treatment Plant Achieves Zero Discharge, Irrigates Cropland,
W77-08565 5D

Trends in Small Sewage Treatment Plants,
W77-08569 5D

Everything from a Pipe Filter to a Turnkey Project,
W77-08572 5D

Sewage Works is Above Ground Level,
W77-08574 5D

Prospects Strong for Waste Water Oxygenation,
W77-08578 5D

Fluid Bed for Sewage Sludge Burn Up,
W77-08582 5E

1.17 Million (Pound) Works and Sewage Scheme Completed at Market Rasen.
W77-08584 5D

Automatic Control of Whitlingham Sewage Treatment Works Norwich,
W77-08585 5D

Moduflex Sewage Treatment Plants Provide the Answer to Growth,
W77-08588 5D

ICI Effluent System to be Used in Essex.
W77-08590 5D

The Trials and Tribulations of Treatment Works in Lower Trent.
W77-08593 5D

Horsham's Sewage Works,
W77-08595 5D

Plant Capacity to Increase,
W77-08597 5D

Perforated, Vitrified Clay Pipe Used in Peoria Facilities,
W77-08598 8G

TRENCHES
Trenching Sludge May be Safe.
W77-08594 5E

TRESPASS
Environmental Protection Through the Common Law,
W77-08133 6G

TRICHODERMA VIRIDE
Enzymatic Treatment of Primary Municipal Sludge with Trichoderma Viride Cellulase,
W77-08529 5D

TROPIC LEVEL
The Limnology of a North Carolina Millpond with Special Reference to Historical Changes as Evidenced by Sediment Core Analysis,
W77-08507 5C

TUNISIA
The Operation of a Flood Warning Network: Its Use for Studying Flash Floods (Exploitation D'un Reseau D'alerte: Son Utilisation Pour L'etude Des Crues Brutales),
W77-08248 2E

TUNNELS
Leadville Mine Drainage Tunnel Act of 1976.
W77-08115 6E

TURBULENCE
Statistical Characterization of Dilute Particulate Suspensions in Turbulent Fluid Fields,
W77-08330 5B

TURBULENT BOUNDARY LAYERS
Drift Velocities of Surface Films Over Waves,
W77-08193 5B

TURBULENT FLOW
The Effect of Aeration of Water Jet Spreading,
W77-08197 8B

Statistical Characterization of Dilute Particulate Suspensions in Turbulent Fluid Fields,
W77-08330 5B

TURKMEN-SSR
Reproduction Rate and Productivity of Bacteria in the Ponds of the Karamet-Niyaz Fishery Farm, (In Russian),
W77-08462 5C

UINTA BASIN AREA (UTAH AND COLO)
Selected Hydrologic Data, Uinta Basin Area, Utah and Colorado,
W77-08183 7C

ULTRAFILTRATION
Investigation of Coagulation - Precipitation and Ultrafiltration for the Regeneration of Brines in the Cucumber Pickle Industry,
W77-08511 5D

UNDERGROUND STORAGE
Effect of Dip on the Subsurface Storage or Disposal of Fluid in Saline Aquifers,
W77-08204 4B

UNESCO
Utilization of LANDSAT Imagery for Mapping Vegetation on the Millionth Scale,
W77-08413 7C

UNIFORMITY DOCTRINE
Oil and Water--A New Look at the Uniformity Doctrine,
W77-08125 6I

UNITED KINGDOM
Reorganizing Pollution Control in the U.K.
W77-08111 5C

UNITED NATIONS
The Environmental Problem of the Oceans: A International Stepchild of National Egotism,
W77-08367 6

Emerging Legal Concepts in the Harmonizatio of Water Resources Development and Enviro mental Protection,
W77-08378 6

UNITED NATIONS ENVIRONMENT PROGRAMME
Emerging Legal Concepts in the Harmonizatio of Water Resources Development and Enviro mental Protection,
W77-08378 6

UNITED STATES
Remembering Maine: Offshore Federalism the United States and Canada,
W77-08363

States' Rights in the Outer Continental Sh Denied by the United States Supreme Court,
W77-08365

UNIVERSITIES
Inventory of Water Resources Research at University of Wyoming, Fiscal Year 1975,
W77-08506

UNOX SYSTEM
Oxygen System Activated Sludge Process.
W77-08575

UNSTEADY FLOW
Data for Calibrating Unsteady-Flow Sedime Transport Models, East Fork River, Wyomi 1975,
W77-08180

A Predictive Model for Transient Temperat Distributions in Unsteady Flows,
W77-08221

UNSTRATIFIED-BED FILTRATION
Unstratified-Bed Filtration of Waste Water,
W77-08537

URBAN DEVELOPMENT
Optimal Layout and Design of Storm Se Systems,
W77-08334

URBAN DRAINAGE
Urban Drainage and Flood Control Proje Economic, Legal, and Financial Aspects,
W77-08345

URBAN HYDROLOGY
The Effects of Urbanization on Low Flows Total Runoff,
W77-08335

URBAN RUNOFF
The Effects of Urbanization on Low Flows Total Runoff,
W77-08335

Water Quality Impacts of Urbanizatio Methodology,
W77-08514

URBANIZATION
Summary of Some Current and Possible Future Environmental Problems Related to Geology and Hydrology at Memphis, Tennessee,
W77-08174 4C

The Effects of Urbanization on Low Flows and Total Runoff,
W77-08335 2A

URINE
Comparative Examination of Enterococci Obtained from Drinking Water, Foodstuffs and Urine, (In German),
W77-08179 5A

US GEOLOGICAL SURVEY (CALIF)
Activities of the Water Resources Division in California.
W77-08479 7C

USSR
The Flooding of Rivers in the USSR and the Measures Taken to Control Ice Jams (Les Inondations Fluviales En URSS Et La Lutte Contre Les Crues Causees Par Les Embacles),
W77-08246 2C

UTAH
Solar Salt Company V Southern Pacific Transportation Company (Alteration of Saline Content of Great Salt Lake is Not Pollution Under Utah Statute).
W77-08146 6E

Sierra Club V Stamm (National Environmental Policy Act Does Not Require Comprehensive Environmental Impact Statement on Large Reclamation Project When EIS have been Prepared for Viable Portion of Project).
W77-08147 6E

Bear River Compact,
W77-08155 6E

Board and Division of Water Resources,
W77-08156 6E

Subsurface-Temperature Data for Some Wells in Western Utah,
W77-08166 7C

Selected Hydrologic Data, Uinta Basin Area, Utah and Colorado,
W77-08183 7C

An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

Great Salt Lake Management and Development.
W77-08407 6E

Prediction Models of Reaeration Rate for Mountain Creeks,
W77-08501 5G

ARIABLE SPEED OPERATION (PUMPED - TORAGE PLANTS)
Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

EGETATION
Monitoring Vegetation Conditions from LANDSAT for Use in Range Management,
W77-08412 4A

Utilization of LANDSAT Imagery for Mapping Vegetation on the Millionth Scale,
W77-08413 7C

The Use of Skylab Data to Study the Early Detection of Insect Infestations and Density and Distribution of Host Plants,
W77-08422 7C

Agricultural Inventory Capabilities of Machine Processed LANDSAT Digital Data,
W77-08423 3F

VEGETATION REGROWTH
Estimating Vegetative Biomass from LANDSAT-1 Imagery for Range Management,
W77-08409 4A

VELOCITY
Statistical Characterization of Dilute Particulate Suspensions in Turbulent Fluid Fields,
W77-08330 5B

VIRGIN ISLANDS
Floods of November 12, 1974, in the Charlotte Amalie Area, St. Thomas, U.S. Virgin Islands,
W77-08470 7C

VIRGINIA
A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

LANDSAT-1 Data as it has Been Applied for Land Use and Water Quality Data By the Virginia State Water Control Board,
W77-08432 5A

A Finite Element Model to Determine the Effect of Land-Use Changes on Flood Hydrographs,
W77-08450 8B

VIRUSES
Enterovirus Types in Israel Sewage,
W77-08519 5A

VISCOSITY
Effect of Viscosity Ratio on the Recovery of Fresh Water Stored in Saline Aquifers,
W77-08205 4B

WAKE COUNTY (NC)
Agricultural Water Demand in Wake County, North Carolina,
W77-08297 6D

WARNING SYSTEMS
The Operation of a Flood Warning Network: Its Use for Studying Flash Floods (Exploitation D'un Reseau D'alerte: Son Utilisation Pour L'etude Des Crues Brutales),
W77-08248 2E

WASHINGTON
Improving Institutional Arrangements for Water Development in the State of Washington: Developmental and Environmental Trade-Offs and Constraints,
W77-08284 6E

Economic Impacts of Controlling Water Quality in an Irrigated River Basin,
W77-08332 5G

Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

WASTE ANALYSIS
Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

WASTE DISPOSAL
A Quantitative Study of Organic Carbon Decomposition and Nitrogen Transformations in Sewage Sludge-Soil Systems,
W77-08291 5B

City of York V. Pennsylvania Department of Environmental Resources (Delegation of Authority Under the Pennsylvania Waste Management Act).
W77-08403 6E

Sewage Disposal System.
W77-08563 5E

Incineration Solves Tough Waste Problems.
W77-08576 5E

WASTE DISPOSAL WELLS
Ohio Liquid Disposal, Inc V Dawe (Defining 'Waters of the State' Within Water Pollution Control Statute).
W77-08401 6E

WASTE TREATMENT
High Capacity Waste Water Treatment System,
W77-08566 5D

Incineration Solves Tough Waste Problems.
W77-08576 5E

WASTE WATER DISPOSAL
Sources, Characteristics and Treatment and Disposal of Industrial Wastes Containing Hexachlorobenzene,
W77-08265 5D

WASTE WATER TREATMENT
Thermocompression-Type Apparatus for Desalting Saline Water,
W77-08252 3A

The Role of Protozoa in Biological Purification of Oil Industry Sewage, (In Russian),
W77-08254 5D

Method of Purification of Waste Water By Treatment with Zirconium Salt,
W77-08255 5D

The Effect of Different Flocculants on the Elimination of Trace Elements and Polycylic Hydrocarbons in the Water Purification Process, (In German),
W77-08256 5D

Kraft Mill Recovery System,
W77-08258 5D

Precoat for Permeability Separation Systems,
W77-08259 5D

Liquid Waste Treatment Apparatus,
W77-08263 5D

Apparatus for Continuous Liquid-Liquid Extraction of Water with a Solvent,
W77-08264 5F

Sources, Characteristics and Treatment and Disposal of Industrial Wastes Containing Hexachlorobenzene,
W77-08265 5D

Removing Explosives from Wastewater,
W77-08266 5D

Ozone Effect of Synthetic Rubber Waste Treatment,
W77-08267 5D

Waste Impoundment Efficiency at Sugar Mill,
W77-08268 5D

Bacteriological Investigation of Alberta Meat-Packing Plant Wastes with Emphasis on Salmonella Isolation,
W77-08269 5D

Occupational Characteristics and Biological Kinetic Constants of Extended Aeration Process,
W77-08270 5D

Closed-Loop System Separates Oil from Prewash Overflow,
W77-08271 5D

Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

Performance of Dual-Media Filters--I,
W77-08273 5D

Performance of Dual-Media Filters--II,
W77-08274 5D

Treatment of Aqueous Condensates and Effluents from Coking Plants--With Alkali Salts of Weak Acids, to Expel Ammonia.
W77-08275 5D

Is pH Pretreatment Necessary,
W77-08276 5D

Purifying Biological Effluent Rich in Carbohydrates or Protein--By Anaerobic Fermentation Separation, Aerobic Treatment and Then Separation.
W77-08277 5D

Characterization and Treatment of Textile Dyeing Wastewaters,
W77-08278 5D

Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

Split-Stream Chemical Treatment (A Patented Process by Chemlan Company, Inc.) of Tanning Industry Waste Water,
W77-08280 5D

Bacterial Growth Kinetics in the Completely Mixed Activated Sludge Treatment of Fellmongery Effluent,
W77-08281 5D

Air Flotation of Oily Waste Waters with Organic Coagulants,
W77-08282 5D

Taking Acres Out of Pollution-Control Plans,
W77-08283 5D

Chelating Agent Analysis by High Speed Liquid Chromatography,
W77-08286 5A

Investigation of the Effectiveness of Polymers in the Treatment of Nirocellulose-Manufacturing Wastewater,
W77-08338 5D

Forward Osmosis Extractors,
W77-08340 3A

Timber Products Processing Point Source Category Effluent Guidelines and Standards,
W77-08356 5G

Nonferrous Metals Manufacturing Point Source Category Pretreatment Standards.
W77-08357 5G

Effluent Guidelines and Standards for Canned and Preserved Fruits and Vegetables Point Source Category,
W77-08371 5G

The 1972 Water Pollution Control Act: Unforeseen Implications for Land Use Planning,
W77-08373 5G

Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

Availability of Aluminum Phosphate Complexes to a Green Alga in Various Culture Media,
W77-08496 5D

The Solubility of Particulate Phosphorus in the Effluent From Alum Treatment of Wastewater and Phosphorus Solutions,
W77-08500 5D

Investigation of Coagulation - Precipitation and Ultrafiltration for the Regeneration of Brines in the Cucumber Pickle Industry,
W77-08511 5D

Health Considerations in Use of Tertiary Effluents,
W77-08513 5F

State of the Art in Sewage Treatment Plant Control,
W77-08515 5D

Clay Adsorption Treatment of Non-Ionic Surfactants in Waste Water,
W77-08522 5D

Reverse Osmosis on Secondary Sewage Effluent: The Effect of Recovery,
W77-08523 5D

Treatment of High Strength Acidic Waste Water with a Completely Mixed Anaerobic Filter,
W77-08524 5D

Oxygen Aeration at Newton Creek,
W77-08526 5D

Aerobic Digestion of Waste Activated Sludge at Low Temperatures,
W77-08527 5D

Dewatering: A New Method Bows,
W77-08528 5D

Enzymatic Treatment of Primary Municipal Sludge with Trichoderma Viride Cellulase,
W77-08529 5D

Aerobic Digestion of Sludges Precipitated from Waste Water by Lime Addition,
W77-08530 5D

Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

Biological Treatment Kinetics of Landfill Leachate,
W77-08532 5D

Progress in MHI's Integrated Techniques for Environmental Protection,
W77-08533 5D

The Sanitary Landfill Leachate Control Plant in Kobe.
W77-08534 5D

Characterizing Sludge for Centrifugal Dewatering,
W77-08535 5D

Ozone and Chlorine in Waste Water Disinfection,
W77-08536 5D

Unstratified-Bed Filtration of Waste Water,
W77-08537 5D

Chlorobiphenyls and PCB's: Formation During Chlorination,
W77-08538 5A

Improved Galvanic Dissolved Oxygen Sensor for Activated Sludge,
W77-08539 5A

Effects of High Organic Loading on Mixed Photosynthetic Waste Water Treatment,
W77-08540 5D

What Lies Ahead for PAC,
W77-08541 5D

Dewatering Machines (Entwasserungsmachinen),
W77-08544 5D

Use of Oxygen in Activated Sludge Plants (Utilizzazione dell'ossigeno allo stato puro negli impianti a fanghi attivi),
W77-08545 5D

Determination of BOD After Freezing Water Samples (Bestimmung des BSB nach Einfrierung der Wasserproben),
W77-08546 5A

An Estimation of the Efficiency of a Waste Water Treatment Plant, as Measured by Several Parameters Including Lipid Biodegradation (Essai d'evaluation de l'efficacite d'une station d'epuration a l'aide de plusieurs parametres dont la biodegradation des lipides),
W77-08548 5D

Aerobic Treatment of Liquid Wastes--With Oxygen Concentration Measured and Used to Control Pump Speed Used to Force Liquid Through Venturis.
W77-08557 5D

Mechanical Surface Aerator for Effluent Purification--Has the Liquid Scooped by the Curved Elements and Ejected into the Air Above,
W77-08558 5D

Sludge Collector and Light Liquid, Separator-from Sewage with Two Tanks in Single Housing and Cover.
W77-08560 5D

Cleaning of Sewage Sludge System.
W77-08561 5D

Screening Apparatus for Removal of Solids-from Sewage with Rotating Screen and Vertical Lift for Residues.
W77-08562 5D

BOC Blows Bubbles in Dirty Bath Water,
W77-08564 5D

Michigan Treatment Plant Achieves Zero Discharge, Irrigates Cropland,
W77-08565 5D

High Capacity Waste Water Treatment System,
W77-08566 5D

Trends in Small Sewage Treatment Plants,
W77-08569 5D

S. W.'s Sludge Incineration scheme,
W77-08570 5E

Chlorine Combining with Sewage,
W77-08571 5D

Everything from a Pipe Filter to a Turnkey Project,
W77-08572 5D

Sewage Works is Above Ground Level,
W77-08574 5D

Oxygen System Activated Sludge Process.
W77-08575 5D

Travelling Grate-Type Filtration System Uses Pulverized Coal to Lower BOD of Wastewater.
W77-08577 5D

Prospects Strong for Waste Water Oxygenation,
W77-08578 5D

Effluent Emphasis Underlines Environmental Effort at Enpocon,
W77-08579 5D

Sewage Sludge Disinfected by Electron-Beam Bombardment.
W77-08580 5D

Fluid Bed for Sewage Sludge Burn Up,
W77-08582 5E

1.17 Million (Pound) Works and Sewage Scheme Completed at Market Rasen.
W77-08584 5D

Automatic Control of Whitlingham Sewage Treatment Works Norwich,
W77-08585 5D

Filters and Sludge Drying Beds,
W77-08586 5D

Moduflex Sewage Treatment Plants Provide the Answer to Growth,
W77-08588 5D

Sodium Bicarbonate Can Settle Many Waste Water Problem Upsets,
W77-08589 5D

ICI Effluent System to be Used in Essex.
W77-08590 5D

Removing Soluble Metals from Waste Water,
W77-08591 5D

The Trials and Tribulations of Treatment Works in Lower Trent.
W77-08593 5D

Horsham's Sewage Works,
W77-08595 5D

Pre-Treatment in the Sewer,
W77-08596 5D

Plant Capacity to Increase,
W77-08597 5D

Perforated, Vitrified Clay Pipe Used in Peoria Facilities,
W77-08598 8G

Oxygen Injection for Bath's Sewers,
W77-08599 5D

Higher Gas Yields and Reduced Retention Times Obtained from Anaerobic Digester,
W77-08600 5D

WASTEWATER COLLECTION SYSTEMS
Network Evaluation of Wastewater Collection Economics,
W77-08331 5D

WASTEWATER TREATMENT
Mathematical and Experimental Investigation of Nonsteady State Thickening of an Ideal Slurry,
W77-08207 5D

Process Design of Single-Sludge Activated Sludge Systems Using Nitrate Respiration,
W77-08336 5D

Treatment of Wastewater From Military Explosives and Propellants Production Industry by Physicochemical Processes,
W77-08337 5D

WATER ALLOCATION (POLICY)
The National Conference on Water.
W77-08131 6E

Water Allocation and Pricing for Control of Irrigation-Related Salinity in a River Basin,
W77-08213 5G

Water Supply and Control Developments Summarized, (Arizona).
W77-08313 6E

Water for Food - Or for More Important Purposes. (Reallocation of Irrigation Water to Cities and Industries),
W77-08377 6E

Water Rights Generally; Appropriation.
W77-08393 6E

A Postscript to the Mutual Prescription Doctrine--City of Los Angeles V City of San Fernando,
W77-08490 6E

WATER ANALYSIS
Investigation of Detection Limits for Solutes in Water Measured by Laser Raman Spectrometry,
W77-08171 2K

Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

WATER BALANCE
Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

WATER CIRCULATION
Transient Three-Dimensional Circulation of Lakes,
W77-08181 2H

Lake Erie International Jetport Model Feasibility Investigation; The Wind-Driven Currents and Contaminant Dispersion in the Near-Shore of Large Lakes,
W77-08220 5B

Suspended-Particle Transport and Circulation in San Francisco Bay: An Overview,
W77-08486 2L

WATER CONSERVATION
What We Can Do Before the Well Runs Dry--A Summary of WRC Report No. 35 --Residential Water conservation-Milne,
W77-08101 3D

Board and Division of Water Resources,
W77-08156 6E

Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

WATER CONTRACTS
Sale of Water Rights,
W77-08140 6E

WATER COOLING
A Study of Cooling Initially Uniform and Thermally Stratified Layers of Water,
W77-08444 5G

WATER DELIVERY
United States V Tulare Lake Canal Company (Reclamation Laws Concerning Sale of Land in Excess of 160 Acres).
W77-08151 6E

WATER DEMAND
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3F

Inventory of Colorado's Front Range Mountain Reservoirs,
W77-08107 6B

Agricultural Water Demand in Wake County, North Carolina,
W77-08297 6D

Input-Output Modeling in Water Resources System Planning,
W77-08346 6A

WATER DISCHARGE REQUIREMENT
Compliance with the Provisions of the Federal Water Pollution Control Act as Amended in 1972.
W77-08153 6E

WATER DISTRICTS
Interstate Stream Commission (Creation, Membership, General Powers).
W77-08402 6E

Water Districts and Commissioners.
W77-08406 6E

WATER JET BEHAVIOR
The Effect of Aeration of Water Jet Spreading,
W77-08197 8B

WATER LAW
Water Supply and Control Developments Summarized, (Arizona).
W77-08313 6E

WATER LEVEL FLUCTUATIONS
Selected Water-Level Records for Western Oklahoma, 1950-1975,
W77-08163 7C

Geohydrology of the Albin and La Grange Areas, Southeastern Wyoming,
W77-08176 4B

WATER LEVEL FLUCTUATIONS

Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975,
W77-08469 4B

WATER LEVELS

Selected Water-Level Records for Western Oklahoma, 1950-1975,
W77-08163 7C

Ground-Water Data for 1974-75 in Joshua Tree National Monument, California,
W77-08164 7C

Maps Showing Ground-Water COnditions in the Puerco-Zuni Area, Apache and Navajo Counties, Arizona--1975,
W77-08471 7C

WATER MANAGEMENT (APPLIED)

Water Resource Policies and Authorities, Coastal Zone Management Program Implementation,
W77-08114 6E

Final Report of Committee VII (Final Recommendations of the International Conference on Water Law and Administration),
W77-08187 6E

Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

A Water Management Model for High Water Table Soils,
W77-08301 3F

Allocating Buried Treasure: Federal Litigation Involving Interstate Ground Water,
W77-08491 6E

WATER PERMITS

Irrigated Agriculture: Nonpoint and Point Source Water Pollution,
W77-08116 5G

Toward Cleaner Water in the Pacific Northwest and Alaska--The National Water Permit Program.
W77-08121 5G

Snake River Land Co V State Board of Control (Beneficial Use of Water Held Sufficient Proof of Appropriation).
W77-08135 6E

Sale of Water Rights,
W77-08140 6E

EPA Focuses on Municipal Enforcement,
W77-08355 6E

Environmental Law-Application of the Refuse Act of 1899 to Continual Industrial Discharges Is Upheld Without Formalized Permit Procedures,
W77-08382 5G

WATER POLICY

New Water Legislation--Drafting for Development, Efficient Allocation and Environmental Protection,
W77-08188 6E

Determination of Water-Resources Policies in Arid Lands,
W77-08453 6B

WATER POLLUTION

Statistical Characterization of Dilute Particulate Suspensions in Turbulent Fluid Fields,
W77-08330 5B

Some Experimental Data on the Study of the Biological Action of Ethylbutylamine as a Water Pollution Factor, (In Russian),
W77-08439 5A

Groundwater Resources of Guam: Occurrence and Development,
W77-08448 4B

WATER POLLUTION CONTROL

States Need Freedom to Innovate (Comment on PL 92-500).
W77-08119 6E

Environmental Protection Through the Common Law,
W77-08133 6G

Compliance with the Provisions of the Federal Water Pollution Control Act as Amended in 1972.
W77-08153 6E

Method of Dispersing Oil in Water,
W77-08260 5G

Environmental Law-Application of the Refuse Act of 1899 to Continual Industrial Discharges Is Upheld Without Formalized Permit Procedures,
W77-08382 5G

American Frozen Food v Train ('Guidelines' and 'Effluent Limitations' for the Potato Process Industry Pursuant to the Federal Water Pollution Control Act Amendments of 1972).
W77-08386 6E

Water Resources Commission V. Connecticut Sand and Stone Corporation (Judicial Review of Administrative Factual Determination).
W77-08404 6E

WATER POLLUTION EFFECTS

Bacteriological Pollution in the Drinking-Water of Jordan,
W77-08454 5B

WATER POLLUTION SOURCES

Deep Water Resources of the Limestones of Franche-Comte: Problems of Quantity and Quality, (In French),
W77-08122 4B

Method of Dispersing Oil in Water,
W77-08260 5G

Bacteriological Pollution in the Drinking-Water of Jordan,
W77-08454 5B

Progress in MHI's Integrated Techniques for Environmental Protection,
W77-08533 5D

WATER POLLUTION TREATMENT

Precoat for Permeability Separation Systems,
W77-08259 5D

Pump-Filter for Bilge Water,
W77-08261 5G

Liquid Waste Treatment Apparatus,
W77-08263 5D

Apparatus for Continuous Liquid-Liquid Extraction of Water with a Solvent,
W77-08264 5F

WATER PURIFICATION

Thermocompression-Type Apparatus for Desalting Saline Water,
W77-08252 3A

Method of Purification of Waste Water By Treatment with Zirconium Salt,
W77-08255 5D

Application of Corrugated Sheet Sprayers for Water Purification (Die Anwendung von Wellbahnrieslern in der Wasseraufbereitung),
W77-08543 5F

Effluent Emphasis Underlines Environmental Effort at Enpocon,
W77-08579 5D

Oxygen Injection for Bath's Sewers,
W77-08599 5D

WATER QUALITY

Water Resources Data for Indiana, Water Year 1975,
W77-08162 7C

Ground-Water Data for 1974-75 in Joshua Tree National Monument, California,
W77-08164 7C

Water Resources of the Myakka River Basin Area, Southwest Florida,
W77-08167 4B

Ground-Water Resources of Vanderburgh County, Indiana,
W77-08170 4B

Ground Water in the San Juan Metropolitan Area, Puerto Rico,
W77-08173 4B

Ground-Water Basic Data for Ramsey County North Dakota,
W77-08177 7C

Selected Hydrologic Data, Uinta Basin Area Utah and Colorado,
W77-08183 7C

Water Resources Data for Illinois, Water Year 1975,
W77-08184 7C

Water Resources Data for Nevada, Water Year 1975,
W77-08185 7C

Methodology and Data for Analyzing Quantity Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5C

Quantitative Water Quality with Landsat and Skylab.
W77-08431 5A

LANDSAT-1 Data as it has Been Applied for Land Use and Water Quality Data By the Virginia State Water Control Board,
W77-08432 5A

The LANDSAT-1 Multispectral Scanner as a Tool in the Classification of Inland Lakes,
W77-08433 5A

Trophic Status of Inland Lakes from LANDSAT,
W77-08434 5A

The Use of LANDSAT-1 Imagery for Water Quality Studies in Southern Scandinavia,
W77-08435 5A

Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2H

Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

Water Quality in the Texas Coastal Basins,
W77-08465 5B

The Eutaw-McShan Aquifer in Mississippi,
W77-08466 7C

Water-Resources Investigations in South Dakota, 1976.
W77-08468 7C

Maps Showing Ground-Water COnditions in the Puerco-Zuni Area, Apache and Navajo Counties, Arizona--1975,
W77-08471 7C

Water Resources Data for Connecticut, Water Year 1975,
W77-08480 7C

Water-Quality Records for Selected Reservoirs in Texas, 1974-75 Water Years,
W77-08483 5A

Water Resources Data for New York, Water Year 1975.
W77-08485 7C

WATER QUALITY CONTROL
Reorganizing Pollution Control in the U.K.
W77-08111 5G

Analyses of Water, Core Material, and Elutriate Samples Collected Near New Orleans, Louisiana (Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project),
W77-08165 8D

Water Allocation and Pricing for Control of Irrigation-Related Salinity in a River Basin,
W77-08213 5G

American Frozen Food v Train ('Guidelines' and 'Effluent Limitations' for the Potato Process Industry Pursuant to the Federal Water Pollution Control Act Amendments of 1972).
W77-08386 6E

WATER QUALITY MONITORING NETWORK
Design of a Water Quality Monitoring Network,
W77-08497 5A

WATER QUALITY STANDARDS
Standards of Performance and Pretreatment Standards for the Explosives Manufacturing Point Source Category (Proposed Rules),
W77-08113 5G

Let's Have Achievable 'Safe' Drinking Water,
W77-08127 5G

Timber Products Processing Point Source Category Effluent Guidelines and Standards,
W77-08356 5G

Nonferrous Metals Manufacturing Point Source Category Pretreatment Standards.
W77-08357 5G

Toxic Pollutant Effluent Standards for Benzidine.
W77-08359 5G

Effluent Guidelines and Standards for Canned and Preserved Fruits and Vegetables Point Source Category,
W77-08371 5G

Some Experimental Data on the Study of the Biological Action of Ethylbutylamine as a Water Pollution Factor, (In Russian),
W77-08439 5A

Design of a Water Quality Monitoring Network,
W77-08497 5A

The Trials and Tribulations of Treatment Works in Lower Trent.
W77-08593 5D

WATER REQUIREMENTS
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3F

Agricultural Water Demand in Wake County, North Carolina,
W77-08297 6D

A Preliminary Analysis of the Energy and Water Requirements for Developing Geothermal Energy in Arizona,
W77-08351 4B

Improving Food Crop Production in the Sudan Savanna Zone of Northern Nigeria,
W77-08459 3F

WATER RESOURCE DEVELOPMENT
Improving Institutional Arrangements for Water Development in the State of Washington: Developmental and Environmental Trade-Offs and Constraints,
W77-08284 6E

WATER RESOURCES
Selected Hydrologic Data, Uinta Basin Area, Utah and Colorado,
W77-08183 7C

Determination of Water-Resources Policies in Arid Lands,
W77-08453 6B

Activities of the Water Resources Division in California.
W77-08479 7C

Inventory of Water Resources Research at the University of Wyoming, Fiscal Year 1975,
W77-08506 9A

WATER RESOURCES ACT OF 1965
University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

WATER RESOURCES DEVELMENT
Water and Energy Systems: A Planning Model,
W77-08212 6A

WATER RESOURCES DEVELOPMENT
The National Conference on Water.
W77-08131 6E

Department of Water Resources,
W77-08141 6E

Final Report of Committee VII (Final Recommendations of the International Conference on Water Law and Administration),
W77-08187 6E

University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

Multiple Objective Planning: Small Watersheds,
W77-08350 6B

Determination of Water-Resources Policies in Arid Lands,
W77-08453 6B

WATER RESOURCES DEVELOPMENT ACT
Flood Plains for Open Space and Recreation.
W77-08374 6F

WATER RESOURCES INSTITUTE
Inventory of Water Resources Research at the University of Wyoming, Fiscal Year 1975,
W77-08506 9A

WATER RESOURCES SYSTEMS
Input-Output Modeling in Water Resources System Planning,
W77-08346 6A

WATER REUSE
Kraft Mill Recovery System,
W77-08258 5D

Forward Osmosis Extractors,
W77-08340 3A

An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

Health Considerations in Use of Tertiary Effluents,
W77-08513 5F

WATER RIGHTS
Federal Statutory Modification of Private Water Rights in South Florida,
W77-08112 6E

Bear River Compact,
W77-08155 6E

New Water Legislation--Drafting for Development, Efficient Allocation and Environmental Protection,
W77-08188 6E

The Winters Doctrine and How It Grew: Federal Reservation of Rights to Use of Water,
W77-08375 6E

WATER RIGHTS (NON-RIPARIANS)
Public Rights in Pennsylvania Waters,
W77-08362 6E

WATER STORAGE
Effect of Dip on the Subsurface Storage or Disposal of Fluid in Saline Aquifers,
W77-08204 4B

Effect of Viscosity Ratio on the Recovery of Fresh Water Stored in Saline Aquifers,
W77-08205 4B

Effect of Dip on the Storage of Fresh Water (or the Disposal of Waste) in a Saline Aquifer,
W77-08288 4B

Design and Operation of Rain Retention Basins (Entwurf und Betrieb von Regenruckhaltebecken),
W77-08547 8A

WATER SUPPLY
What We Can Do Before the Well Runs Dry--A Summary of WRC Report No. 35 --Residential Water conservationMilne,
W77-08101 3D

Water and Energy Systems: A Planning Model,
W77-08212 6A

Input-Output Modeling in Water Resources System Planning,
W77-08346 6A

Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

WATER SUPPLY DEVELOPMENT
An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

WATER TEMPERATURE
A Predictive Model for Transient Temperature Distributions in Unsteady Flows,
W77-08221 5B

True-Temperature Determination of Geothermal Reservoirs,
W77-08318 7B

Economic Impacts of Controlling Water Quality in an Irrigated River Basin,
W77-08332 5G

A Study of Cooling Initially Uniform and Thermally Stratified Layers of Water,
W77-08444 5G

WATER TREATMENT
States Need Freedom to Innovate (Comment on PL 92-500).
W77-08119 6E

Liquid Waste Treatment Apparatus,
W77-08263 5D

Apparatus for Continuous Liquid-Liquid Extraction of Water with a Solvent,
W77-08264 5F

Role of Polyelectrolytes in the Filtration of Colloidal Particles from Water and Wastewater,
W77-08339 5D

Fluoride Analysis of Water-Treatment-Plant Sludges,
W77-08342 5F

Application of Corrugated Sheet Sprayers for Water Purification (Die Anwendung von Wellbahnrieslern in der Wasseraufbereitung),
W77-08543 5F

WATER USERS
The National Conference on Water.
W77-08131 6E

Final Report of Committee VII (Final Recommendations of the International Conference on Water Law and Administration),
W77-08187 6E

WATER UTILIZATION
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3F

The National Conference on Water.
W77-08131 6E

Board and Division of Water Resources,
W77-08156 6E

Agricultural Water Demand in Wake County, North Carolina,
W77-08297 6D

Water for Food - Or for More Important Purposes. (Reallocation of Irrigation Water to Cities and Industries),
W77-08377 6E

Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975,
W77-08469 4B

Digital-Model Analysis of the Effects of Water-Use Alternatives on Spring Discharges, Gooding and Jerome Counties, Idaho,
W77-08484 4B

WATER UTILIZZATION
Inventory of Colorado's Front Range Mountain Reservoirs,
W77-08107 6B

WATER WELLS
Selected Water-Level Records for Western Oklahoma, 1950-1975,
W77-08163 7C

Ground-Water Data for 1974-75 in Joshua Tree National Monument, California,
W77-08164 7C

Water-Level Decline and Pumpage in Deep Wells in the Chicago Region, 1971-1975,
W77-08302 2F

100 Mesh Sand Improves Hydraulic Frac Results.
W77-08312 4B

Groundwater Resources of Guam: Occurrence and Development,
W77-08448 4B

Maps Showing Ground-Water COnditions in the Puerco-Zuni Area, Apache and Navajo Counties, Arizona--1975,
W77-08471 7C

WATER WORKS
Sale of Water Rights,
W77-08140 6E

WATER YIELD
Ground-Water Data for 1974-75 in Joshua Tree National Monument, California,
W77-08164 7C

Ground Water in the San Juan Metropolitan Area, Puerto Rico,
W77-08173 4B

WATER YIELD IMPROVEMENT
100 Mesh Sand Improves Hydraulic Frac Results.
W77-08312 4B

WATERFOWL
The Ecological Significance of Antibiotic Substances Excreted by Algae in Waters, (In Polish),
W77-08463 5C

WATERPROOF MEMBRANES
Asphalt-Rubber Mixtures for Seepage Control,
W77-08195 4A

WATERSHED MODELS
Regional Simulation of Streamflow Data,
W77-08298 2A

WATERSHEDS (BASINS)
Flash Floods in Spain (Les Crues Brutales En Espagne),
W77-08247 2E

Recent Flash Floods of the Dison Brook (Crues Brutales Recentes Du 'Ruisseau' De Dison (Belgique): Observations Et Previsions),
W77-08250 4A

WATET ALLOCATION (POLICY)
Water and Energy Systems: A Planning Model,
W77-08212 6A

WAVE STEEPNESS
Drift Velocities of Surface Films Over Waves,
W77-08193 5B

WAVES (WATER)
Drift Velocities of Surface Films Over Waves,
W77-08193 5B

WEATHER PATTERNS
Flash Floods in the Western Mediterranean (Les Crues Catastrophiques sur la Mediterranee Occidentale),
W77-08245 2E

WELL CASING MAKE-UP
Cementing Oil and Gas Wells, Part 2 - Casing Inspection and Pipe Handling Methods, Including Thread Make-Up Control,
W77-08327 8F

WELL CASINGS
Better Protection for Casing and Tool Joints,
W77-08315 8G

Cementing Oil and Gas Wells, Part 2 - Casing Inspection and Pipe Handling Methods, Including Thread Make-Up Control,
W77-08327 8F

WELL DATA
Ground-Water Basic Data for Ramsey County, North Dakota,
W77-08177 7C

WELL FIELDS
Minimizing Costs in Well Field Design in Relation to Aquifer Models,
W77-08214 4B

WELL FILTERS
Resin-Coated Gravel is Used to Help Control Sand,
W77-08316 8G

WELL PERMITS
Artesian Wells.
W77-08397 6E

Ohio Liquid Disposal, Inc V Dawe (Defining 'Waters of the State' Within Water Pollution Control Statute).
W77-08401 6E

WELL REGULATIONS
Artesian Wells.
W77-08397 6E

WELLS
Subsurface-Temperature Data for Some Wells in Western Utah,
W77-08166 7C

Minimizing Costs in Well Field Design in Relation to Aquifer Models,
W77-08214 4B

WESSEX WATER AUTHORITY (ENG)
Reorganizing Pollution Control in the U.K.
W77-08111 5G

LIBRARY OF THE UNIVERSITY OF CHICAGO

WEST VIRGINIA
Boom Companies; Construction, Powers Of,
W77-08157 6E

WESTERN UNITED STATES
The Winters Doctrine and How It Grew: Federal Reservation of Rights to Use of Water,
W77-08375 6E

WET AIR OXIDATION
Involvement of Free Radicals in the Catalytic Oxidation of Phenol in Aqueous Solution,
W77-08201 5D

WET SEASONS
A Note on the Study of Rainy Days and Wet Spells at Bijapur,
W77-08455 2B

WETLAND-UPLAND TRANSITION
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

WETLANDS
Federal Control Over Wetland Areas: The Corps of Engineers Expands its Jurisdiction,
W77-08123 5G

Coastal Zone Legislation: Louisiana Landmarks, Labyrinths and Logrolling,
W77-08186 6E

Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

Russo V. New York Dept. of Environmental Conservation (Limits of State Regulations Restricting Alteration of Wetlands).
W77-08388 6E

WILDLAND FUELS
Mapping of the Wildland Fuel Characteristics of the Santa Monica Mountains of Southern California,
W77-08419 7C

WILDLIFE
Organochlorine Residues in New Zealand Birds and Mammals 2. Polychlorinated Biphenyls,
W77-08210 5C

WIND-GENERATED WAVES
Drift Velocities of Surface Films Over Waves,
W77-08193 5B

WIND VELOCITY
Drift Velocities of Surface Films Over Waves,
W77-08193 5B

WINDS
Lake Erie International Jetport Model Feasibility Investigation; The Wind-Driven Currents and Contaminant Dispersion in the Near-Shore of Large Lakes,
W77-08220 5B

WINTERS DOCTRINE
The Winters Doctrine and How It Grew: Federal Reservation of Rights to Use of Water,
W77-08375 6E

WISCONSIN
Simulation of Streamflow of Flambeau River at Park Falls, Wisconsin to Define Low-Flow Characteristics,
W77-08172 2E

University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

Classification and Test of Public Participation Concepts Applied to Local Resource Planning,
W77-08295 6B

Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-08329 5B

The LANDSAT-1 Multispectral Scanner as a Tool in the Classification of Inland Lakes,
W77-08433 5A

Trophic Status of Inland Lakes from LANDSAT,
W77-08434 5A

Digital-Computer Model of the Sandstone Aquifer in Southeastern Wisconsin,
W77-08478 2F

WITHDRAWAL
Withdrawal of Certain Waters from Appropriation: Special Municipal and County Water Rights,
W77-08142 6E

Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

WITHDRAWN WATERS
Withdrawal of Certain Waters from Appropriation: Special Municipal and County Water Rights,
W77-08142 6E

WOLVERINE AND GULKANA GLACIERS (ALASKA)
Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

WOOD WASTES
Effluent Limitations and Guidelines for Existing Sources and Standards of Performance and Pretreatment Standards for New Sources for the Bleached Kraft, Groundwood, Sulfite, Soda, Deink and Non-Integrated Paper Mills Segment of the Pulp, Paper, and Paperboard Point Source Category.
W77-08383 5G

WYOMING
Snake River Land Co V State Board of Control (Beneficial Use of Water Held Sufficient Proof of Appropriation).
W77-08135 6E

Bear River Compact,
W77-08155 6E

Reservoirs,
W77-08158 6E

Geohydrology of the Albin and La Grange Areas, Southeastern Wyoming,
W77-08176 4B

Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

Water Districts and Commissioners.
W77-08406 6E

Estimating Evapotranspiration in the North Platte Basin of Wyoming,
W77-08505 2D

Inventory of Water Resources Research at the University of Wyoming, Fiscal Year 1975,
W77-08506 9A

X-RAY DIFFRACTION
Crystal Structure Analysis of Selected Pesticides by Single Crystal X-Ray Diffraction: The Crystal and Molecular Structure of Padan,
W77-08503 5A

YAKIMA RIVER BASIN (WASH)
Economic Impacts of Controlling Water Quality in an Irrigated River Basin,
W77-08332 5G

ZINC
Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

ZIRCONIUM SALTS
Method of Purification of Waste Water By Treatment with Zirconium Salt,
W77-08255 5D

LIBRARY U. OF I. URBANA-CHAMPAIGN

AUTHOR INDEX

ABELIOVICH, A.
Effects of High Organic Loading on Mixed Photosynthetic Waste Water Treatment,
W77-08540 5D

ABRAMS, N. E.
The Environmental Problem of the Oceans: An International Stepchild of National Egotism,
W77-08367 6E

ADDISON, J. R.
Impurity Concentrations in Sea Ice,
W77-08237 2C

AGRAWAL, B. K.
Effect of Viscosity Ratio on the Recovery of Fresh Water Stored in Saline Aquifers,
W77-08205 4B

AHNOFF, M.
Apparatus for Continuous Liquid-Liquid Extraction of Water with a Solvent,
W77-08264 5F

ALIMOV, A. F.
The Productivity of Fouling Organism Associations in Lake Zelenetskoe, (In Russian),
W77-08323 5C

AMATO, R. V.
Application of EREP, LANDSAT and Aircraft Image Data to Environmental Problems Related to Coal Mining,
W77-08429 5A

ANAN'EV, N. I.
Sanitary and Hygienic Characteristics of Subsurface Waters of the Tselinograd and Turgai Oblasts, (In Russian),
W77-08253 5B

ANDERSON, A. W.
States' Rights in the Outer Continental Shelf Denied by the United States Supreme Court,
W77-08365 6E

ANDERSON, H. R.
Ground Water in the San Juan Metropolitan Area, Puerto Rico,
W77-08173 4B

ANDERSON, P. H.
Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2G

ANDREN, R. K.
Removing Explosives from Wastewater,
W77-08266 5D

ANDREWS, D. S.
Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

ANDREWS, E. D.
Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

APPLETON, B.
BOC Blows Bubbles in Dirty Bath Water,
W77-08564 5D

ARP, G. K.
The Rationale for Attempting to Define Salt Marsh Mosquito-Breeding Areas in Galveston County by Remote Sensing the Associated Vegetation.
W77-08428 4A

ASH, R.
Sorption and Flow of Carbon Dioxide and Some Hydrocarbons in a Microporous Carbon Membrane,
W77-08232 5A

ATWOOD, R. C.
Taking Acres Out of Pollution-Control Plans,
W77-08283 5D

AUKERMAN, R.
Inventory of Colorado's Front Range Mountain Reservoirs,
W77-08107 6B

AYUKAWA, B.
Method of Purification of Waste Water By Treatment with Zirconium Salt,
W77-08255 5D

BAKER, R. W.
Transference: A Comprehensive Parameter Governing Permeation of Solutes Through Membranes,
W77-08231 3A

BALL, R. C.
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5A

BARBA, D.
Thermocompression-Type Apparatus for Desalting Saline Water,
W77-08252 3A

BARBER, N.
Sodium Bicarbonate Can Settle Many Waste Water Problem Upsets,
W77-08589 5D

BARKER, G. R.
Operational Considerations for the Application of Remotely Sensed Forest Data from LANDSAT or Other Airborne Platforms,
W77-08417 7C

BARKER, J. L.
LANDSAT-1 Data as it has Been Applied for Land Use and Water Quality Data By the Virginia State Water Control Board,
W77-08432 5A

BARNES, C. M.
An Overview of the Development of Remote Sensing Techniques for the Screwworm Eradication Program,
W77-08427 3F

BARNES, H. H. JR.
Measurement of Flash Floods in the United States--State of the Art,
W77-08161 2E

BARR, B. G.
Remote Sensing Applications in Kansas,
W77-08437 4A

BARRER, R. M.
Sorption and Flow of Carbon Dioxide and Some Hydrocarbons in a Microporous Carbon Membrane,
W77-08232 5A

BASSIKI, A.
The Influences of Simulated Moisture Stress Conditions and Osmotic Substrates on Germination and Growth of Cultivated and Wild Safflowers,
W77-08460 2I

BEATTY, M. T.
University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

BECKER, D. A.
Population Dynamics and Species Diversity of Ichthyo-Parasitofauna of the Buffalo National River,
W77-08446 5C

BEER, C.
Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

Process Design of Single-Sludge Activated Sludge Systems Using Nitrate Respiration,
W77-08336 5D

BEHNIA, M.
A Study of Cooling Initially Uniform and Thermally Stratified Layers of Water,
W77-08444 5G

BELFORT, G.
Effects of High Organic Loading on Mixed Photosynthetic Waste Water Treatment,
W77-08540 5D

BELL, J. A.
Dewatering: A New Method Bows,
W77-08528 5D

BELL, J. B.
Bacteriological Investigation of Alberta Meat-Packing Plant Wastes with Emphasis on Salmonella Isolation,
W77-08269 5D

BEN-ASHER, J.
Determining Areal Precipitation in the Basin and Range Province of Southern Arizona - Sonoita Creek Basin,
W77-08308 2B

BENSON, C. R.
Water-Level Decline and Pumpage in Deep Wells in the Chicago Region, 1971-1975,
W77-08302 2F

BENSON, H. A.
Effects of 40-Foot Charleston Harbor Project on Tides, Currents, and Salinities; Hydraulic Model Investigation,
W77-08222 2L

BERGER, B. B.
Chromosome Mutations in a Fern Population Growing in a Polluted Environment: A Bioassay for Mutagens in Aquatic Environments,
W77-08305 5A

BERNDT, R. A.
Design of a Water Quality Monitoring Network,
W77-08497 5A

BIGGS, S. B.
Recreational Use of Texas Rivers--Recommendations for Adoption of the Texas Public Rivers Act,
W77-08134 6E

BILGEN, F.
Investigation of the Effectiveness of Polymers in the Treatment of Nirocellulose-Manufacturing Wastewater,
W77-08338 5D

BISHOP, A. B.
An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

BISWANGER, K.
Pump-Filter for Bilge Water,
W77-08261 5G

BITCOVER, E. H.
Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

BLACKWELL, R. J.
The LANDSAT-1 Multispectral Scanner as a Tool in the Classification of Inland Lakes,
W77-08433 5A

BLANCHAR, R. W.
Pyro- and Tripoly-Phosphate Contents of Sediments,
W77-08306 5A

BOCQUET, G.
Measurement of Ice Movement in Subglacial Cavities: A New Cavitometer Beneath the Glacier D'Argentiere (Mt Blanc, France),
W77-08238 2C

BODDEN, M.
U S Geological Survey, Water Resources Division, Radiocarbon Measurements I,
W77-08169 4B

BOGDANOVICH, O. I.
Reproduction Rate and Productivity of Bacteria in the Ponds of the Karamet-Niyaz Fishery Farm, (In Russian),
W77-08462 5C

BOLAND, D. H. P.
The LANDSAT-1 Multispectral Scanner as a Tool in the Classification of Inland Lakes,
W77-08433 5A

BOLLINGER, W. A.
Federal Statutory Modification of Private Water Rights in South Florida,
W77-08112 6E

BONCZEK, R. H.
Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6B

BORCHERT, W. B.
Geohydrology of the Albin and La Grange Areas, Southeastern Wyoming,
W77-08176 4B

BORN, S. M.
University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

BORNEFF, J.
The Effect of Different Flocculants on the Elimination of Trace Elements and Polycylic Hydrocarbons in the Water Purification Process, (In German),
W77-08256 5D

BOSTOCK, C. A.
Minimizing Costs in Well Field Design in Relation to Aquifer Models,
W77-08214 4B

BOSWELL, E. H.
The Eutaw-McShan Aquifer in Mississippi,
W77-08466 7C

BOTHAM, L. H.
Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

BOWERS, C. W.
Taking Acres Out of Pollution-Control Plans,
W77-08283 5D

BRADLEY, C. C.
On Depth Hoar and the Strength of Snow,
W77-08239 2C

BRENNER, R. C.
Oxygen Aeration at Newton Creek,
W77-08526 5D

BRILL, E. D. JR.
Water and Energy Systems: A Planning Model,
W77-08212 6A

BRINEGAR, D. W.
Kelly Care Extends Service Life,
W77-08311 8C

BROCARD, D. N.
A Predictive Model for Transient Temperature Distributions in Unsteady Flows,
W77-08221 5B

BRODY, M. A.
Performance of Dual-Media Filters--I,
W77-08273 5D

BROWN, R. L.
On Depth Hoar and the Strength of Snow,
W77-08239 2C

BURFORD, M. G.
Is pH Pretreatment Necessary,
W77-08276 5D

BURTON, J. J. JR.
Environmental Law-Application of the Refuse Act of 1899 to Continual Industrial Discharges Is Upheld Without Formalized Permit Procedures,
W77-08382 5G

BUSBY, C. E.
American Sedimentation Law and Physical Processes,
W77-08130 6E

BYERS, D.
Multiple Objective Planning: Small Watersheds,
W77-08350 6B

CABLE, L. W.
Ground-Water Resources of Vanderburgh County, Indiana,
W77-08170 4B

CADY, R. E.
Ground Water Recharge in Eastern Connecticut Based on Simulation Modeling,
W77-08344 2F

CARBERRY, J. G.
Clay Adsorption Treatment of Non-Ionic Surfactants in Waste Water,
W77-08522 5D

CARLSON, M. P.
Estimating Vegetative Biomass from LANDSAT-1 Imagery for Range Management,
W77-08409 4A

CARNEGGIE, D. M.
Usefulness of LANDSAT Data for Monitoring Plant Development and Range Conditions in California's Annual Grassland,
W77-08411 4A

CARY, P. G.
Measurement of the Attenuation of Electromagnetic Radiation by Water in the Visible Region of the Spectrum,
W77-08293 1A

CHAMBON-MOUGENOT, R.
An Estimation of the Efficiency of a Waste Water Treatment Plant, as Measured by Several Parameters Including Lipid Biodegradation (Essai d'evaluation de l'efficacite d'une station d'epuration a l'aide de plusieurs parametres dont la biodegradation des lipides),
W77-08548 5D

CHAMBON, P.
An Estimation of the Efficiency of a Waste Water Treatment Plant, as Measured by Several Parameters Including Lipid Biodegradation (Essai d'evaluation de l'efficacite d'une station d'epuration a l'aide de plusieurs parametres dont la biodegradation des lipides),
W77-08548 5D

CHANNABASAPPA, K. C.
Status of Reverse Osmosis Desalination Technology,
W77-08225 3A

CHAW, S. Y.
Research on Cements for Geothermal and Deep Oil Wells,
W77-08320 8F

CHEN, K. Y.
Ozone Effect of Synthetic Rubber Waste Treatment,
W77-08267 5D

CHEN, L. H.
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3F

CHEN, Y. K.
Occupational Characteristics and Biological Kinetic Constants of Extended Aeration Process,
W77-08270 5D

CHENG, R. T.
Transient Three-Dimensional Circulation of Lakes,
W77-08181 2H

CHIAN, E. S. K.
Treatment of High Strength Acidic Waste Water with a Completely Mixed Anaerobic Filter,
W77-08524 5D

CHITWOOD, E. S.
Water-Quality Records for Selected Reservoirs in Texas, 1974-75 Water Years,
W77-08483 5A

CHUMACHENKO, P. N.
Mechanical Surface Aerator for Effluent Purification--Has the Liquid Scooped by the Curved Elements and Ejected into the Air Above,
W77-08558 5D

CIBULA, W. G.
Computer Implemented Classification of Vegetation Using Aircraft Acquired Multispectral Scanner Data,
W77-08421 4A

CINQ-MARS, G. V.
Enzymatic Treatment of Primary Municipal Sludge with Trichoderma Viride Cellulase,
W77-08529 5D

CLARK, G. R.
Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

CLARK, J. A.
Pollution Indicator Bacteria Associated with Municipal Raw and Drinking Water Supplies,
W77-08516 5A

CLARKSON, R. J. JR.
Spectroanalytical Parameters of Fungal Metabolites: Oosporein and Desmethoxyviridiol,
W77-08449 2K

CLAY, C.
Determination of Water-Resources Policies in Arid Lands,
W77-08453 6B

CLOUGH, J. W.
Radio-Echo Sounding: Reflections from Internal Layers in Ice Sheets,
W77-08230 2C

COINER, J. C.
Remote Sensing Applications in Kansas,
W77-08437 4A

Utilization of LANDSAT Imagery for Mapping Vegetation on the Millionth Scale,
W77-08413 7C

COLLINS, M. A.
Implementation of an Optimization Model for Operation of a Metropolitan Reservoir System,
W77-08211 4A

COLVIN, V. M.
Water-Level Decline and Pumpage in Deep Wells in the Chicago Region, 1971-1975,
W77-08302 2F

COLWELL, R. N.
Usefulness of LANDSAT Data for Monitoring Plant Development and Range Conditions in California's Annual Grassland,
W77-08411 4A

CONCARI, F.
Thermocompression-Type Apparatus for Desalting Saline Water,
W77-08252 3A

CONN, W. M.
Precoat for Permeability Separation Systems,
W77-08259 5D

CONOMOS, T. J.
Implications of Seasonal Chemical and Physical Factors on the Production of Phytoplankton in Northern San Francisco Bay,
W77-08489 5C

Longitudinal Distribution of Selected Micronutrients in Northern San Francisco Bay During 1973,
W77-08487 5C

Suspended-Particle Transport and Circulation in San Francisco Bay: An Overview,
W77-08486 2L

COOPER, J. E.
Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

COOPER, L. W.
Air, Mist and Foam Drilling, A Look at the Latest Techniques, Part 2,
W77-08326 8C

COOPER, R. C.
Health Considerations in Use of Tertiary Effluents,
W77-08513 5F

CORKER, C. E.
Can a State Embargo the Export of Water by Transbasin Diversions,
W77-08129 6E

COUPE, L. D.
Pumped Storage Potential of the Hells Canyon Area,
W77-08196 8C

CRIBER, J. H.
Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975,
W77-08469 4B

CROSBY, J. W. III
Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

CROWELL, R. L.
What We Can Do Before the Well Runs Dry--A Summary of WRC Report No. 35 --Residential Water conservation-Milne,
W77-08101 3D

CRUETTE, J.
A Methodology for Measuring Flash Floods (Methodologie Pour La Mesure Des Crues Brutales),
W77-08249 2E

CRUTCHFIELD, J. A.
Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

CULP, G. L.
What Lies Ahead for PAC,
W77-08541 5D

CUNNINGHAM, K. M.
Investigation of Detection Limits for Solutes in Water Measured by Laser Raman Spectrometry,
W77-08171 2K

D'AMICO, J. A.
Effect of Dip on the Subsurface Storage or Disposal of Fluid in Saline Aquifers,
W77-08204 4B

DAGG, M.
Improving Food Crop Production in the Sudan Savanna Zone of Northern Nigeria,
W77-08459 3F

DAIDOLA, E.
Marine Life Protector,
W77-08262 8I

DAIDOLA, J. C.
Marine Life Protector,
W77-08262 8I

DAJANI, JARIR S.
Network Evaluation of Wastewater Collection Economics,
W77-08331 5D

DANILEVSKAYA, I. P.
The Role of Protozoa in Biological Purification of Oil Industry Sewage, (In Russian),
W77-08254 5D

DAUBNER, I.
A Method for Quantitative Determination of Ammonifying and Denitrifying Bacteria in Water with Applied Examples from Gravel-Pit Pools, (In Czech),
W77-08509 5A

DAVIS, K. D.
Prediction Models of Reaeration Rate for Mountain Creeks,
W77-08501 5G

DAVIS, M. H.
A Survey of Cadmium Occurrence and Concentration in Fish from Eleven Major Reservoirs in South Carolina,
W77-08192 5A

DAVIS, M. R.
The Use of Skylab Data to Study the Early Detection of Insect Infestations and Density and Distribution of Host Plants,
W77-08422 7C

DAVIS, R. A.
Beach Profile Changes: East Coast of Lake Michigan, 1970-72,
W77-08440 2J

DEERING, D. W.
Monitoring Vegetation Conditions from LANDSAT for Use in Range Management,
W77-08412 4A

DEGLORIA, S. D.
Usefulness of LANDSAT Data for Monitoring Plant Development and Range Conditions in California's Annual Grassland,
W77-08411 4A

DEHAAN, R. W.
Input-Output Modeling in Water Resources System Planning,
W77-08346 6A

DEHAB, M. F.
Unstratified-Bed Filtration of Waste Water,
W77-08537 5D

DEMPSEY, B. A.
The Solubility of Particulate Phosphorus in the Effluent From Alum Treatment of Wastewater and Phosphorus Solutions,
W77-08500 5D

DEMPSEY, J. H.
Development of a Column Chromatography Method for Field of Pre-Concentration of

DEMPSEY, J. H.

Trace Metals with Application to the Haw-Cape Fear Rivers, N.C.,
W77-08299 5A

DENTON, R. S.
History and Development of the Oxidation Ditch,
W77-08587 5D

DEWALLE, F. B.
Treatment of High Strength Acidic Waste Water with a Completely Mixed Anaerobic Filter,
W77-08524 5D

DIETRICH, D. L.
Agricultural Inventory Capabilities of Machine Processed LANDSAT Digital Data,
W77-08423 3F

DILISSIO, L. E.
Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

DILLMAN, R. D.
Timber Type Separability in Southeastern United States on LANDSAT-1 MSS Data,
W77-08418 4A

DIMMLER, D. G.
A Controllable Automated Environmental Data Acquisition and Monitoring System,
W77-08441 7C

DIMOCK, C. W.
The Effect of Soluble Organic Matter On the Utilization of Phenoxy Herbicides by Pseudomonas sp.,
W77-08504 5C

DOAKE, C. S. M.
A Further Comparison of Glacier Velocities Measured by Radio-Echo and Survey Methods,
W77-08228 2C

DOUGLAS, R. R.
A New Measure of Damage for Wrongfully Appropriated Water,
W77-08361 4A

DOWNING, D. J.
Ground-Water Data for 1974-75 in Joshua Tree National Monument, California,
W77-08164 7C

DREW, J. V.
Estimating Vegetative Biomass from LANDSAT-1 Imagery for Range Management,
W77-08409 4A

DREYFUSS, M.
Deep Water Resources of the Limestones of Franche-Comte: Problems of Quantity and Quality, (In French),
W77-08122 4B

DUKE, W. H.
Fluoride Analysis of Water-Treatment-Plant Sludges,
W77-08342 5F

DUMENIL, L.
Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

DUNLAP, D. V.
The Influence of Precipitation on Biochemical Oxygen Demand on Nine Streams in New Jersey,
W77-08203 5B

DUTKA, B. J.
Confirmation of the Single-Step Membrane Filtration Procedure for Estimating Pseudomonas Aeruginosa Densities in Water,
W77-08518 5A

EARLE, J. E.
Dissolved Solids, Hardness, and Orthophosphate of Surface-Water Runoff in the Northwest Florida Water Management District,
W77-08467 7C

EARLS, L. M.
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

EBERHART, D. K.
Clay Adsorption Treatment of Non-Ionic Surfactants in Waste Water,
W77-08522 5D

EDGE, B. L.
Methodology for Applying the Finite Element Method to Partially Stratified Estuaries,
W77-08198 2L

EDGERTON, G. A.
Thermal Sensor for Measurement of Ocean Current Direction,
W77-08257 2L

EDMONDS, C. R.
Root Growth, Strength, and Chemical Properties of a Hobson Fragipan,
W77-08285 2G

EGBERT, D. D.
Agricultural Inventory Capabilities of Machine Processed LANDSAT Digital Data,
W77-08423 3F

EGUCHI, R. T.
An Earthquake Risk Model That Incorporates Local Near Surface Site Conditions,
W77-08348 8E

EL-SAID, M.
Drainable Porosity Evaluation and its Relationship to Hydraulic Conductivity and Exchangeable Cations Under Different Bulk Densities,
W77-08461 4A

EL-SHAFEI, Y. Z.
Drainable Porosity Evaluation and its Relationship to Hydraulic Conductivity and Exchangeable Cations Under Different Bulk Densities,
W77-08461 4A

ELDER, P. S.
Environmental Protection Through the Common Law,
W77-08133 6G

ELLICKSON, R. C.
Ticket to Thermidor: A Commentary on the Proposed California Coastal Plan,
W77-08379 6B

ELLIS, R. C.
Cementing Oil and Gas Wells, Part 2 - Casing Inspection and Pipe Handling Methods, Including Thread Make-Up Control,
W77-08327 8F

Cementing Oil and Gas Wells, Part 3,
W77-08328 8F

EMMETT, W. W.
Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

ENG, J.
Performance of Dual-Media Filters--II,
W77-08274 5D

ENGLAND, A. W.
Radio-Echo Sounding of Temperate Glaciers: Ice Properties and Sounder Design Criteria,
W77-08229 2C

ERTEL, M. O.
Citizen Participation in Comprehensive Water Resources Planning,
W77-08105 6B

ERWIN, D.
Closed-Loop System Separates Oil from Prewash Overflow,
W77-08271 5D

EVANS, R. L.
Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2H

FAHMY, M. I.
Drainable Porosity Evaluation and its Relationship to Hydraulic Conductivity and Exchangeable Cations Under Different Bulk Densities,
W77-08461 4A

FATTAL, B.
Enterovirus Types in Israel Sewage,
W77-08519 5A

FAULKNER, D. P.
Discriminating Coastal Rangeland Production and Improvements with Computer Aided Techniques,
W77-08410 4A

FEDERMAN, A. B.
The 1972 Water Pollution Control Act: Unforeseen Implications for Land Use Planning,
W77-08373 5C

FETHE, T. P.
Operational Considerations for the Application of Remotely Sensed Forest Data from LANDSAT or Other Airborne Platforms,
W77-08417 7C

FINGLETON, W. G.
Beach Profile Changes: East Coast of Lake Michigan, 1970-72,
W77-08440 2

FISH, G. R.
The Fallout of Nitrogen and Phosphorus Compounds from the Atmosphere at Ngapuna, Near Rotorua, New Zealand,
W77-08243 5

Nitrogen and Phosphorus Analyses of Rainfall at Rotorua, New Zealand,
W77-08242 5

FISHER, L. T.
Trophic Status of Inland Lakes from LANDSAT,
W77-08434 5

FORDE, B. J.
Growth of Tropical and Temperate Grasses at Palmerston North I. Warm-Season Yields With and Without Irrigation,
W77-08457 3F

FORSBERG, F. C.
An Overview of the Development of Remote Sensing Techniques for the Screwworm Eradication Program,
W77-08427 3F

FOSTER, J. H.
Flood Management: Who Benefits and Who Pays,
W77-08303 6F

FOSTER, K. E.
A Computerized Information System Relating to Arizona's Water Resources,
W77-08307 7C

FOSTER, W. S.
Plain-End Pipe 'Collars' Problem Sewer Connections,
W77-08553 8G

FRAZEE, C. J.
LANDSAT-1 Data, Its Use in a Soil Survey Program,
W77-08414 2G

FRENTRESS, C. D.
Wildlife Management by Habitat Units--A Preliminary Plan of Action,
W77-08426 4A

FRERE, M. H.
Water Quality in the Texas Coastal Basins,
W77-08465 5B

FRIES, R. E.
Agricultural Inventory Capabilities of Machine Processed LANDSAT Digital Data,
W77-08423 3F

FRY, J.
From Good Husbandry to Reasonable Use: Illinois Surface Water Drainage Law Evolves in Subdivision Case,
W77-08353 4A

FRYE, R. G.
Wildlife Management by Habitat Units--A Preliminary Plan of Action,
W77-08426 4A

FUESSLE, R. W.
Water and Energy Systems: A Planning Model,
W77-08212 6A

FULLER, W. A.
Kraft Mill Recovery System,
W77-08258 5D

GAFFNEY, P. E.
Chlorobiphenyls and PCB's: Formation During Chlorination,
W77-08538 5A

GALE, R. M.
Transference: A Comprehensive Parameter Governing Permeation of Solutes Through Membranes,
W77-08231 3A

GALLOWAY, J. N.
The Utility of Paleolimnological Analyses of Lake Sediments for Evaluating Acid Precipitation Effects on Dilute Lakes,
W77-08103 5A

GANCZARCZYK, J.
Aerobic Digestion of Sludges Precipitated from Waste Water by Lime Addition,
W77-08530 5D

GANGLER, N. F.
Water-Level Decline and Pumpage in Deep Wells in the Chicago Region, 1971-1975,
W77-08302 2F

GARDINER, J.
Improved Method for the Determination of Ethylenediaminetetraacetic Acid in Aqueous Environmental Samples by Gas-Liquid Chromatography,
W77-08521 5A

GARFIELD, D. E.
Resurvey of the 'Byrd' Station, Antarctica, Drill Hole,
W77-08227 2C

GERLACH, T.
A Preliminary Analysis of the Energy and Water Requirements for Developing Geothermal Energy in Arizona,
W77-08351 4B

GHASSEMI, M.
Sources, Characteristics and Treatment and Disposal of Industrial Wastes Containing Hexachlorobenzene,
W77-08265 5D

GLIDEWELL, J. D. JR.
Sewage Pumping Station Built to Handle Future System Demands,
W77-08550 8C

GOEMAAT, R. L.
Selected Water-Level Records for Western Oklahoma, 1950-1975,
W77-08163 7C

GOLDBERG, M. C.
Investigation of Detection Limits for Solutes in Water Measured by Laser Raman Spectrometry,
W77-08171 2K

GOOCH, A. E.
Better Protection for Casing and Tool Joints,
W77-08315 8G

GOODRICK, F. E.
Delineation of the Boundaries of a Buried Pre-Glacial Valley with LANDSAT-1 Data,
W77-08415 2G

GORMAN, M.
A Further Comparison of Glacier Velocities Measured by Radio-Echo and Survey Methods,
W77-08228 2C

GOULDEN, O. A.
Trends in Small Sewage Treatment Plants,
W77-08569 5D

GRAHAM, J. W.
Resin-Coated Gravel is Used to Help Control Sand,
W77-08316 8G

GRAY, J. R.
Legal Control of Consumptive Water Use in Pennsylvania Power Plants,
W77-08368 3E

GRAY, W. G.
On the Relationship Between the Finite Element and Finite Difference Methods,
W77-08168 7A

GREENLAW, N.
A Controllable Automated Environmental Data Acquisition and Monitoring System,
W77-08441 7C

GRIGG, N. S.
Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

GROSS, D. L.
Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2H

GUETZKOW, L. C.
Small-Stream Flood Investigations in Minnesota, October 1958 to September 1975,
W77-08481 2E

GUNARD, K. T.
Small-Stream Flood Investigations in Minnesota, October 1958 to September 1975,
W77-08481 2E

HAAS, R. H.
Monitoring Vegetation Conditions from LANDSAT for Use in Range Management,
W77-08412 4A

HADEED, S. J.
Irrigated Agriculture: Nonpoint and Point Source Water Pollution,
W77-08116 5G

HADLEY, R. F.
Sediment Yield and Land Use in Southwest United States,
W77-08178 4D

HAENDEL, H.
Construction and Maintenance Costs of Sewer Systems (Bau- und Betriebskosten von Kanalisationsanlagen),
W77-08542 8A

HAIRE, W. J.
Floods of November 12, 1974, in the Charlotte Amalie Area, St. Thomas, U.S. Virgin Islands,
W77-08470 7C

HALL, S. J.
The AFGWC Snow Cover Analysis Model,
W77-08223 2C

HAMDY, M. K.
Biochemical Transformation and Detoxification of Mercury in Aquatic Environment,
W77-08289 5C

HAMODA, M. F.
Aerobic Digestion of Sludges Precipitated from Waste Water by Lime Addition,
W77-08530 5D

HAPPICH, W. F.
Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

HARDEN, J. M.
Arsenic in Water and Fish from Lakes Hartwell, Keowee, and Jocassee, South Carolina,
W77-08191 5A

HARDGROVE, T. W.
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5A

HARLAN, J. W.
Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

HARLEMAN, D. R. F.
A Predictive Model for Transient Temperature Distributions in Unsteady Flows,
W77-08221 5B

HART, W. G.
The Use of Skylab Data to Study the Early Detection of Insect Infestations and Density and Distribution of Host Plants,
W77-08422 7C

HECOCK, R. D.
RECSAD: A Computer Program for Recreation Planning,
W77-08300 6B

HELLDEN, U.
The Use of LANDSAT-1 Imagery for Water Quality Studies in Southern Scandinavia,
W77-08435 5A

HENDERSON, R. W.
Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

HENDRICKS, D. W.
Input-Output Modeling in Water Resources System Planning,
W77-08346 6A

HERAS, R.
Flash Floods in Spain (Les Crues Brutales En Espagne),
W77-08247 2E

HERSHAW, M. J.
Boundaries of the Coastal Zone: A Survey of State Laws,
W77-08132 6E

HETLING, L. J.
Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

HEWITT, J. P.
A Comparison of the Methods for Calculating the Constants for the First Order BOD Equation,
W77-08494 5B

The Mathematical Description of the BOD Reaction in Stream Water,
W77-08493 5B

HIGGINS, R.
Dewatering: A New Method Bows,
W77-08528 5D

HO, J. C.
Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

HOLLAND, W. E.
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

HOLSAPPLE, C.
Discriminant Analysis of Characteristics Determining Acceptance or Rejection of Nuclear Power,
W77-08109 6B

HOLSAPPLE, C. W.
Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6B

HOOD, J. W.
Selected Hydrologic Data, Uinta Basin Area, Utah and Colorado,
W77-08183 7C

HOOK, R. A.
Air, Mist and Foam Drilling, A Look at the Latest Techniques, Part 2,
W77-08326 8C

HOOPES, J. A.
Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

HORNEY, L. F.
Investigation of Coagulation - Precipitation and Ultrafiltration for the Regeneration of Brines in the Cucumber Pickle Industry,
W77-08511 5D

HORNING, R. H.
Characterization and Treatment of Textile Dyeing Wastewaters,
W77-08278 5D

HORNOR, S. G.
Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2H

HOWARD, C. E. JR.
Remote Sensing Applications in the Inventory and Analysis of Environmental Problems,
W77-08438 5A

HOWELL, J.
Enzymatic Treatment of Primary Municipal Sludge with Trichoderma Viride Cellulase,
W77-08529 5D

HOYLE, J. L.
A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

HSIA, A. H.
The Effect of Aeration of Water Jet Spreading,
W77-08197 8B

HSIEH, Y. P.
A Quantitative Study of Organic Carbon Decomposition and Nitrogen Transformations in Sewage Sludge-Soil Systems,
W77-08291 5B

HULL, J. A.
Annual Peak Discharges from Small Drainage Areas in Montana Through September 1976,
W77-08482 2E

HUNT, B. J.
Potential of New Summer Grasses in Northland: I. Warm-Season Yields Under Dryland and Irrigation,
W77-08458 3F

HUTCHINSON, R. D.
Ground-Water Basic Data for Ramsey County, North Dakota,
W77-08177 7C

IKAWA, M.
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

INGLE, S. J.
The Use of Skylab Data to Study the Early Detection of Insect Infestations and Density and Distribution of Host Plants,
W77-08422 7C

IP, S. Y.
Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

ISSELHARDT, L. O.
Detection of Phosphate Adsorption onto Coal Humic Acids,
W77-08294 5A

JAIN, S. C.
Effects of Meandering in Alluvial Streams,
W77-08216 2E

JAKUBEK, P.
Pump-Filter for Bilge Water,
W77-08261 5C

JALAL, K. F.
Water Quality Impacts of Urbanization--A Methodology,
W77-08514 5B

JENSEN, B. C.
An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

JIN, D. J.
True-Temperature Determination of Geothermal Reservoirs,
W77-08318 7B

JOHNSON, K. G.
Floods of November 12, 1974, in the Charlotte Amalie Area, St. Thomas, U.S. Virgin Islands,
W77-08470 7C

JOHNSON, M. V.
Annual Peak Discharges from Small Drainage Areas in Montana Through September 1976,
W77-08482 2E

JOLLEY, V. D.
Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

JONES, D. R. IV.
Chelating Agent Analysis by High Speed Liquid Chromatography,
W77-08286 5A

JOSEFSSON, B. O.
Apparatus for Continuous Liquid-Liquid Extraction of Water with a Solvent,
W77-08264 5A

JOYNER, B. F.
Water Resources of the Myakka River Basin Area, Southwest Florida,
W77-08167 4B

JUDGE, J. F.
Inventory of Colorado's Front Range Mountain Reservoirs,
W77-08107 6B

KALASH, R. M.
Asphalt-Rubber Mixtures for Seepage Control,
W77-08195 4A

KALLEL, R.
The Operation of a Flood Warning Network: Its Use for Studying Flash Floods (Exploitation D'un Reseau D'alerte: Son Utilisation Pour L'etude Des Crues Brutales),
W77-08248 2E

KALOUSEK, G. L.
Research on Cements for Geothermal and Deep Oil Wells,
W77-08320 8F

KAN, E. P.
Timber Type Separability in Southeastern United States on LANDSAT-1 MSS Data,
W77-08418 4A

KARDOS, L. T.
Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

Spray Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soil,
W77-08202 5D

KASSAM, A. H.
Improving Food Crop Production in the Sudan Savanna Zone of Northern Nigeria,
W77-08459 3F

KAVI, P. S.
A Note on the Study of Rainy Days and Wet Spells at Bijapur,
W77-08455 2B

KAWARA, O.
Ozone and Chlorine in Waste Water Disinfection,
W77-08536 5D

KELLER, E. A.
Channelization: Environmental, Geomorphic and Engineering Aspects,
W77-08352 8D

KEMPLING, J. C.
Performance of Dual-Media Filters--II,
W77-08274 5D

KENNEDY, J. F.
Effects of Meandering in Alluvial Streams,
W77-08216 2E

KENT, J. C.
The Accumulation and Distribution of Organochlorines and Some Heavy Metals in American Falls Reservoir Fishes, Water and Sediment,
W77-08287 5B

KESSLER, J. O.
Forward Osmosis Extractors,
W77-08340 3A

KHADR, F. H.
Improving Food Crop Production in the Sudan Savanna Zone of Northern Nigeria,
W77-08459 3F

KHOSH-KHUI, M.
The Influences of Simulated Moisture Stress Conditions and Osmotic Substrates on Germination and Growth of Cultivated and Wild Safflowers,
W77-08460 2I

KIDDER, R. J.
Reliable pH Measurement When Effluent Conditions Get Tough,
W77-08592 5A

KILAMBI, R. V.
Population Dynamics and Species Diversity of Ichthyo-Parasitofauna of the Buffalo National River,
W77-08446 5C

KLEKOWSKI, E. J.
Chromosome Mutations in a Fern Population Growing in a Polluted Environment: A Bioassay for Mutagens in Aquatic Environments,
W77-08305 5A

KNUD-HANSEN, C. F.
The Limnology of a North Carolina Millpond with Special Reference to Historical Changes as Evidenced by Sediment Core Analysis,
W77-08507 5C

KOCH, S. G.
Citizen Participation in Comprehensive Water Resources Planning,
W77-08105 6B

KOERS, D. A.
Aerobic Digestion of Waste Activated Sludge at Low Temperatures,
W77-08527 5D

KOLARIK, L. O.
Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

KOSTENKO, V. F.
Mechanical Surface Aerator for Effluent Purification--Has the Liquid Scooped by the Curved Elements and Ejected into the Air Above,
W77-08558 5D

KOTHANDARAMAN, V.
Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2H

KOWAL, J. M.
Improving Food Crop Production in the Sudan Savanna Zone of Northern Nigeria,
W77-08459 3F

KRASNOFF, P. J.
Oxygen Aeration at Newton Creek,
W77-08526 5D

KREITH, F.
An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

KRIMMEL, R. M.
Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

KRUG, W. R.
Simulation of Streamflow of Flambeau River at Park Falls, Wisconsin to Define Low-Flow Characteristics,
W77-08172 2E

KUKLINA, M. N.
Some Experimental Data on the Study of the Biological Action of Ethylbutylamine as a Water Pollution Factor, (In Russian),
W77-08439 5A

KUNTE, H.
The Effect of Different Flocculants on the Elimination of Trace Elements and Polycylic Hydrocarbons in the Water Purification Process, (In German),
W77-08256 5D

KWAN, K. K.
Confirmation of the Single-Step Membrane Filtration Procedure for Estimating Pseudomonas Aeruginosa Densities in Water,
W77-08518 5A

LAMM, W. T.
Classification and Test of Public Participation Concepts Applied to Local Resource Planning,
W77-08295 6B

LARKIN, E. P.
Persistence of Mycobacterium Bovis BCG in Soil and on Vegetables Spray-Irrigated with Sewage Effluent and Sludge,
W77-08525 5C

LEE, Y. J.
Are Clear-Cut Areas Estimated from LANDSAT Imagery Reliable,
W77-08416 4A

LEHV, D. G.
Sovereignty and the Control of Water Pollution,
W77-08366 5G

LENG, M. S.
The Protection and Repair of Underground Pipelines for Water and Sewage,
W77-08551 8G

LEONE, H. L. JR.
Analyses of Water, Core Material, and Elutriate Samples Collected Near New Orleans, Louisiana (Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project),
W77-08165 8D

LEOPOLD, L. B.
Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

LESHENDOK, T. V.
Sources, Characteristics and Treatment and Disposal of Industrial Wastes Containing Hexachlorobenzene,
W77-08265 5D

LEWIS, F. W.
Oil and Water--A New Look at the Uniformity Doctrine,
W77-08125 6E

LIENERT, H. D.
A Statistical Analysis of the Mercury Concentrations in Fish from Lake Jocassee, South Carolina,
W77-08190 5A

LIGHTSEY, G. R.
Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

LIPO, T. A.
Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

LIPSCOMB, P. J.
The Import - Export Clause and Control of Oil Pollution: Regulatory Fee Imposed Pursuant to the Police Power,
W77-08354 5G

LLOYD, E. T.
Mercury Accumulation in Trout of Southern Missouri,
W77-08304 5C

LOEB, S.
Production of Energy From Concentrated Brines by Pressure-Retarded Osmosis, 1. Preliminary Technical and Economic Correlations,
W77-08233 3A

LOUNSBURY, R. W.
Summary of Some Current and Possible Future Environmental Problems Related to Geology and Hydrology at Memphis, Tennessee,
W77-08174 4C

LUBOMIROVA, K. S.
The Flooding of Rivers in the USSR and the Measures Taken to Control Ice Jams (Les Inondations Fluviales En URSS Et La Lutte Contre Les Crues Causees Par Les Embacles),
W77-08246 2C

LUCES, S. A.
The AFGWC Snow Cover Analysis Model,
W77-08223 2C

LUDLUM, S. D.
Laminated Sediments in Holomictic Berkshire Lakes,
W77-08341 2J

LUMPKINS, R. J.
Performance of Dual-Media Filters--I,
W77-08273 5D

LUNDBERG, A.
Lake Naivasha and Lake Nakuru: An Ecological Comparison Between Two Bird Lakes in East Africa, (In Swedish),
W77-08324 2H

LUTHY, R. G.
Air Flotation of Oily Waste Waters with Organic Coagulants,
W77-08282 5D

LYNCH, T. J.
Treatment of Wastewater From Military Explosives and Propellants Production Industry by Physicochemical Processes,
W77-08337 5D

LYON, K. S.
An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

MAHONEY, H. A.
Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

MAKRUSHIN, A. V.
Possibilities and Role of Biological Analysis in Evaluating the Degree of Pollution of Water Bodies, (In Russian),
W77-08430 5A

MALONEY, F. E.
Report on Water Resources Problems of Western Collier County, Florida as Affected by the GAC Corporation's Canal System in Its Golden Gate Development Project,
W77-08380 6E

MALPRICHT, E.
Design and Operation of Rain Retention Basins (Entwurf und Betrieb von Regenruckhaltebecken),
W77-08547 8A

MANN, L. J.
Maps Showing Ground-Water COnditions in the Puerco-Zuni Area, Apache and Navajo Counties, Arizona--1975,
W77-08471 7C

MAR, B. W.
Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

MARKWOOD, I. M.
Let's Have Achievable 'Safe' Drinking Water,
W77-08127 5G

MARTENS, J. D.
The AFGWC Snow Cover Analysis Model,
W77-08223 2C

MARTIN, D.
Fluid Bed for Sewage Sludge Burn Up,
W77-08582 5E

MARTIN, K. R.
Application of EREP, LANDSAT and Aircraft Image Data to Environmental Problems Related to Coal Mining,
W77-08429 5A

MASON, D. G.
Dewatering: A New Method Bows,
W77-08528 5D

MASOTTI, L.
Use of Oxygen in Activated Sludge Plants (Utilizzazione dell'ossigeno allo stato puro negli impianti a fanghi attivi),
W77-08545 5D

MASSELLI, J. W.
Is pH Pretreatment Necessary,
W77-08276 5D

MASSELLI, N. W.
Is pH Pretreatment Necessary,
W77-08276 5D

MATHESON, J. C. III.
Availability of Aluminum Phosphate Complexes to a Green Alga in Various Culture Media,
W77-08496 5D

MATHEWS, W. H.
Relocation of Buried Markers,
W77-08240 2C

MATSUMOTO, K.
Progress in MHI's Integrated Techniques for Environmental Protection,
W77-08533 5D

MAVINIC, D. S.
Aerobic Digestion of Waste Activated Sludge at Low Temperatures,
W77-08527 5D

MAYO, L. R.
Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

MAYS, L. W.
Optimal Layout and Design of Storm Sewer Systems,
W77-08334 5D

MCCALLUM, C.
Computer Prediction of Stationary States of Membranes from Differential Permeabilities,
W77-08234 3A

MCCAULEY, J. R.
Quantitative Water Quality with Landsat and Skylab.
W77-08431 5A

MCCLYMONT, G. L.
Applications of Surface Resistivity Methods,
W77-08244 2F

MCCOY, J. E.
Methodology for Applying the Finite Element Method to Partially Stratified Estuaries,
W77-08198 2L

MCCUTCHEON, R. C.
Aquaculture: Problems of Implementation Under Existing Law,
W77-08369 6E

MCDANNALD, R. B.
It's Your Loss,
W77-08319 8G

MCDONNELL, R.
Removing Explosives from Wastewater,
W77-08266 5D

MCLOUD, P. R.
Agricultural Water Demand in Wake County, North Carolina,
W77-08297 6D

MCMAHON, T. A.
Low Flow Analyses of Streams: Details of Computational Procedures and Annotated Bibliography,
W77-08219 2E

MCVAUGH, J. B. JR.
Mathematical and Experimental Investigation of Nonsteady State Thickening of an Ideal Slurry,
W77-08207 5D

MEADE, R. H.
Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

MEARES, P.
Computer Prediction of Stationary States of Membranes from Differential Permeabilities,
W77-08234 3A

MEEK, C. C.
Statistical Characterization of Dilute Particulate Suspensions in Turbulent Fluid Fields,
W77-08330 5B

MEIN, R. G.
Application of Three Daily-Rainfall Runoff Models to Four Australian Catchments,
W77-08218 2A

MELHORN, W. N.
Delineation of the Boundaries of a Buried Pre-Glacial Valley with LANDSAT-1 Data,
W77-08415 2G

MENDE, J. S.
Water-Level Decline and Pumpage in Deep Wells in the Chicago Region, 1971-1975,
W77-08302 2F

METZNER, A. V.
Removing Soluble Metals from Waste Water,
W77-08591 5D

MIFFLIN, M. D.
Pluvial Lakes of Nevada and Estimated Full Pluvial Climates,
W77-08199 2H

MILLER, S.
Effects of High Organic Loading on Mixed Photosynthetic Waste Water Treatment,
W77-08540 5D

MILLER, W.
Multiple Objective Planning: Small Watersheds,
W77-08350 6B

MINK, J. F.
Groundwater Resources of Guam: Occurrence and Development,
W77-08448 4B

MIRO-GRANADA Y GELABERT, J.
Flash Floods in the Western Mediterranean (Les Crues Catastrophiques sur la Mediterranee Occidentale),
W77-08245 2E

MITCHELL, S.
What We Can Do Before the Well Runs Dry--A Summary of WRC Report No. 35 --Residential Water conservation-Milne,
W77-08101 3D

MOHR, M. C.
Drift Velocities of Surface Films Over Waves,
W77-08193 5B

MOLNAU, M.
A Guide to the Use of HISARS -- A Hydrologic Information Storage and Retrieval System,
W77-08445 7C

MONKMEYER, P. L.
Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

MOODY, C. D.
Forward Osmosis Extractors,
W77-08340 3A

MOORE, I. D.
Application of Three Daily-Rainfall Runoff Models to Four Australian Catchments,
W77-08218 2A

MORELAND, J. A.
Digital-Model Analysis of the Effects of Water-Use Alternatives on Spring Discharges, Gooding and Jerome Counties, Idaho,
W77-08484 4B

MORLAND, L. W.
Stress in an Elastic Bedrock Hump Due to Glacier Flow,
W77-08236 2C

MORRIS, E. M.
Stress in an Elastic Bedrock Hump Due to Glacier Flow,
W77-08236 2C

MORRISON, W. R.
Chemical and Vegetative Stabilization of Soils,
W77-08512 8D

MORROW, J.
Improved Galvanic Dissolved Oxygen Sensor for Activated Sludge,
W77-08539 5A

MORSE, J. G.
Rainfall Infiltration Characteristics for a Semi-Arid Watershed Soil,
W77-08206 2G

MOTZ, L. H.
Hydrologic Effects of the Tampa Bypass Canal System,
W77-08182 4A

MUELLER, J. E.
Restless River: International Law and the Behavior of the Rio Grande,
W77-08384 6E

MULINO, M. M.
The Influence of Brackish-Water Intrusion on Macroinvertebrate Associations of the Lower Tchefuncte River, Louisiana,
W77-08292 5B

MULLINS, W. H.
Aerators Control Lift Station Odor and Corrosion,
W77-08567 5G

Liquid Waste Treatment Apparatus,
W77-08263 5D

MUNDORFF, J. C.
Selected Hydrologic Data, Uinta Basin Area, Utah and Colorado,
W77-08183 7C

MURDOCK, J. N.
A Postscript to the Mutual Prescription Doctrine--City of Los Angeles V City of San Fernando,
W77-08490 6E

MUSZYNSKI, W. J.
Operation and Impact of NPDES in Region II, Part I,
W77-08117 5G

MYERS, D. R.
Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

NAGEL, G.
Application of Corrugated Sheet Sprayers for Water Purification (Die Anwendung von Wellbahnrieslern in der Wasseraufbereitung),
W77-08543 5F

NAHEDH, S. I.
Response of Oat and Spinach to Sewage Sludge Application in Soil,
W77-08495 5C

NAJARIAN, T. O.
A Predictive Model for Transient Temperature Distributions in Unsteady Flows,
W77-08221 5B

NANNEN, L. W.
An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

NARAYANAN, R.
An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

NASH, N.
Oxygen Aeration at Newton Creek,
W77-08526 5D

NICHOLS, J. D.
Mapping of the Wildland Fuel Characteristics of the Santa Monica Mountains of Southern California,
W77-08419 7C

NICHOLS, W. D.
Geohydrology of the Englishtown Formation in the Northern Coastal Plain of New Jersey,
W77-08175 2F

NICKS, P. F.
Method of Dispersing Oil in Water,
W77-08260 5G

NIEWOLAK, S.
The Ecological Significance of Antibiotic Substances Excreted by Algae in Waters, (In Polish),
W77-08463 5C

NIKIFOROVA, E. P.
Bacterial Growth on Dissolved Organic Compounds in Fresh-Water Reservoirs, (In Russian),
W77-08498 5A

NIKULINA, V. N.
The Productivity of Fouling Organism Associations in Lake Zelenetskoe, (In Russian),
W77-08323 5C

NISHMI, M.
Enterovirus Types in Israel Sewage,
W77-08519 5A

NORTON, D.
A Preliminary Analysis of the Energy and Water Requirements for Developing Geothermal Energy in Arizona,
W77-08351 4B

NORTON, M. G.
Method of Dispersing Oil in Water,
W77-08260 5G

NYSTROM, J. M.
Removing Explosives from Wastewater,
W77-08266 5D

O'MELIA, C. R.
A Predictive Phosphorus Model for Lakes - Sensitivity Analysis and Applications,
W77-08499 5C

OKEY, R. W.
Ozone Effect of Synthetic Rubber Waste Treatment,
W77-08267 5D

OLENIK, T. J.
Operation and Impact of NPDES in Region II, Part I,
W77-08117 5G

OLOFSSON, J. A. JR.
Effects of pH and Inorganic Carbon Concentrations Upon Competition Between Anabaena flos-aquae and Selenastrum capricornutum,
W77-08200 5C

OLSSON, G.
State of the Art in Sewage Treatment Plant Control,
W77-08515 5D

OMANG, R. J.
Annual Peak Discharges from Small Drainage Areas in Montana Through September 1976,
W77-08482 2E

ONISHI, Y.
Effects of Meandering in Alluvial Streams,
W77-08216 2E

ORSBORN, J. F.
Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

OSBORN, P. G.
Method of Dispersing Oil in Water,
W77-08260 5G

PAGEL, J. E.
Pollution Indicator Bacteria Associated with Municipal Raw and Drinking Water Supplies,
W77-08516 5A

PAKULO, A. G.
Effect of Some Chemical Elements on the Accumulation of Cesium-137 in Freshwater Fish, (In Russian),
W77-08322 5C

PALIT, T.
Biological Treatment Kinetics of Landfill Leachate,
W77-08532 5D

PAPARKOWA, K.
Comparative Examination of Enterococci Obtained from Drinking Water, Foodstuffs and Urine, (In German),
W77-08179 5A

PAPKOV, G. I.
Mechanical Surface Aerator for Effluent Purification--Has the Liquid Scooped by the Curved Elements and Ejected into the Air Above,
W77-08558 5D

PARKS, W. S.
Summary of Some Current and Possible Future Environmental Problems Related to Geology and Hydrology at Memphis, Tennessee,
W77-08174 4C

PARKS, W. W.
Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975,
W77-08469 4B

PATERSON, W. S. B.
A Further Comparison of Glacier Velocities Measured by Radio-Echo and Survey Methods,
W77-08228 2C

Vertical Strain-Rate Measurements in an Arctic Ice Cap and Deductions from Them,
W77-08226 2C

PATIN, S. A.
Effect of Metals on Photosynthesis of Marine Phytoplankton, (In Russian),
W77-08160 5C

PATTEE, E.
An Estimation of the Efficiency of a Waste Water Treatment Plant, as Measured by Several Parameters Including Lipid Biodegradation (Essai d'evaluation de l'efficacite d'une station d'epuration a l'aide de plusieurs parametres dont la biodegradation des lipides),
W77-08548 5D

PAYNE, B. R.
Air, Mist and Foam Drilling, A Look at the Latest Techniques, Part 2,
W77-08326 8C

PEALY, R. H.
Improving Institutional Arrangements for Water Development in the State of Washington: Developmental and Environmental Trade-Offs and Constraints,
W77-08284 6E

PEARSON, F. J. JR.
U S Geological Survey, Water Resources Division, Radiocarbon Measurements I,
W77-08169 4B

PENDLEY, W. P.
Allocating Buried Treasure: Federal Litigation Involving Interstate Ground Water,
W77-08491 6E

PERRY, L. K.
Inventory of Water Resources Research at the University of Wyoming, Fiscal Year 1975,
W77-08506 9A

PETERSON, D. H.
Implications of Seasonal Chemical and Physical Factors on the Production of Phytoplankton in Northern San Francisco Bay,
W77-08489 5C

Longitudinal Distribution of Selected Micronutrients in Northern San Francisco Bay During 1973,
W77-08487 5C

Suspended-Particle Transport and Circulation in San Francisco Bay: An Overview,
W77-08486 2L

PETERSON, J. B.
Delineation of the Boundaries of a Buried Pre-Glacial Valley with LANDSAT-1 Data,
W77-08415 2G

PETERSON, W. A.
Taking Acres Out of Pollution-Control Plans,
W77-08283 5D

PETTI, M. J.
Phosphorus Exchange at the Sediment-Water Interface of Selected Narragansett Bay Sediments,
W77-08502 5C

PFEIFFER, G. H.
Economic Impacts of Controlling Water Quality in an Irrigated River Basin,
W77-08332 5G

PHELPS, R. A.
Practical Application of Remote Sensing in Agriculture,
W77-08425 3F

PHIRKE, P. M.
Rapid Agar Pour-Plate Technique for Detection and Enumeration of Faecal Coliforms in Sewage,
W77-08520 5A

PICKLES, F. J.
Crystal Structure Analysis of Selected Pesticides by Single Crystal X-Ray Diffraction: The Crystal and Molecular Structure of Padan,
W77-08503 5A

PICKUP, G.
Alternative Measures of River Channel Shape and Their Significance,
W77-08241 8B

PIERRE, W. H.
Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

PIERSON, M.
An Estimation of the Efficiency of a Waste Water Treatment Plant, as Measured by Several Parameters Including Lipid Biodegradation (Essai d'evaluation de l'efficacite d'une station d'epuration a l'aide de plusieurs parametres dont la biodegradation des lipides),
W77-08548 5D

PILKINGTON, N. H.
Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

PINDER, G. F.
On the Relationship Between the Finite Element and Finite Difference Methods,
W77-08168 7A

POLISHCHUK, L. R.
Determination of Pyridine in Farm Crops and Fish, (In Russian),
W77-08126 5A

POOLE, R.
Improved Galvanic Dissolved Oxygen Sensor for Activated Sludge,
W77-08539 5A

POONAWALA, N. A.
Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

POPOVSKAYA, G. I.
Characteristics of the Biotic Cycle of Lake Baikal, (In Russian),
W77-08321 2H

POSAMENTIER, H. W.
A New Climatic Model for Glacier Behavior of the Austrian Alps,
W77-08235 2C

POSGATE, E. S.
Suspended Solids Measurement Gives Improved Control,
W77-08568 5A

POULTON, C. E.
A Comparative Interregional Analysis of Selected Data from LANDSAT-1 and EREP for the Inventory and Monitoring of Natural Ecosystems,
W77-08436 7C

PRESSMAN, W. B.
Oxygen Aeration at Newton Creek,
W77-08526 5D

PRICE, D.
Selected Hydrologic Data, Uinta Basin Area, Utah and Colorado,
W77-08183 7C

PRINCE, J. E.
Liquid Waste Treatment Apparatus,
W77-08263 5D

PRITCHETT, P. C.
Beach Profile Changes: East Coast of Lake Michigan, 1970-72,
W77-08440 2J

QASIM, S. R.
Biological Treatment Kinetics of Landfill Leachate,
W77-08532 5D

QUERRY, M. D.
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

QUERRY, M. R.
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

QUINLIVAN, S. C.
Sources, Characteristics and Treatment and Disposal of Industrial Wastes Containing Hexachlorobenzene,
W77-08265 5D

RAKAROWA, N.
Comparative Examination of Enterococci Obtained from Drinking Water, Foodstuffs and Urine, (In German),
W77-08179 5A

RAMANA, B. V. RAO
A Note on the Study of Rainy Days and Wet Spells at Bijapur,
W77-08455 2B

RANDALL, J.
Determining Areal Precipitation in the Basin and Range Province of Southern Arizona - Sonoita Creek Basin,
W77-08308 2B

RANDAZZO, A. F.
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

RANDOLPH, V.
Let's Have Achievable 'Safe' Drinking Water,
W77-08127 5G

RANKOWITZ, S.
A Controllable Automated Environmental Data Acquisition and Monitoring System,
W77-08441 7C

RANQUIST, H. A.
The Winters Doctrine and How It Grew: Federal Reservation of Rights to Use of Water,
W77-08375 6E

RAO, A. R.
The Effects of Urbanization on Low Flows and Total Runoff,
W77-08335 2A

RAPER, W. G. C.
Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

RAWLINGS, D. E.
Bacterial Growth Kinetics in the Completely Mixed Activated Sludge Treatment of Fellmongery Effluent,
W77-08281 5D

RAWSON, J.
Water-Quality Records for Selected Reservoirs in Texas, 1974-75 Water Years,
W77-08483 5A

REED, S. W.
Should Rivers Have Running. Toward Extension of the Reserved Rights Doctrine to Include Minimum Stream Flows,
W77-08372 6E

REEVES, C. A.
Discriminating Coastal Rangeland Production and Improvements with Computer Aided Techniques,
W77-08410 4A

REICHERT, J. K.
The Effect of Different Flocculants on the Elimination of Trace Elements and Polycylic Hydrocarbons in the Water Purification Process, (In German),
W77-08256 5D

RESNICK, S.
Determining Areal Precipitation in the Basin and Range Province of Southern Arizona - Sonoita Creek Basin,
W77-08308 2B

RICE, L.
Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

RICHENDERFER, J. L.
Spray Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soil,
W77-08202 5D

RICQ, J. C.
Measurement of Ice Movement in Subglacial Cavities: A New Cavitometer Beneath the Glacier D'Argentiere (Mt Blanc, France),
W77-08238 2C

RIEGO, D. C.
Pyro- and Tripoly-Phosphate Contents of Sediments,
W77-08306 5A

RITTER, R.
A Method for Quantitative Determination of Ammonifying and Denitrifying Bacteria in Water with Applied Examples from Gravel-Pit Pools, (In Czech),
W77-08509 5A

ROBBINS, J. M.
Boundaries of the Coastal Zone: A Survey of State Laws,
W77-08132 6E

ROBY, K. B.
Invertebrate Colonization of Artificial Substrates in San Leandro Creek,
W77-08443 5A

ROEFS, T. G.
Minimizing Costs in Well Field Design in Relation to Aquifer Models,
W77-08214 4B

ROMANENKO, V. I.
Bacterial Growth on Dissolved Organic Compounds in Fresh-Water Reservoirs, (In Russian),
W77-08498 5A

ROSS, B. B.
A Finite Element Model to Determine the Effect of Land-Use Changes on Flood Hydrographs,
W77-08450 8B

ROUGHAN, P. G.
Growth of Tropical and Temperate Grasses at Palmerston North I. Warm-Season Yields With and Without Irrigation,
W77-08457 3F

ROUHANI, I.
The Influences of Simulated Moisture Stress Conditions and Osmotic Substrates on Germination and Growth of Cultivated and Wild Safflowers,
W77-08460 2I

ROUSE, J. W. JR.
Monitoring Vegetation Conditions from LANDSAT for Use in Range Management,
W77-08412 4A

ROWELL, W. C.
A Statistical Analysis of the Mercury Concentrations in Fish from Lake Jocassee, South Carolina,
W77-08190 5A

ROWLEY, J. A.
Potential of New Summer Grasses in Northland: I. Warm-Season Yields Under Dryland and Irrigation,
W77-08458 3F

RUSH, F. E.
Subsurface-Temperature Data for Some Wells in Western Utah,
W77-08166 7C

RUSSELL, O. R.
Application of EREP, LANDSAT and Aircraft Image Data to Environmental Problems Related to Coal Mining,
W77-08429 5A

SADANA, A. J.
Involvement of Free Radicals in the Catalytic Oxidation of Phenol in Aqueous Solution,
W77-08201 5D

SANDERFORD, S. G.
Forest Fertilization and Water Quality in the North Carolina Piedmont,
W77-08508 5B

SAROOP, H. C.
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

SASMAN, R. T.
Water-Level Decline and Pumpage in Deep Wells in the Chicago Region, 1971-1975,
W77-08302 2F

SASNER, J. J. JR.
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

SAWYER, P. J.
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

SCARPACE, F. L.
Trophic Status of Inland Lakes from LANDSAT,
W77-08434 5A

SCHALLER, E. S.
Agricultural Applications of Remote Sensing--A True Life Adventure,
W77-08424 3F

SCHELL, J. A.
Monitoring Vegetation Conditions from LANDSAT for Use in Range Management,
W77-08412 4A

SCHERER, C. R.
Water Allocation and Pricing for Control of Irrigation-Related Salinity in a River Basin,
W77-08213 5G

SCHNEIDER, R. R.
Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-08329 5B

SCHNEIDER, W. F.
Federal Control Over Wetland Areas: The Corps of Engineers Expands its Jurisdiction,
W77-08123 5G

SCHOFIELD, C. L.
The Utility of Paleolimnological Analyses of Lake Sediments for Evaluating Acid Precipitation Effects on Dilute Lakes,
W77-08103 5A

SCHOOF, R. R.
Computer Program for Reservoir-Water Budgets,
W77-08464 4A

SCHRENK, W. T.
Mercury Accumulation in Trout of Southern Missouri,
W77-08304 5C

SCHWARTZ, F. W.
Applications of Surface Resistivity Methods,
W77-08244 2F

SCRIVANI, E. P.
Phytoplankton Production and Enumeration in Northern San Francisco Bay During 1972,
W77-08488 5C

SCULLY, D. R.
Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

SEEVERS, P. M.
Estimating Vegetative Biomass from LANDSAT-1 Imagery for Range Management,
W77-08409 4A

SEWELL, D.
Planning Challenges in the Management of Coastal Zone Water Resources,
W77-08376 6B

SHADE, R. W.
Investigation of the Effectiveness of Polymers in the Treatment of Nirocellulose-Manufacturing Wastewater,
W77-08338 5D

Treatment of Wastewater From Military Explosives and Propellants Production Industry by Physicochemical Processes,
W77-08337 5D

SHANKS, R. W.
The Effects of Urbanization on Low Flows and Total Runoff,
W77-08335 2A

SHANKS, V.
Organochlorine Residues in New Zealand Birds and Mammals 2. Polychlorinated Biphenyls,
W77-08210 5C

SHARMA, P.
Sorption and Flow of Carbon Dioxide and Some Hydrocarbons in a Microporous Carbon Membrane,
W77-08232 5A

SHEHABI, A.
Bacteriological Pollution in the Drinking-Water of Jordan,
W77-08454 5B

SHENG, Y-Y. P.
Lake Erie International Jetport Model Feasibility Investigation; The Wind-Driven Currents and Contaminant Dispersion in the Near-Shore of Large Lakes,
W77-08220 5B

SHERRARD, J. H.
A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

SHIN, K. C.
Dewatering Machines (Entwasserungsmachinen),
W77-08544 5D

SHOCKCOR, J. H.
Split-Stream Chemical Treatment (A Patented Process by Chemlan Company, Inc.) of Tanning Industry Waste Water,
W77-08280 5D

SHOEMAKER, W. J.
Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

SHORT, A. F.
Seabed Sewers for Hong Kong,
W77-08555 5E

SHRADER, W. D.
Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

SHUCKROW, A. J.
What Lies Ahead for PAC,
W77-08541 5D

SHUSTER, W. W.
Investigation of the Effectiveness of Polymers in the Treatment of Nirocellulose-Manufacturing Wastewater,
W77-08338 5D

Role of Polyelectrolytes in the Filtration of Colloidal Particles from Water and Wastewater,
W77-08339 5D

Treatment of Wastewater From Military Explosives and Propellants Production Industry by Physicochemical Processes,
W77-08337 5D

SIMMONS, L. R.
Chemical and Vegetative Stabilization of Soils,
W77-08512 8D

SIMPSON, E. S.
Minimizing Costs in Well Field Design in Relation to Aquifer Models,
W77-08214 4B

SINCLAIR, A. R.
Resin-Coated Gravel is Used to Help Control Sand,
W77-08316 8G

SKAGGS, R. W.
A Water Management Model for High Water Table Soils,
W77-08301 3F

SLACK, C. R.
Growth of Tropical and Temperate Grasses at Palmerston North I. Warm-Season Yields With and Without Irrigation,
W77-08457 3F

SLADE, R. M. JR.
Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

SNEED, R. E.
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3F

SNODGRASS, W. J.
A Predictive Phosphorus Model for Lakes - Sensitivity Analysis and Applications,
W77-08499 5C

SNYDER, J. H.
What We Can Do Before the Well Runs Dry--A Summary of WRC Report No. 35 --Residential Water conservation-Milne,
W77-08101 3D

SOLLY, S. R. B.
Organochlorine Residues in New Zealand Birds and Mammals 2. Polychlorinated Biphenyls,
W77-08210 5C

SOONG, H. K.
Effect of Lateral Inflow on Steady Open Channel Flows,
W77-08290 2E

SOPPER, W. E.
Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

Spray Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soil,
W77-08202 5D

SOWELL, R. S.
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3F

SPIZZICHINO, G.
Thermocompression-Type Apparatus for Desalting Saline Water,
W77-08252 3A

SPRINGER, W. T.
Inventory of Colorado's Front Range Mountain Reservoirs,
W77-08107 6B

SPRONCK, R.
Recent Flash Floods of the Dison Brook (Crues Brutales Recentes Du 'Ruisseau' De Dison (Belgique): Observations Et Previsions),
W77-08250 4A

SRIDHARAN, P. C.
A Note on the Study of Rainy Days and Wet Spells at Bijapur,
W77-08455 2B

ST, J. C.
Year Round Cooling Water from the Cold Weather of Winter,
W77-08251 5D

ST, K. M.
Waste Impoundment Efficiency at Sugar Mill,
W77-08268 5D

STALL, N. G.
Fox Chain of Lakes Investigation and Water Quality Management Plan,
W77-08442 2H

STEMPKOVSKAYA, L. A.
Determination of Pyridine in Farm Crops and Fish, (In Russian),
W77-08126 5A

STEPHENS, G. D.
A Simulation of an Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W77-08343 3F

STEPHENSON, M. E.
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5A

STEVENS, B.
Removing Explosives from Wastewater,
W77-08266 5D

STOFFER, J. O.
Mercury Accumulation in Trout of Southern Missouri,
W77-08304 5C

STONE, G. C.
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

STORCK, W. J.
Prospects Strong for Waste Water Oxygenation,
W77-08578 5D

STROM, A. D.
The Role of Protozoa in Biological Purification of Oil Industry Sewage, (In Russian),
W77-08254 5D

SUMAN, G. O. JR.
Cementing Oil and Gas Wells, Part 2 - Casing Inspection and Pipe Handling Methods, Including Thread Make-Up Control,
W77-08327 8F

Cementing Oil and Gas Wells, Part 3,
W77-08328 8F

SUTCLIFFE, H. JR.
Water Resources of the Myakka River Basin Area, Southwest Florida,
W77-08167 4B

SWAN, G. S.
Remembering Maine: Offshore Federalism in the United States and Canada,
W77-08363 6E

SWINTON, E. A.
Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

TALLMARK, B.
Lake Naivasha and Lake Nakuru: An Ecological Comparison Between Two Bird Lakes in East Africa, (In Swedish),
W77-08324 2H

TANGBORN, W. V.
Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

TATE, P. T.
Effect of Dip on the Storage of Fresh Water (or the Disposal of Waste) in a Saline Aquifer,
W77-08288 4B

TAYLOR, A. O.
Potential of New Summer Grasses in Northland: I. Warm-Season Yields Under Dryland and Irrigation,
W77-08458 3F

TAYLOR, M. M.
Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

TECLAFF, L. A.
Emerging Legal Concepts in the Harmonization of Water Resources Development and Environmental Protection,
W77-08378 6E

TERRY, F. E.
Liquid Waste Treatment Apparatus,
W77-08263 5D

THEEUWES, F.
Transference: A Comprehensive Parameter Governing Permeation of Solutes Through Membranes,
W77-08231 3A

THURLEY, B. L.
Automatic Control of Whitlingham Sewage Treatment Works Norwich,
W77-08585 5D

TIKHONRUK, I. F.
The Role of Protozoa in Biological Purification of Oil Industry Sewage, (In Russian),
W77-08254 5D

TKACHENKO, V. N.
Effect of Metals on Photosynthesis of Marine Phytoplankton, (In Russian),
W77-08160 5C

TOETZ, D. W.
Mineral Cycling in Reservoirs,
W77-08217 5C

TOMS, R.
Reorganizing Pollution Control in the U.K.
W77-08111 5G

TOMS, R. S. H.
The ERDA Geothermal Program,
W77-08314 4B

TRELEASE, F. J.
New Water Legislation--Drafting for Development, Efficient Allocation and Environmental Protection,
W77-08188 6E

Water for Food - Or for More Important Purposes. (Reallocation of Irrigation Water to Cities and Industries),
W77-08377 6E

TREXLER, P. L.
LANDSAT-1 Data as it has Been Applied for Land Use and Water Quality Data By the Virginia State Water Control Board,
W77-08432 5A

TUCKER, L. S.
Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

TWARDOWSKI, C. J.
Clay Adsorption Treatment of Non-Ionic Surfactants in Waste Water,
W77-08522 5D

TWEEDIE, S. W.
RECSAD: A Computer Program for Recreation Planning,
W77-08300 6B

UEDA, H. T.
Resurvey of the 'Byrd' Station, Antarctica, Drill Hole,
W77-08227 2C

VAN DONSEL, D. J.
Persistence of Mycobacterium Bovis BCG in Soil and on Vegetables Spray-Irrigated with Sewage Effluent and Sludge,
W77-08525 5C

VAN KESSEL, J. F.
Factors Affecting the Denitrification Rate in Two Water-Sediment Systems,
W77-08517 5B

VAN KLAVEREN, R. W.
Estimating Evapotranspiration in the North Platte Basin of Wyoming,
W77-08505 2D

VAN LOPIK, J. R.
Coastal Zone Legislation: Louisiana Landmarks, Labyrinths and Logrolling,
W77-08186 6E

VANDERPOST, J. M.
Bacteriological Investigation of Alberta Meat-Packing Plant Wastes with Emphasis on Salmonella Isolation,
W77-08269 5D

VASILENKO, H. D.
The Role of Protozoa in Biological Purification of Oil Industry Sewage, (In Russian),
W77-08254 5D

VELIOGLU, S. G.
Water and Energy Systems: A Planning Model,
W77-08212 6A

VESILIND, P. A.
Characterizing Sludge for Centrifugal Dewatering,
W77-08535 5D

VIAL, J.
An Estimation of the Efficiency of a Waste Water Treatment Plant, as Measured by Several Parameters Including Lipid Biodegradation (Essai d'evaluation de l'efficacite d'une station d'epuration a l'aide de plusieurs parametres dont la biodegradation des lipides),
W77-08548 5D

VITLI NSKAYA, V. V.
The Role of Protozoa in Biological Purification of Oil Industry Sewage, (In Russian),
W77-08254 5D

VODOPICH, D. S.
Fractionation and Control of Iron in Channelized and Swamp Drainage Streams in North Carolina,
W77-08510 5B

VOGEL, J. K.
Governmental Interest in Protecting Beach from Environmental Damage Through Overuse Outweighs Due Process Right to Bath Nude,
W77-08124 6E

VONDRICK, A. F.
PL 92-500: Phoenix V. the EPA,
W77-08128 5G

VOTINTSEV, K. K.
Characteristics of the Biotic Cycle of Lake Baikal, (In Russian),
W77-08321 2H

VOVK, P. S.
Hypophthalmichthys Molitrix (Val.)) for Increasing Fish Productivity and Decreasing the Level of Eutrophication of Dnieper Reservoirs, (In Russian),
W77-08364 5C

WACHS, B.
Determination of BOD After Freezing Water Samples (Bestimmung des BSB nach Einfrierung der Wasserproben),
W77-08546 5A

WANG, L. K.
Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

Investigation of the Effectiveness of Polymers in the Treatment of Nirocellulose-Manufacturing Wastewater,
W77-08338 5D

Process Design of Single-Sludge Activated Sludge Systems Using Nitrate Respiration,
W77-08336 5D

Role of Polyelectrolytes in the Filtration of Colloidal Particles from Water and Wastewater,
W77-08339 5D

Treatment of Wastewater From Military Explosives and Propellants Production Industry by Physicochemical Processes,
W77-08337 5D

WARD, P. S.
EPA Focuses on Municipal Enforcement,
W77-08355 6E

WARING, R. C.
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environmental Waters,
W77-08215 2L

WATERS, C. A. JR.
Remote Sensing Applications in the Inventory and Analysis of Environmental Problems,
W77-08438 5A

WATTS, R. D.
Radio-Echo Sounding of Temperate Glaciers: Ice Properties and Sounder Design Criteria,
W77-08229 2C

WEBB, J. R.
Relationship Between Corn Yield, Expressed as a Percentage of Maximum, and the N Percentage in the Grain. I. Various N-Rate Experiments,
W77-08456 3F

WEBER, J. H.
Fulvic Acid-Metal Ion Interactions in Water,
W77-08102 5A

WECHSLER, R.
Reverse Osmosis on Secondary Sewage Effluent: The Effect of Recovery,
W77-08523 5D

WEINER, E. R.
Investigation of Detection Limits for Solutes in Water Measured by Laser Raman Spectrometry,
W77-08171 2K

WEST, R. E.
An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

WESTIN, F. C.
LANDSAT-1 Data, Its Use in a Soil Survey Program,
W77-08414 2G

WESTON, R. T.
Legal Control of Consumptive Water Use in Pennsylvania Power Plants,
W77-08368 3E

Public Rights in Pennsylvania Waters,
W77-08362 6E

WHEAT, M.
Pluvial Lakes of Nevada and Estimated Full Pluvial Climates,
W77-08199 2H

WHINSTON, A.
Discriminant Analysis of Characteristics Determining Acceptance or Rejection of Nuclear Power,
W77-08109 6B

WHINSTON, A. B.
Computerized Planning System for Nuclear Power Plant Evaluation,
W77-08108 6B

WHITEHEAD, H. C. M.
Growth of Tropical and Temperate Grasses at Palmerston North I. Warm-Season Yields With and Without Irrigation,
W77-08457 3F

WIER, C. E.
Application of EREP, LANDSAT and Aircraft Image Data to Environmental Problems Related to Coal Mining,
W77-08429 5A

WILLIAMS, D. L.
Computer Analysis and Mapping of Gypsy Moth Defoliation Levels in Pennsylvania Using LANDSAT-1 Digital Data,
W77-08420 7C

Remote Sensing Applications in Kansas,
W77-08437 4A

Utilization of LANDSAT Imagery for Mapping Vegetation on the Millionth Scale,
W77-08413 7C

WILLIAMS, T.
On Depth Hoar and the Strength of Snow,
W77-08239 2C

WILSON, S. A.
Fulvic Acid-Metal Ion Interactions in Water,
W77-08102 5A

WISER, E. H.
Regional Simulation of Streamflow Data,
W77-08298 2A

WOLF, R. J.
Ground-Water Resources of Vanderburgh County, Indiana,
W77-08170 4B

WOOD, R.
Effluent Emphasis Underlines Environmental Effort at Enpocon,
W77-08579 5D

WOODARD, F. E.
Effects of pH and Inorganic Carbon Concentrations Upon Competition Between Anabaena flos-aquae and Selenastrum capricornutum,
W77-08200 5C

WOODS, D. R.
Bacterial Growth Kinetics in the Completely Mixed Activated Sludge Treatment of Fellmongery Effluent,
W77-08281 5D

WORKMAN, O. D.
Water Quality in the Texas Coastal Basins,
W77-08465 5B

YAKOVLEVA, L. E.
Some Experimental Data on the Study of the Biological Action of Ethylbutylamine as a Water Pollution Factor, (In Russian),
W77-08439 5A

YANG, P. Y.
Occupational Characteristics and Biological Kinetic Constants of Extended Aeration Process,
W77-08270 5D

YANGGEN, D. A.
University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

YARGER, H. L.
Quantitative Water Quality with Landsat and Skylab.
W77-08431 5A

YOUNG, H. L.
Digital-Computer Model of the Sandstone Aquifer in Southeastern Wisconsin,
W77-08478 2F

YOUNG, J. C.
Unstratified-Bed Filtration of Waste Water,
W77-08537 5D

YTREBERG, D.
Liability for Damages to Adjacent Land or Building Caused by Dredging,
W77-08387 6E

ZEBIDI, H.
The Operation of a Flood Warning Network: Its Use for Studying Flash Floods (Exploitation D'un Reseau D'alerte: Son Utilisation Pour L'etude Des Crues Brutales),
W77-08248 2E

ZYABBAROVA, S. A.
Some Experimental Data on the Study of the Biological Action of Ethylbutylamine as a Water Pollution Factor, (In Russian),
W77-08439 5A

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ORGANIZATIONAL INDEX

BERDEEN UNIV. (SCOTLAND). DEPT. OF HEMISTRY.
Computer Prediction of Stationary States of Membranes from Differential Permeabilities,
W77-08234 3A

GRICULTURAL RESEARCH SERVICE, HICKASHA OKLA. SOUTHERN GREAT LAINS WATERSHED RESEARCH CENTER.
Computer Program for Reservoir-Water Budgets,
W77-08464 4A

Water Quality in the Texas Coastal Basins,
W77-08465 5B

GRICULTURAL RESEARCH SERVICE, HILADELPHIA, PA. EASTERN REGIONAL ESEARCH CENTER.
Effect of Acclimation to Lime-Sulfide Effluent from Unhairing Cattlehides on the Composition of Activated Sludge,
W77-08279 5D

GRICULTURAL RESEARCH SERVICE, 'ESLACO, TEX. SOUTHERN REGION ITRUS INSECTS RESEARCH.
The Use of Skylab Data to Study the Early Detection of Insect Infestations and Density and Distribution of Host Plants,
W77-08422 7C

GRICULTURAL UNIV., WAGENINGEN NETHERLANDS). DEPT. OF ICROBIOLOGY.
Factors Affecting the Denitrification Rate in Two Water-Sediment Systems,
W77-08517 5B

IR FORCE GLOBAL WEATHER CENTRAL, FFUTT AFB, NEBR.
The AFGWC Snow Cover Analysis Model,
W77-08223 2C

KADEMIYA NAUK SSSR, LENINGRAD. OOLOGICHESKII INSTITUT.
The Productivity of Fouling Organism Associations in Lake Zelenetskoe, (In Russian),
W77-08323 5C

Possibilities and Role of Biological Analysis in Evaluating the Degree of Pollution of Water Bodies, (In Russian),
W77-08430 5A

KADEMIYA NAUK SSSR, MOSCOW. NSTITUT BIOLOGII VNUTRENNYKH VOD.
Bacterial Growth on Dissolved Organic Compounds in Fresh-Water Reservoirs, (In Russian),
W77-08498 5A

KADEMIYA NAUK SSSR, MOSCOW. NSTITUT VODNYKH PROBLEM.
The Flooding of Rivers in the USSR and the Measures Taken to Control Ice Jams (Les Inondations Fluviales En URSS Et La Lutte Contre Les Crues Causees Par Les Embacles),
W77-08246 2C

KADEMIYA NAUK URSR, KIEV. INSTYTUT IDROBIOLOGII.
Hypophthalmichthys Molitrix (Val.)) for Increasing Fish Productivity and Decreasing the Level of Eutrophication of Dnieper Reservoirs, (In Russian),
W77-08364 5C

Reproduction Rate and Productivity of Bacteria in the Ponds of the Karamet-Niyaz Fishery Farm, (In Russian),
W77-08462 5C

AKTIEBOLAGET TELLUSOND, GOTEBORG (SWEDEN). (ASSIGNEE).
Apparatus for Continuous Liquid-Liquid Extraction of Water with a Solvent,
W77-08264 5F

ALBERTA UNIV., EDMONTON. DEPT. OF GEOLOGY.
Applications of Surface Resistivity Methods,
W77-08244 2F

ALEXANDRIA UNIV. (EGYPT). DEPT. OF SOIL AND WATER SCIENCES.
Drainable Porosity Evaluation and its Relationship to Hydraulic Conductivity and Exchangeable Cations Under Different Bulk Densities,
W77-08461 4A

ALL-UNION RESEARCH INST. OF MARINE FISHERIES AND OCEANOGRAPHY, MOSCOW (USSR).
Effect of Metals on Photosynthesis of Marine Phytoplankton, (In Russian),
W77-08160 5C

ALZA CORP., PALO ALTO, CALIF.
Transference: A Comprehensive Parameter Governing Permeation of Solutes Through Membranes,
W77-08231 3A

ANDERSON, CLAYTON AND CO., HOUSTON, TEX.
Practical Application of Remote Sensing in Agriculture,
W77-08425 3F

ARIZONA STATE WATER AND SEWER DEPT., PHOENIX.
PL 92-500: Phoenix V. the EPA,
W77-08128 5G

ARIZONA UNIV., TUCSON. DEPT. OF CIVIL ENGINEERING AND ENGINEERING MECHANICS.
Asphalt-Rubber Mixtures for Seepage Control,
W77-08195 4A

ARIZONA UNIV., TUCSON. DEPT. OF GEOSCIENCES.
A Preliminary Analysis of the Energy and Water Requirements for Developing Geothermal Energy in Arizona,
W77-08351 4B

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Minimizing Costs in Well Field Design in Relation to Aquifer Models,
W77-08214 4B

ARIZONA UNIV., TUCSON. OFFICE OF ARID LANDS STUDIES.
A Computerized Information System Relating to Arizona's Water Resources,
W77-08307 7C

ARIZONA UNIV., TUCSON. SCHOOL OF RENEWABLE NATURAL RESOURCES.
Forward Osmosis Extractors,
W77-08340 3A

ARIZONA WATER RESOURCES RESEARCH CENTER, TUCSON.
Rainfall Infiltration Characteristics for a Semi-Arid Watershed Soil,
W77-08206 2G

Determining Areal Precipitation in the Basin and Range Province of Southern Arizona - Sonoita Creek Basin,
W77-08308 2B

ARKANSAS UNIV., FAYETTEVILLE. DEPT. OF ZOOLOGY.
Population Dynamics and Species Diversity of Ichthyo-Parasitofauna of the Buffalo National River,
W77-08446 5C

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. HYDRAULICS LAB.
Effects of 40-Foot Charleston Harbor Project on Tides, Currents, and Salinities; Hydraulic Model Investigation,
W77-08222 2L

ASIAN INST. OF TECH., BANGKOK (THAILAND).
Occupational Characteristics and Biological Kinetic Constants of Extended Aeration Process,
W77-08270 5D

AUBURN UNIV., ALA. DEPT. OF AGRICULTURAL ENGINEERING.
A Simulation of an Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W77-08343 3F

AUBURN UNIV., ALA. DEPT. OF CHEMISTRY.
Spectroanalytical Parameters of Fungal Metabolites: Oosporein and Desmethoxyviridiol,
W77-08449 2K

AUBURN UNIV., ALA. DEPT. OF CIVIL ENGINEERING.
Fluoride Analysis of Water-Treatment-Plant Sludges,
W77-08342 5F

AUSTRALIAN ATOMIC ENERGY RESEARCH ESTABLISHMENT, LUCAS HEIGHTS.
Reverse Osmosis on Secondary Sewage Effluent: The Effect of Recovery,
W77-08523 5D

BATTELLE-PACIFIC NORTHWEST LABS. RICHLAND, WASH.
Effects of Meandering in Alluvial Streams,
W77-08216 2E

BEN GURION UNIV. OF THE NEGEV, BEERSHEBA (ISRAEL). RESEARCH AND DEVELOPMENT AUTHORITY.
Production of Energy From Concentrated Brines by Pressure-Retarded Osmosis, 1. Preliminary Technical and Economic Correlations,
W77-08233 3A

BRITISH ANTARCTIC SURVEY, CAMBRIDGE (ENGLAND).
A Further Comparison of Glacier Velocities Measured by Radio-Echo and Survey Methods,
W77-08228 2C

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF CIVIL ENGINEERING.
Aerobic Digestion of Waste Activated Sludge at Low Temperatures,
W77-08527 5D

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF GEOLOGICAL SCIENCES.
Relocation of Buried Markers,
W77-08240 2C

BRITISH COLUMBIA UNIV., VANCOUVER. FACULTY OF LAW.
Aquaculture: Problems of Implementation Under Existing Law,
W77-08369 6E

BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
A Controllable Automated Environmental Data Acquisition and Monitoring System,
W77-08441 7C

BUREAU OF OUTDOOR RECREATION, WASHINGTON, D. C.
Flood Plains for Open Space and Recreation.
W77-08374 6F

BUREAU OF RECLAMATION, DENVER, COLO. ENGINEERING AND RESEARCH CENTER.
Chemical and Vegetative Stabilization of Soils,
W77-08512 8D

CALGARY UNIV. (ALBERTA). FACULTY OF ENVIRONMENTAL DESIGN.
Environmental Protection Through the Common Law,
W77-08133 6G

CALIFORNIA UNIV., BERKELEY.
Air Flotation of Oily Waste Waters with Organic Coagulants,
W77-08282 5D

CALIFORNIA UNIV., BERKELEY. DEPT. OF BIOMEDICAL AND ENVIRONMENTAL HEALTH SCIENCES.
Health Considerations in Use of Tertiary Effluents,
W77-08513 5F

CALIFORNIA UNIV., BERKELEY. DEPT. OF FORESTRY AND CONSERVATION.
Invertebrate Colonization of Artificial Substrates in San Leandro Creek,
W77-08443 5A

CALIFORNIA UNIV., BERKELEY. WATER RESOURCES CENTER.
What We Can Do Before the Well Runs Dry--A Summary of WRC Report No. 35 --Residential Water conservation-Milne,
W77-08101 3D

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF ENGINEERING SYSTEMS.
Water Allocation and Pricing for Control of Irrigation-Related Salinity in a River Basin,
W77-08213 5G

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ENGINEERING AND APPLIED SCIENCE.
An Earthquake Risk Model That Incorporates Local Near Surface Site Conditions,
W77-08348 8E

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Confirmation of the Single-Step Membrane Filtration Procedure for Estimating Pseudomonas Aeruginosa Densities in Water,
W77-08518 5A

CAPE TOWN UNIV. (SOUTH AFRICA). DEPT. OF CHEMICAL ENGINEERING.
Effects of High Organic Loading on Mixed Photosynthetic Waste Water Treatment,
W77-08540 5D

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO. DEPT. OF EARTH SCIENCES.
Lake Erie International Jetport Model Feasibility Investigation; The Wind-Driven Currents and Contaminant Dispersion in the Near-Shore of Large Lakes,
W77-08220 5B

CHURCH AND DWIGHT CO., INC., PISCATAWAY, N.J.
Sodium Bicarbonate Can Settle Many Waste Water Problem Upsets,
W77-08589 5D

CLEMSON UNIV., S.C. DEPT. OF CIVIL ENGINEERING.
Methodology for Applying the Finite Element Method to Partially Stratified Estuaries,
W77-08198 2L

CLEMSON UNIV., S.C. DEPT. OF ENVIRONMENTAL SYSTEMS ENGINEERING.
A Statistical Analysis of the Mercury Concentrations in Fish from Lake Jocassee, South Carolina,
W77-08190 5A

Arsenic in Water and Fish from Lakes Hartwell, Keowee, and Jocassee, South Carolina,
W77-08191 5A

A Survey of Cadmium Occurrence and Concentration in Fish from Eleven Major Reservoirs in South Carolina,
W77-08192 5A

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
Resurvey of the 'Byrd' Station, Antarctica, Drill Hole,
W77-08227 2C

COLLEGE OF PETROLEUM AND MINERALS, DHAHRAN (SAUDI ARABIA).
Removing Explosives from Wastewater,
W77-08266 5D

COLORADO SCHOOL OF MINES, GOLDEN.
Research on Cements for Geothermal and Deep Oil Wells,
W77-08320 8F

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Urban Drainage and Flood Control Projects: Economic, Legal, and Financial Aspects,
W77-08345 6B

Input-Output Modeling in Water Resources System Planning,
W77-08346 6A

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF RECREATION RESOURCES.
Inventory of Colorado's Front Range Mountain Reservoirs,
W77-08107 6B

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, MELBOURNE (AUSTRALIA). DIV. OF CHEMICAL TECHNOLOGY.
Physicochemical Treatment of an Australian Municipal Waste Water,
W77-08531 5D

COMPLETION TECHNOLOGY CO., HOUSTON, TEX.
Cementing Oil and Gas Wells, Part 2 - Casing Inspection and Pipe Handling Methods, Including Thread Make-Up Control,
W77-08327 8F

Cementing Oil and Gas Wells, Part 3,
W77-08328 8F

CONNECTICUT UNIV., STORRS.
Effect of Lateral Inflow on Steady Open Channel Flows,
W77-08290 2E

Ground Water Recharge in Eastern Connecticut Based on Simulation Modeling,
W77-08344 2E

CONNECTICUT UNIV., STORRS. INST. OF WATER RESOURCES.
Drift Velocities of Surface Films Over Waves,
W77-08193 5E

Delineation of Deciduous Wetland Forests in Northeastern Connecticut,
W77-08194 2C

The Effect of Aeration of Water Jet Spreading,
W77-08197 8E

Benthic Microbial Community Respiration of a Soft-Water Lake,
W77-08296 2E

CONSEJO SUPERIOR DI INVESTIGACIONES CIENTIFICAS, MADRID (SPAIN). INSTITUTO DE HIDROLOGIA.
Flash Floods in Spain (Les Crues Brutales En Espagne),
W77-08247 2E

CORNELL UNIV., ITHACA, N.Y. DEPT. OF NATURAL RESOURCES.
The Utility of Paleolimnological Analyses of Lake Sediments for Evaluating Acid Precipitation Effects on Dilute Lakes,
W77-08103 5A

CORPS OF ENGINEERS, PORTLAND, OREG. NORTH PACIFIC DIV.
Pumped-Storage in the Pacific Northwest, An Inventory.
W77-08224 2E

CORPS OF ENGINEERS, WASHINGTON, D.C.
Water Resource Policies and Authorities Coastal Zone Management Program Implementation,
W77-08114 6E

CROMPTON AND KNOWLES CORP., READING, PA.
Characterization and Treatment of Textile Dyeing Wastewaters,
W77-08278 5D

CULP, WESNER, EL DORADO HILLS, CALIF.
What Lies Ahead for PAC,
W77-08541 5D

DELAWARE UNIV., NEWARK. DEPT. OF CHEMICAL ENGINEERING.
Involvement of Free Radicals in the Catalytic Oxidation of Phenol in Aqueous Solution,
W77-08201 5D

DELAWARE UNIV., NEWARK, DEPT. OF CIVIL ENGINEERING.
Mathematical and Experimental Investigation of Nonsteady State Thickening of an Ideal Slurry,
W77-08207 5D

DELWARE UNIV., NEWARK. DEPT. OF CIVIL ENGINEERING.
Clay Adsorption Treatment of Non-Ionic Surfactants in Waste Water,
W77-08522 5D

DEPARTMENT OF AGRICULTURE, WELLINGTON (NEW ZEALAND). WALLACEVILLE ANIMAL RESEARCH CENTER.
Organochlorine Residues in New Zealand Birds and Mammals 2. Polychlorinated Biphenyls,
W77-08210 5C

DEPARTMENT OF ENERGY, MINES, AND RESOURCES, OTTAWA (ONTARIO). POLAR CONTINENTAL SHELF PROJECT.
Vertical Strain-Rate Measurements in an Arctic Ice Cap and Deductions from Them,
W77-08226 2C

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, PALMERSTON NORTH (NEW ZEALAND). PLANT PHYSIOLOGY DIV.
Growth of Tropical and Temperate Grasses at Palmerston North I. Warm-Season Yields With and Without Irrigation,
W77-08457 3F

Potential of New Summer Grasses in Northland: I. Warm-Season Yields Under Dryland and Irrigation,
W77-08458 3F

DIVISION DES RESOURCES EN EAU, TUNIS (TUNISIA).
The Operation of a Flood Warning Network: Its Use for Studying Flash Floods (Exploitation D'un Reseau D'alerte: Son Utilisation Pour L'etude Des Crues Brutales),
W77-08248 2E

DRILCO, HOUSTON, TEX.
Kelly Care Extends Service Life,
W77-08311 8C

DUKE UNIV., DURHAM, N. C. DEPT. OF CIVIL ENGINEERING.
Characterizing Sludge for Centrifugal Dewatering,
W77-08535 5D

EARTH SATELLITE CORP., BERKELEY, CALIF.
A Comparative Interregional Analysis of Selected Data from LANDSAT-1 and EREP for the Inventory and Monitoring of Natural Ecosystems,
W77-08436 7C

EARTH SATELLITE CORP. WASHINGTON, D. .
Application of EREP, LANDSAT and Aircraft Image Data to Environmental Problems Related to Coal Mining,
W77-08429 5A

EAST CAROLINA UNIV., GREENVILLE, N.C. DEPT. OF BIOLOGY.
Fractionation and Control of Iron in Channelized and Swamp Drainage Streams in North Carolina,
W77-08510 5B

ECODYNE CORP., KANS. SMITH AND COVELESS DIV.
Dewatering: A New Method Bows,
W77-08528 5D

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC (UN), BANGKOK (THAILAND). DIV. OF INDUSTRY, HOUSING, AND TECHNOLOGY.
Water Quality Impacts of Urbanization--A Methodology,
W77-08514 5B

ELECTROFACT, PLYMOUTH, MINN.
Reliable pH Measurement When Effluent Conditions Get Tough,
W77-08592 5A

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, WASHINGTON, D.C.
The ERDA Geothermal Program,
W77-08314 4B

ENVIRONMENTAL CONSULTING SERVICES, INC., BOULDER, COLO.
An Investigation of the Technical and Economic Feasibility of Using Low Temperature Geothermal Sources in Colorado,
W77-08310 4B

ENVIRONMENTAL PROTECTION AGENCY, NEW YORK. CARIBBEAN CONSTRUCTION GRANTS BRANCH.
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W77-08117 5G

ENVIRONMENTAL PROTECTION AGENCY, SEATTLE, WASH. PUBLIC AFFAIRS OFFICE.
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W77-08121 5G

ENVIRONMENTAL PROTECTION AGENCY, WARRENTON, VA. ENVIRONMENTAL PHOTOGRAPHIC INTERPRETATION CENTER.
Remote Sensing Applications in the Inventory and Analysis of Environmental Problems,
W77-08438 5A

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
Standards of Performance and Pretreatment Standards for the Explosives Manufacturing Point Source Category (Proposed Rules),
W77-08113 5G

Timber Products Processing Point Source Category Effluent Guidelines and Standards,
W77-08356 5G

Nonferrous Metals Manufacturing Point Source Category Pretreatment Standards.
W77-08357 5G

Toxic Pollutant Effluent Standards for Benzidine.
W77-08359 5G

Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Nitric Acid Subcategory.
W77-08360 5G

Proposed Effluent Guidelines and Standards for Iron and Steel Manufaturing,
W77-08370 5G

Effluent Guidelines and Standards for Canned and Preserved Fruits and Vegetables Point Source Category,
W77-08371 5G

Effluent Limitations and Guidelines for Existing Sources and Standards of Performance and Pretreatment Standards for New Sources for the Bleached Kraft, Groundwood, Sulfite, Soda, Deink and Non-Integrated Paper Mills Segment of the Pulp, Paper, and Paperboard Point Source Category.
W77-08383 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF RESEARCH AND DEVELOPMENT.
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W77-08120 6G

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W77-08385 5G

ENVIRONMENTAL PROTECTION SERVICE, EDMONTON (ALBERTA). MICROBIOLOGY LAB.
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W77-08269 5D

ESL, INC., SUNNYVALE, CALIF. EARTH RESOURCES TECHNOLOGY APPLICATIONS.
Mapping of the Wildland Fuel Characteristics of the Santa Monica Mountains of Southern California,
W77-08419 7C

FISCHER AND PORTER CO., WARMINSTER, PA.
Improved Galvanic Dissolved Oxygen Sensor for Activated Sludge,
W77-08539 5A

FLORENCE UNIV. (ITALY). FACOLTA DI INGEGNERIA.
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W77-08545 5D

FLORIDA UNIV., GAINESVILLE. COLL. OF LAW.
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W77-08380 6E

FLORIDA UNIV., GAINESVILLE. DEPT. OF GEOLOGY.
Diagenesis of Middle and Upper Eocene Carbonate Shoreline Sequences, Central Florida.
W77-08208 2F

FLORIDA UNIV., GAINESVILLE. SCHOOL OF LAW.
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W77-08112 6E

FORDHAM UNIV., N.Y. SCHOOL OF LAW.
Emerging Legal Concepts in the Harmonization of Water Resources Development and Environmental Protection,
W77-08378 6E

FRANCIS MARION COLL., FLORENCE, S. C. DEPT. OF CHEMISTRY AND PHYSICS.
Reduction of Mercury, Copper, Nickel, Cadmium, and Zinc Levels in Solution by Competitive Adsorption onto Peanut Hulls, and Raw and Aged Bark,
W77-08272 5D

GENERAL ELECTRIC CO., BELTSVILLE, MD.
Agricultural Applications of Remote Sensing--A True Life Adventure,
W77-08424 3F

GENERAL ELECTRIC CO., BELTSVILLE, MD. SPACE SYSTEMS ORGANIZATION.
Agricultural Inventory Capabilities of Machine Processed LANDSAT Digital Data,
W77-08423 3F

GENERAL ELECTRIC CO., SCHENECTADY, N.Y. ELECTRONIC POWER CONDITIONING AND CONTROL LAB.
Research into the Impact on Electrical Equipment from Variable Speed Operation of Pumped-Storage Plants,
W77-08492 8C

GEOLOGICAL SURVEY, ALBANY, N.Y. WATER RESOURCES DIV.
Water Resources Data for New York, Water Year 1975.
W77-08485 7C

GEOLOGICAL SURVEY, ANCHORAGE, ALASKA. WATER RESOURCES DIV.
Combined Ice and Water Balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 Hydrologic Year,
W77-08473 2C

GEOLOGICAL SURVEY, AUSTIN, TEX. WATER RESOURCES DIV.
Water-Quality Records for Selected Reservoirs in Texas, 1974-75 Water Years,
W77-08483 5A

GEOLOGICAL SURVEY, BATON ROUGE, LA. WATER RESOURCES DIV.
Analyses of Water, Core Material, and Elutriate Samples Collected Near New Orleans, Louisiana (Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project),
W77-08165 8D

GEOLOGICAL SURVEY, BISMARCK, N. DAK. WATER RESOURCES DIV.
Ground-Water Basic Data for Ramsey County, North Dakota,
W77-08177 7C

GEOLOGICAL SURVEY, BOISE, IDAHO. WATER RESOURCES DIV.
Digital-Model Analysis of the Effects of Water-Use Alternatives on Spring Discharges, Gooding and Jerome Counties, Idaho,
W77-08484 4B

GEOLOGICAL SURVEY, CARSON CITY, NEV. WATER RESOURCES DIV.
Water Resources Data for Nevada, Water Year 1975,
W77-08185 7C

GEOLOGICAL SURVEY, CHAMPAIGN, ILL. WATER RESOURCES DIV.
Water Resources Data for Illinois, Water Year 1975,
W77-08184 7C

GEOLOGICAL SURVEY, CHEYENNE, WYO. WATER RESOURCES DIV.
Geohydrology of the Albin and La Grange Areas, Southeastern Wyoming,
W77-08176 4B

GEOLOGICAL SURVEY, DENVER, COLO.
Radio-Echo Sounding of Temperate Glaciers: Ice Properties and Sounder Design Criteria,
W77-08229 2C

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Maps Showing Ground-Water COnditions in the Puerco-Zuni Area, Apache and Navajo Counties, Arizona--1975,
W77-08471 7C

GEOLOGICAL SURVEY, FORT BUCHANAN, PUERTO RICO. WATER RESOURCES DIV.
Ground Water in the San Juan Metropolitan Area, Puerto Rico,
W77-08173 4B

GEOLOGICAL SURVEY, FORT WORTH, TEX. WATER RESOURCES DIV.
Time of Travel of Solutes in the East Fork Trinity River, November 1975; and Elm Fork Trinity River, December 1975; Trinity River Basin, Texas,
W77-08472 7C

GEOLOGICAL SURVEY, HARTFORD, CONN. WATER RESOURCES DIV.
Water Resources Data for Connecticut, Water Year 1975,
W77-08480 7C

GEOLOGICAL SURVEY, HELENA, MONT. WATER RESOURCES DIV.
Annual Peak Discharges from Small Drainage Areas in Montana Through September 1976,
W77-08482 2E

GEOLOGICAL SURVEY, HURON, S.D. WATER RESOURCES DIV.
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W77-08468 7C

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Water Resources Data for Indiana, Water Year 1975,
W77-08162 7C

GEOLOGICAL SURVEY, JACKSON, MISS. WATER RESOURCES DIV.
The Eutaw-McShan Aquifer in Mississippi,
W77-08466 7C

GEOLOGICAL SURVEY, LAKEWOOD, COLO. WATER RESOURCES DIV.
Sediment Yield and Land Use in Southwest United States,
W77-08178 4D

Data for Calibrating Unsteady-Flow Sediment-Transport Models, East Fork River, Wyoming, 1975,
W77-08180 7C

GEOLOGICAL SURVEY, MADISON, WIS. WATER RESOURCES DIV.
Simulation of Streamflow of Flambeau River at Park Falls, Wisconsin to Define Low-Flow Characteristics,
W77-08172 2E

Digital-Computer Model of the Sandstone Aquifer in Southeastern Wisconsin,
W77-08478 2F

GEOLOGICAL SURVEY, MEMPHIS, TENN. WATER RESOURCES DIV.
Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975,
W77-08469 4B

GEOLOGICAL SURVEY, MENLO PARK, CALIF. WATER RESOURCES DIV.
Ground-Water Data for 1974-75 in Joshua Tree National Monument, California,
W77-08164 7C

Transient Three-Dimensional Circulation of Lakes,
W77-08181 2H

Activities of the Water Resources Division in California.
W77-08479 7C

Suspended-Particle Transport and Circulation in San Francisco Bay: An Overview,
W77-08486 2L

Longitudinal Distribution of Selected Micronutrients in Northern San Francisco Bay During 1973,
W77-08487 5C

Phytoplankton Production and Enumeration in Northern San Francisco Bay During 1972,
W77-08488 5C

Implications of Seasonal Chemical and Physical Factors on the Production of Phytoplankton in Northern San Francisco Bay,
W77-08489 5C

GEOLOGICAL SURVEY, MIAMI, FLA. WATER RESOURCES DIV.; AND GEOLOGICAL SURVEY, SAN JUAN (PUERTO RICO). WATER RESOURCES DIV.
Floods of November 12, 1974, in the Charlotte Amalie Area, St. Thomas, U.S. Virgin Islands,
W77-08470 7C

GEOLOGICAL SURVEY, NASHVILLE, TENN. WATER RESOURCES DIV.
Summary of Some Current and Possible Future Environmental Problems Related to Geology and Hydrology at Memphis, Tennessee,
W77-08174 4C

GEOLOGICAL SURVEY, OKLAHOMA CITY, OKLA. WATER RESOURCES DIV.
Selected Water-Level Records for Western Oklahoma, 1950-1975,
W77-08163 7C

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
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W77-08161 2E

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W77-08169 4E

Hydrologic Unit Map--1974, State of Texas.
W77-08474 7C

Hydrologic Unit Map--1974, State of Oklahoma.
W77-08475 7C

Hydrologic Unit Map--1974, State of South Dakota.
W77-08476 7C

Hydrologic Unit Map--1974, State of Kansas.
W77-08477 7C

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.; AND

GEOLOGICAL SURVEY, ST. PAUL, MINN. WATER RESOURCES DIV.
Ground-Water Resources of Vanderburgh County, Indiana,
W77-08170 4B

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH. WATER RESOURCES DIV.
Subsurface-Temperature Data for Some Wells in Western Utah,
W77-08166 7C

Selected Hydrologic Data, Uinta Basin Area, Utah and Colorado,
W77-08183 7C

GEOLOGICAL SURVEY, SIOUX FALLS, S. DAK. EROS DATA CENTER.
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W77-08411 4A

GEOLOGICAL SURVEY, ST. PAUL, MINN. WATER RESOURCES DIV.
Small-Stream Flood Investigations in Minnesota, October 1958 to September 1975,
W77-08481 2E

GEOLOGICAL SURVEY, TALLAHASSEE, FLA. WATER RESOURCES DIV.
Water Resources of the Myakka River Basin Area, Southwest Florida,
W77-08167 4B

Hydrologic Effects of the Tampa Bypass Canal System,
W77-08182 4A

Dissolved Solids, Hardness, and Orthophosphate of Surface-Water Runoff in the Northwest Florida Water Management District,
W77-08467 7C

GEOLOGICAL SURVEY, TRENTON, N.J. WATER RESOURCES DIV.
On the Relationship Between the Finite Element and Finite Difference Methods,
W77-08168 7A

Geohydrology of the Englishtown Formation in the Northern Coastal Plain of New Jersey,
W77-08175 2F

GEORGIA STATE UNIV., ATLANTA. DEPT. OF BIOLOGY.
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W77-08538 5A

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W77-08289 5C

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W77-08238 2C

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W77-08448 4B

HADASSAH MEDICAL SCHOOL, JERUSALEM (ISRAEL).
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W77-08519 5A

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W77-08258 5D

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W77-08287 5B

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W77-08445 7C

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W77-08196 8C

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W77-08372 6E

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W77-08127 5G

ILLINOIS STATE WATER SURVEY, URBANA.
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W77-08302 2F

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W77-08442 2H

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W77-08334 5D

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W77-08524 5D

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W77-08330 5B

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W77-08232 5A

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W77-08274 5D

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W77-08459 3F

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W77-08568 5A

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W77-08456 3F

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W77-08537 5D

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W77-08119 6E

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W77-08431 5A

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W77-08413 7C

Remote Sensing Applications in Kansas,
W77-08437 4A

KIEV INST. OF NUTRITIONAL HYGIENE (USSR).
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W77-08126 5A

KRANNERT GRADUATE SCHOOL OF MANAGEMENT, LAFAYETTE, IND.
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W77-08108 6B

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W77-08109 6B

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W77-08250 4A

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W77-08321 2H

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W77-08418 4A

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W77-08410 4A

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W77-08186 6E

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W77-08288 4B

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W77-08205 4B

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W77-08132 6E

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W77-08204 4B

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W77-08515 5D

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W77-08548 5D

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W77-08256 5D

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W77-08242 5A

The Fallout of Nitrogen and Phosphorus Compounds from the Atmosphere at Ngapuna, Near Rotorua, New Zealand,
W77-08243 5A

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W77-08341 2J

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W77-08105 6B

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W77-08303 6F

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W77-08316 8G

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W77-08237 2C

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MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF FISHERIES AND WILDLIFE.
Continuous Automated Monitoring of Chemical and Physical Characteristics of the Red Cedar River,
W77-08110 5A

MILLER BREWING CO., MILWAUKEE, WIS.
Closed-Loop System Separates Oil from Prewash Overflow,
W77-08271 5D

MINISTERSTVO ZDRAVOOKHRANENIYA SSSR, MOSCOW. INSTITUT BIOFIZIKI.
Effect of Some Chemical Elements on the Accumulation of Cesium-137 in Freshwater Fish (In Russian),
W77-08322 5C

MINISTRY OF HEALTH, AMMAN (JORDAN). DEPT. OF BACTERIOLOGY.
Bacteriological Pollution in the Drinking-Water of Jordan,
W77-08454 5B

MISSOURI UNIV., COLUMBIA. DEPT. OF AGRONOMY.
Root Growth, Strength, and Chemical Properties of a Hobson Fragipan,
W77-08285 2G

Pyro- and Tripoly-Phosphate Contents of Sediments,
W77-08306 5A

MISSOURI UNIV., COLUMBIA. DEPT. OF CHEMISTRY.
Chelating Agent Analysis by High Speed Liquid Chromatography,
W77-08286 5A

Detection of Phosphate Adsorption onto Co Humic Acids,
W77-08294 5B

MISSOURI UNIV.-KANSAS CITY. DEPT. OF PHYSICS.
Relative Reflectance and Complex Refractive Index in the Infrared for Saline Environment Waters,
W77-08215 2K

Measurement of the Attenuation of Electromagnetic Radiation by Water in the Visible Region of the Spectrum,
W77-08293 1B

MISSOURI UNIV.-ROLLA. DEPT. OF CHEMISTRY.
Mercury Accumulation in Trout of Southern Missouri,
W77-08304 5A

MITSUBISHI HEAVY-INDUSTRIES LTD., TOKYO (JAPAN). ENVIRONMENTAL TECHNOLOGY DEPT.
Progress in MHI's Integrated Techniques for Environmental Protection,
W77-08533 5G

MIXING EQUIPMENT CO., INC., ROCHESTER, N. Y.
High Capacity Waste Water Treatment System
W77-08566 5D

MONASH UNIV., CLAYTON (AUSTRALIA). DEPT. OF CIVIL ENGINEERING.
Application of Three Daily-Rainfall Runoff Models to Four Australian Catchments,
W77-08218 2A

Low Flow Analyses of Streams: Details of Computational Procedures and Annotated Bibliography,
W77-08219 2E

MONTANA STATE UNIV., BOZEMAN. DEPT OF EARTH SCIENCES.
On Depth Hoar and the Strength of Snow,
W77-08239 2C

MULLINS (W. H.), INC., SAN ANTONIO, TEX.
Aerators Control Lift Station Odor and Corrosion,
W77-08567 5G

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, BAY SAINT LOUIS, MISS. EARTH RESOURCES LAB.
Computer Implemented Classification of Vegetation Using Aircraft Acquired Multispectral Scanner Data,
W77-08421 4A

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, GREENBELT, MD. GODDARD SPACE FLIGHT CENTER.
Computer Analysis and Mapping of Gypsy Moth Defoliation Levels in Pennsylvania Using LANDSAT-1 Digital Data,
W77-08420 7C

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, HOUSTON, TEX. LYNDON B. JOHNSON SPACE CENTER.
Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Volume I-A, Technical Session Presentations, Agriculture-Environment.
W77-08408 7B

An Overview of the Development of Remote Sensing Techniques for the Screwworm Eradication Program,
W77-08427 3F

NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INST., NAGPUR (INDIA).
Rapid Agar Pour-Plate Technique for Detection and Enumeration of Faecal Coliforms in Sewage,
W77-08520 5A

NATIONAL EUTROPHICATION SURVEY, CORVALLIS, OREG.
The LANDSAT-1 Multispectral Scanner as a Tool in the Classification of Inland Lakes,
W77-08433 5A

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATIONS, WASHINGTON, D.C.
Coastal Energy Impact Program.
W77-08358 6E

NEBRASKA UNIV., LINCOLN. CONSERVATION SURVEY DIV.
Estimating Vegetative Biomass from LANDSAT-1 Imagery for Range Management,
W77-08409 4A

NEVADA UNIV. SYSTEM, RENO. WATER RESOURCES CENTER.
Pluvial Lakes of Nevada and Estimated Full Pluvial Climates,
W77-08199 2H

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF CHEMISTRY.
Fulvic Acid-Metal Ion Interactions in Water,
W77-08102 5A

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF ZOOLOGY.
Impact of Toxic Clones of Blue-Green Algae on Water Quality as Related to Aquatic Animals,
W77-08104 5C

NEW ORLEANS UNIV., LA. DEPT. OF BIOLOGICAL SCIENCES.
The Influence of Brackish-Water Intrusion on Macroinvertebrate Associations of the Lower Tchefuncte River, Louisiana,
W77-08292 5B

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY: AND RENSSELAER POLYTECHNIC INST., TROY, N.Y.
Process Design of Single-Sludge Activated Sludge Systems Using Nitrate Respiration,
W77-08336 5D

Full Scale Operation of Plug Flow Activated Sludge Systems,
W77-08451 5D

NEW YORK STATE DEPT. OF WATER RESOURCES, NEW YORK.
Oxygen Aeration at Newton Creek,
W77-08526 5D

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING.
An Analysis of Agricultural Water Requirements in the Tar-Neuse River Basin of North Carolina,
W77-08106 3F

Agricultural Water Demand in Wake County, North Carolina,
W77-08297 6D

A Water Management Model for High Water Table Soils,
W77-08301 3F

NORTH CAROLINA STATE UNIV., RALEIGH. SCHOOL OF FOREST RESOURCES.
Forest Fertilization and Water Quality in the North Carolina Piedmont,
W77-08508 5B

NORTH CAROLINA UNIV. AT CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
Development of a Column Chromatography Method for Field of Pre-Concentration of Trace Metals with Application to the Haw-Cape Fear Rivers, N.C.,
W77-08299 5A

Availability of Aluminum Phosphate Complexes to a Green Alga in Various Culture Media,
W77-08496 5D

Design of a Water Quality Monitoring Network,
W77-08497 5A

A Predictive Phosphorus Model for Lakes - Sensitivity Analysis and Applications,
W77-08499 5C

The Solubility of Particulate Phosphorus in the Effluent From Alum Treatment of Wastewater and Phosphorus Solutions,
W77-08500 5D

The Limnology of a North Carolina Millpond with Special Reference to Historical Changes as Evidenced by Sediment Core Analysis,
W77-08507 5C

Investigation of Coagulation - Precipitation and Ultrafiltration for the Regeneration of Brines in the Cucumber Pickle Industry,
W77-08511 5D

NORTH CAROLINA UNIV. AT CHARLOTTE. DEPT. OF GEOGRAPHY AND EARTH SCIENCE.
Channelization: Environmental, Geomorphic and Engineering Aspects,
W77-08352 8D

NORTH CAROLINA UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING.
Regional Simulation of Streamflow Data,
W77-08298 2A

NORTHWESTERN UNIV., EVANSTON, ILL. DEPT. OF CIVIL ENGINEERING.
Network Evaluation of Wastewater Collection Economics,
W77-08331 5D

OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE OUTRE-MER, PARIS (FRANCE).
A Methodology for Measuring Flash Floods (Methodologie Pour La Mesure Des Crues Brutales),
W77-08249 2E

OFFICE OF THE SECRETARY (NAVY), WASHINGTON, D.C.
Thermal Sensor for Measurement of Ocean Current Direction,
W77-08257 2L

OFFICE OF THE SOLICITOR (INTERIOR), WASHINGTON, D. C.
The Winters Doctrine and How It Grew: Federal Reservation of Rights to Use of Water,
W77-08375 6E

OFFICE OF WATER RESEARCH AND TECHNOLOGY, WASHINGTON, D.C. MEMBRANE PROCESSES DIV.
Status of Reverse Osmosis Desalination Technology,
W77-08225 3A

OKAYAMA UNIV. (JAPAN). DEPT. OF CIVIL ENGINEERING.
Ozone and Chlorine in Waste Water Disinfection,
W77-08536 5D

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF GEOGRAPHY.
RECSAD: A Computer Program for Recreation Planning,
W77-08300 6B

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF ZOOLOGY.
Mineral Cycling in Reservoirs,
W77-08217 5C

ONTARIO MINISTRY OF THE ENVIRONMENT, REXDALE. LAB. SERVICE BRANCH.
Pollution Indicator Bacteria Associated with Municipal Raw and Drinking Water Supplies,
W77-08516 5A

PACIFIC FOREST RESEARCH CENTRE, VICTORIA (BRITISH COLUMBIA).
Are Clear-Cut Areas Estimated from LANDSAT Imagery Reliable,
W77-08416 4A

PAHLAVI UNIV., SHIRAZ (IRAN). COLL. OF AGRICULTURE.
The Influences of Simulated Moisture Stress Conditions and Osmotic Substrates on Ger-

mination and Growth of Cultivated and Wild Safflowers,
W77-08460 2I

PAPUA AND NEW GUINEA UNIV., PORT MORESBY (NEW GUINEA). DEPT. OF GEOGRAPHY.
Alternative Measures of River Channel Shape and Their Significance,
W77-08241 8B

PENNSYLVANIA DEPT. OF ENVIRONMENTAL RESOURCES, HARRISBURG. OFFICE OF ENFORCEMENT.
Public Rights in Pennsylvania Waters,
W77-08362 6E

Legal Control of Consumptive Water Use in Pennsylvania Power Plants,
W77-08368 3E

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. INST. FOR RESEARCH ON LAND AND WATER RESOURCES.
Spray Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soil,
W77-08202 5D

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. SCHOOL OF FOREST RESOURCES.
Reclamation of Anthracite Coal Refuse Using Treated Municipal Wastewater and Sludge,
W77-08189 5D

POLSKIE TOWARZYSTWO PRZYRODNIKOW IM. KOPERNIKA, WARSAW.
The Ecological Significance of Antibiotic Substances Excreted by Algae in Waters, (In Polish),
W77-08463 5C

PUBLIC HEALTH SERVICE, CINCINNATI, OHIO. DIV. OF MICROBIOLOGY.
Persistence of Mycobacterium Bovis BCG in Soil and on Vegetables Spray-Irrigated with Sewage Effluent and Sludge,
W77-08525 5C

PURDUE UNIV., LAFAYETTE, IND.
Delineation of the Boundaries of a Buried Pre-Glacial Valley with LANDSAT-1 Data,
W77-08415 2G

PURDUE UNIV., LAFAYETTE, IND. DEPT. OF AGRICULTURAL ECONOMICS.
Multiple Objective Planning: Small Watersheds,
W77-08350 6B

PURDUE UNIV., LAFAYETTE, IND. SCHOOL OF CIVIL ENGINEERING.
The Effects of Urbanization on Low Flows and Total Runoff,
W77-08335 2A

PURDUE UNIV. LAFAYETTE, IND. SCHOOL OF MECHANICAL ENGINEERING.
A Study of Cooling Initially Uniform and Thermally Stratified Layers of Water,
W77-08444 5G

REED TOOL CO., HOUSTON, TEX.
Better Protection for Casing and Tool Joints,
W77-08315 8G

RENSSELAER POLYTECHNIC INST. TROY, N.Y. DEPT. OF CHEMICAL ENGINEERING; AND RENSSELAER POLYTECHNIC INST., TROY, N.Y. DEPT. OF ENVIRONMENTAL ENGINEERING.
Treatment of Wastewater From Military Explosives and Propellants Production Industry by Physicochemical Processes,
W77-08337 5D

Investigation of the Effectiveness of Polymers in the Treatment of Nirocellulose-Manufacturing Wastewater,
W77-08338 5D

Role of Polyelectrolytes in the Filtration of Colloidal Particles from Water and Wastewater,
W77-08339 5D

RHODE ISLAND UNIV., KINGSTON. DEPT. OF CHEMISTRY.
Crystal Structure Analysis of Selected Pesticides by Single Crystal X-Ray Diffraction: The Crystal and Molecular Structure of Padan,
W77-08503 5A

RHODE ISLAND UNIV., KINGSTON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Phosphorus Exchange at the Sediment-Water Interface of Selected Narragansett Bay Sediments,
W77-08502 5C

RHODE ISLAND UNIV., KINGSTON. DEPT. OF MICROBIOLOGY.
The Effect of Soluble Organic Matter On the Utilization of Phenoxy Herbicides by Pseudomonas sp.,
W77-08504 5C

RHODES UNIV., GRAHAMSTOWN (SOUTH AFRICA). DEPT. OF MICROBIOLOGY.
Bacterial Growth Kinetics in the Completely Mixed Activated Sludge Treatment of Fellmongery Effluent,
W77-08281 5D

RIDER COLL., TRENTON, N.J. DEPT. OF GEOSCIENCES.
A New Climatic Model for Glacier Behavior of the Austrian Alps,
W77-08235 2C

RUTGER - THE STATE UNIV., NEW BRUNSWICK, N. J. DEPT. OF SOILS AND CROPS.
A Quantitative Study of Organic Carbon Decomposition and Nitrogen Transformations in Sewage Sludge-Soil Systems,
W77-08291 5B

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J. DEPT. OF ENVIRONMENTAL SCIENCE.
The Mathematical Description of the BOD Reaction in Stream Water,
W77-08493 5B

A Comparison of the Methods for Calculating the Constants for the First Order BOD Equation,
W77-08494 5B

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF GEOGRAPHY.
The Influence of Precipitation on Biochemical Oxygen Demand on Nine Streams in New Jersey,
W77-08203 5B

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF SOILS AND CROPS.
Response of Oat and Spinach to Sewage Sludge Application in Soil,
W77-08495 5C

SAINT REGIS PAPER CO., JACKSONVILLE, FLA. SOUTHERN TIMBERLANDS DIV.
Operational Considerations for the Application of Remotely Sensed Forest Data from LANDSAT or Other Airborne Platforms,
W77-08417 7C

SANITARNO-GIGIENICHESKII MEDITSINSKII INSTITUT, LENINGRAD (USSR). DIV. OF PUBLIC HYGIENE.
Some Experimental Data on the Study of the Biological Action of Ethylbutylamine as a Water Pollution Factor, (In Russian),
W77-08439 5A

SERVICIO METEOROLOGICO NACIONAL, MADRID (SPAIN).
Flash Floods in the Western Mediterranean (Les Crues Catastrophiques sur la Mediterranee Occidentale),
W77-08245 2E

SHIKOKU PAPER MFG. CO. LTD. (JAPAN). (ASSIGNEE).
Method of Purification of Waste Water By Treatment with Zirconium Salt,
W77-08255 5D

SLOVENSKA AKADEMIE VIED, BRATISLAVA (CZECHOSLOVAKIA). LIMNOBIOLOGISCHES INSTITUT.
A Method for Quantitative Determination of Ammonifying and Denitrifying Bacteria in Water with Applied Examples from Gravel-Pit Pools, (In Czech),
W77-08509 5A

SMITHSONIAN INSTITUTION, WASHINGTON, D.C.; AND GEOLOGICAL SURVEY, LAKEWOOD, COLO. WATER RESOURCES DIV.
Investigation of Detection Limits for Solutes in Water Measured by Laser Raman Spectrometry,
W77-08171 2K

SOCIETA ITALIANA RESINE S.P.A., MILAN (ITALY).
Thermocompression-Type Apparatus for Desalting Saline Water,
W77-08252 3A

SOUTH DAKOTA STATE UNIV., BROOKINGS. DEPT. OF PLANT SCIENCE; AND SOUTH DAKOTA STATE UNIV., BROOKINGS. REMOTE SENSING INST.
LANDSAT-1 Data, Its Use in a Soil Survey Program,
W77-08414 2C

SOUTHERN METHODIST UNIV., DALLAS, TEX. SCHOOL OF ENGINEERING AND APPLIED SCIENCE.
Implementation of an Optimization Model for Operation of a Metropolitan Reservoir System
W77-08211 4A

STANDARD OIL CO. (OHIO), CLEVELAND.
Performance of Dual-Media Filters--I,
W77-08273 5F

STATE UNIV. OF NEW YORK AT BUFFALO. DEPT. OF CHEMICAL ENGINEERING.
Enzymatic Treatment of Primary Municipal Sludge with Trichoderma Viride Cellulase,
W77-08529 5D

TEXAS A AND M UNIV., COLLEGE STATION.
Monitoring Vegetation Conditions from LANDSAT for Use in Range Management,
W77-08412 4A

TEXAS INSTRUMENTS, INC., DALLAS, TEX.
True-Temperature Determination of Geothermal Reservoirs,
W77-08318 7B

TEXAS UNIV. AT ARLINGTON. DEPT. OF CIVIL ENGINEERING.
Biological Treatment Kinetics of Landfill Leachate,
W77-08532 5D

TEXAS UNIV. AT AUSTIN. DEPT. OF GEOGRAPHY.
Restless River: International Law and the Behavior of the Rio Grande,
W77-08384 6E

TOPEKA WATER POLLUTION CONTROL DEPT. KANS.
Sewage Pumping Station Built to Handle Future System Demands,
W77-08550 8C

TORONTO UNIV. (ONTARIO). DEPT. OF CIVIL ENGINEERING.
Aerobic Digestion of Sludges Precipitated from Waste Water by Lime Addition,
W77-08530 5D

TORONTO UNIV. (ONTARIO). FACULTY OF LAW.
Remembering Maine: Offshore Federalism in the United States and Canada,
W77-08363 6E

TREATMENT PLANT CONTRACTS LTD., HOUNSLOW (ENGLAND).
Trends in Small Sewage Treatment Plants,
W77-08569 5D

TRW SYSTEMS AND ENERGY, REDONDO BEACH, CALIF.
Sources, Characteristics and Treatment and Disposal of Industrial Wastes Containing Hexachlorobenzene,
W77-08265 5D

TSELINOGRADSKII MEDITSINSKII INSTITUT (USSR). DEPT. OF GENERAL HYGIENE.
Sanitary and Hygienic Characteristics of Subsurface Waters of the Tselinograd and Turgai Oblasts, (In Russian),
W77-08253 5B

UNIVERSAL OIL PRODUCTS CO., DES PLAINES, ILL. (ASSIGNEE).
Precoat for Permeability Separation Systems,
W77-08259 5D

UNIVERSITY OF AGRICULTURAL SCIENCES, BANGALORE (INDIA).
A Note on the Study of Rainy Days and Wet Spells at Bijapur,
W77-08455 2B

UNIVERSITY OF EAST ANGLIA, NORWICH (ENGLAND). SCHOOL OF MATHEMATICS AND PHYSICS.
Stress in an Elastic Bedrock Hump Due to Glacier Flow,
W77-08236 2C

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. ENVIRONMENTAL ENGINEERING DIV.
Ozone Effect of Synthetic Rubber Waste Treatment,
W77-08267 5D

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. SCHOOL OF LAW.
Ticket to Thermidor: A Commentary on the Proposed California Coastal Plan,
W77-08379 6B

UPPSALA UNIV. (SWEDEN). INST. OF ZOOLOGY.
Lake Naivasha and Lake Nakuru: An Ecological Comparison Between Two Bird Lakes in East Africa, (In Swedish),
W77-08324 2H

UTAH STATE UNIV. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Prediction Models of Reaeration Rate for Mountain Creeks,
W77-08501 5G

UTAH STATE UNIV., LOGAN. DEPT. OF ECONOMICS.
An Economic Appraisal of Reuse Concepts in Regional Water Supply Planning,
W77-08347 5D

VICTORIA UNIV. (BRITISH COLUMBIA). DEPT. OF GEOGRAPHY.
Planning Challenges in the Management of Coastal Zone Water Resources,
W77-08376 6B

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF CIVIL ENGINEERING.
A Productivity Study of the Roanoke River Above Niagra Dam in Virginia,
W77-08333 5C

A Finite Element Model to Determine the Effect of Land-Use Changes on Flood Hydrographs,
W77-08450 8B

VIRGINIA STATE WATER CONTROL BOARD, RICHMOND. DIV. OF SURVEILLANCE AND FIELD STUDIES.
LANDSAT-1 Data as it has Been Applied for Land Use and Water Quality Data By the Virginia State Water Control Board,
W77-08432 5A

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT NEFTEKHMICHESKIKH PROTSESSOV, KIEV (USSR).
The Role of Protozoa in Biological Purification of Oil Industry Sewage, (In Russian),
W77-08254 5D

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF AGRICULTURAL ECONOMICS.
Economic Impacts of Controlling Water Quality in an Irrigated River Basin,
W77-08332 5G

WASHINGTON UNIV., SEATTLE. DEPT. OF ECONOMICS.
Methodology and Data for Analyzing Quantity, Quality and Economic Aspects of Minimum Streamflows, Appendices, Volume 2,
W77-08349 5G

WASHINGTON UNIV., SEATTLE. INST. OF GOVERNMENTAL RESEARCH.
Improving Institutional Arrangements for Water Development in the State of Washington: Developmental and Environmental Trade-Offs and Constraints,
W77-08284 6E

WASHINGTON UNIV., SEATTLE. SCHOOL OF LAW.
Can a State Embargo the Export of Water by Transbasin Diversions,
W77-08129 6E

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
Improved Method for the Determination of Ethylenediaminetetraacetic Acid in Aqueous Environmental Samples by Gas-Liquid Chromatography,
W77-08521 5A

WATSON (J. D. AND D. M.) (HONG KONG).
Seabed Sewers for Hong Kong,
W77-08555 5E

WESLEYAN UNIV., MIDDLETOWN, CONN. INDUSTRIAL WASTE LAB.
Is pH Pretreatment Necessary,
W77-08276 5D

WESSEX WATER AUTHORITY, BRISTOL (ENGLAND).
Reorganizing Pollution Control in the U.K.
W77-08111 5G

WESTERN MICHIGAN UNIV., KALAMAZOO.
Beach Profile Changes: East Coast of Lake Michigan, 1970-72,
W77-08440 2J

WISCONSIN UNIV. EXTENSION, MADISON. INLAND LAKE DEMONSTRATION PROJECT.
University Public Service Programs as They Relate to Water Resources Management in Wisconsin,
W77-08209 6E

WISCONSIN UNIV. MADISON. DEPT. OF AGRICULTURAL ECONOMICS.
Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-08329 5B

WISCONSIN UNIV. -MADISON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Selective Withdrawal and Heated Water Discharge: Influence on the Water Quality of Lakes and Reservoirs Part I - Selective Withdrawal,
W77-08447 5G

WISCONSIN UNIV. MADISON. DEPT. OF LANDSCAPE ARCHITECTURE.
Classification and Test of Public Participation Concepts Applied to Local Resource Planning,
W77-08295 6B

WISCONSIN UNIV., MADISON. INST. FOR ENVIRONMENTAL STUDIES.
Trophic Status of Inland Lakes from LANDSAT,
W77-08434 5A

WISCONSIN UNIV. MIDDLETON. GEOPHYSICAL AND POLAR RESEARCH CENTER.
Radio-Echo Sounding: Reflections from Internal Layers in Ice Sheets,
W77-08230 2C

WYOMING UNIV., LARAMIE. COLL. OF LAW.
New Water Legislation--Drafting for Development, Efficient Allocation and Environmental Protection,
W77-08188 6E

Water for Food - Or for More Important Purposes. (Reallocation of Irrigation Water to Cities and Industries),
W77-08377 6E

WYOMING UNIV., LARAMIE. DEPT. OF AGRICULTURAL ENGINEERING.
Estimating Evapotranspiration in the North Platte Basin of Wyoming,
W77-08505 2D

WYOMING UNIV., LARAMIE. WATER RESOURCES RESEARCH INST.
Inventory of Water Resources Research at the University of Wyoming, Fiscal Year 1975,
W77-08506 9A

LIBRARY U. OF I. URBANA-CHAMPAIGN

ACCESSION NUMBER INDEX

W77-08101 3D
W77-08102 5A
W77-08103 5A
W77-08104 5C
W77-08105 6B
W77-08106 3F
W77-08107 6B
W77-08108 6B
W77-08109 6B
W77-08110 5A
W77-08111 5G
W77-08112 6E
W77-08113 5G
W77-08114 6E
W77-08115 6E
W77-08116 5G
W77-08117 5G
W77-08118 5G
W77-08119 6E
W77-08120 6G
W77-08121 5G
W77-08122 4B
W77-08123 5G
W77-08124 6E
W77-08125 6E
W77-08126 5A
W77-08127 5G
W77-08128 5G
W77-08129 6E
W77-08130 6E
W77-08131 6E
W77-08132 6E
W77-08133 6G
W77-08134 6E
W77-08135 6E
W77-08136 6E
W77-08137 6E
W77-08138 6E
W77-08139 6E
W77-08140 6E
W77-08141 6E
W77-08142 6E
W77-08143 6E
W77-08144 6E
W77-08145 6E
W77-08146 6E
W77-08147 6E
W77-08148 6E
W77-08149 6E
W77-08150 6E
W77-08151 6E
W77-08152 6E
W77-08153 6E
W77-08154 6E
W77-08155 6E
W77-08156 6E
W77-08157 6E
W77-08158 6E
W77-08159 6E
W77-08160 5C
W77-08161 2E
W77-08162 7C
W77-08163 7C
W77-08164 7C
W77-08165 8D
W77-08166 7C
W77-08167 4B
W77-08168 7A
W77-08169 4B
W77-08170 4B
W77-08171 2K
W77-08172 2E
W77-08173 4B
W77-08174 4C
W77-08175 2F
W77-08176 4B
W77-08177 7C
W77-08178 4D
W77-08179 5A
W77-08180 7C
W77-08181 2H
W77-08182 4A
W77-08183 7C
W77-08184 7C
W77-08185 7C
W77-08186 6E
W77-08187 6E
W77-08188 6E
W77-08189 5D
W77-08190 5A
W77-08191 5A
W77-08192 5A
W77-08193 5B
W77-08194 2G
W77-08195 4A
W77-08196 8C
W77-08197 8B
W77-08198 2L
W77-08199 2H
W77-08200 5C
W77-08201 5D
W77-08202 5D
W77-08203 5B
W77-08204 4B
W77-08205 4B
W77-08206 2G
W77-08207 5D
W77-08208 2F
W77-08209 6E
W77-08210 5C
W77-08211 4A
W77-08212 6A
W77-08213 5G
W77-08214 4B
W77-08215 2L
W77-08216 2E
W77-08217 5C
W77-08218 2A
W77-08219 2E
W77-08220 5B
W77-08221 5B
W77-08222 2L
W77-08223 2C
W77-08224 2H
W77-08225 3A
W77-08226 2C
W77-08227 2C
W77-08228 2C
W77-08229 2C
W77-08230 2C
W77-08231 3A
W77-08232 5A
W77-08233 3A
W77-08234 3A
W77-08235 2C
W77-08236 2C
W77-08237 2C
W77-08238 2C
W77-08239 2C
W77-08240 2C
W77-08241 8B
W77-08242 5A
W77-08243 5A
W77-08244 2F
W77-08245 2E
W77-08246 2C
W77-08247 2E
W77-08248 2E
W77-08249 2E
W77-08250 4A
W77-08251 5D
W77-08252 3A
W77-08253 5B
W77-08254 5D
W77-08255 5D
W77-08256 5D
W77-08257 2L
W77-08258 5D
W77-08259 5D
W77-08260 5G
W77-08261 5G
W77-08262 8I
W77-08263 5D
W77-08264 5F
W77-08265 5D
W77-08266 5D
W77-08267 5D
W77-08268 5D
W77-08269 5D
W77-08270 5D
W77-08271 5D
W77-08272 5D
W77-08273 5D
W77-08274 5D
W77-08275 5D
W77-08276 5D
W77-08277 5D
W77-08278 5D
W77-08279 5D
W77-08280 5D
W77-08281 5D
W77-08282 5D
W77-08283 5D
W77-08284 6E
W77-08285 2G
W77-08286 5A
W77-08287 5B
W77-08288 4B
W77-08289 5C
W77-08290 2E
W77-08291 5B
W77-08292 5B
W77-08293 1A
W77-08294 5A
W77-08295 6B
W77-08296 2H
W77-08297 6D
W77-08298 2A
W77-08299 5A
W77-08300 6B
W77-08301 3F
W77-08302 2F
W77-08303 6F
W77-08304 5C
W77-08305 5A
W77-08306 5A
W77-08307 7C
W77-08308 2B
W77-08309 2I
W77-08310 4B
W77-08311 8C
W77-08312 4B
W77-08313 6E
W77-08314 4B
W77-08315 8G
W77-08316 8G
W77-08317 2F
W77-08318 7B
W77-08319 8G
W77-08320 8F
W77-08321 2H
W77-08322 5C
W77-08323 5C
W77-08324 2H
W77-08325 4B
W77-08326 8C
W77-08327 8F
W77-08328 8F
W77-08329 5B
W77-08330 5B
W77-08331 5D
W77-08332 5G
W77-08333 5C
W77-08334 5D
W77-08335 2A
W77-08336 5D
W77-08337 5D
W77-08338 5D
W77-08339 5D
W77-08340 3A
W77-08341 2J
W77-08342 5F
W77-08343 3F
W77-08344 2F
W77-08345 6B
W77-08346 6A
W77-08347 5D
W77-08348 8E
W77-08349 5G
W77-08350 6B
W77-08351 4B
W77-08352 8D
W77-08353 4A
W77-08354 5G
W77-08355 6E
W77-08356 5G
W77-08357 5G
W77-08358 6E
W77-08359 5G
W77-08360 5G
W77-08361 4A
W77-08362 6E
W77-08363 6E
W77-08364 5C
W77-08365 6E
W77-08366 5G
W77-08367 6E
W77-08368 3E
W77-08369 6E
W77-08370 5G
W77-08371 5G
W77-08372 6E
W77-08373 5G
W77-08374 6F
W77-08375 6E
W77-08376 6B
W77-08377 6E
W77-08378 6E
W77-08379 6B
W77-08380 6E
W77-08381 5G
W77-08382 5G
W77-08383 5G
W77-08384 6E
W77-08385 5G
W77-08386 6E
W77-08387 6E
W77-08388 6E
W77-08389 6E
W77-08390 6E
W77-08391 6E
W77-08392 6E
W77-08393 6E
W77-08394 6E
W77-08395 6E
W77-08396 6E
W77-08397 6E
W77-08398 6E
W77-08399 6E
W77-08400 6E
W77-08401 6E
W77-08402 6E
W77-08403 6E
W77-08404 6E
W77-08405 6E
W77-08406 6E
W77-08407 6E
W77-08408 7B
W77-08409 4A
W77-08410 4A
W77-08411 4A
W77-08412 4A

W77-08413

W77-08413	7C
W77-08414	2G
W77-08415	2G
W77-08416	4A
W77-08417	7C
W77-08418	4A
W77-08419	7C
W77-08420	7C
W77-08421	4A
W77-08422	7C
W77-08423	3F
W77-08424	3F
W77-08425	3F
W77-08426	4A
W77-08427	3F
W77-08428	4A
W77-08429	5A
W77-08430	5A
W77-08431	5A
W77-08432	5A
W77-08433	5A
W77-08434	5A
W77-08435	5A
W77-08436	7C
W77-08437	4A
W77-08438	5A
W77-08439	5A
W77-08440	2J
W77-08441	7C
W77-08442	2H
W77-08443	5A
W77-08444	5G
W77-08445	7C
W77-08446	5C
W77-08447	5G
W77-08448	4B
W77-08449	2K
W77-08450	8B
W77-08451	5D
W77-08452	5G
W77-08453	6B
W77-08454	5B
W77-08455	2B
W77-08456	3F
W77-08457	3F
W77-08458	3F
W77-08459	3F
W77-08460	2I
W77-08461	4A
W77-08462	5C
W77-08463	5C
W77-08464	4A
W77-08465	5B
W77-08466	7C
W77-08467	7C
W77-08468	7C
W77-08469	4B
W77-08470	7C
W77-08471	7C
W77-08472	7C
W77-08473	2C
W77-08474	7C
W77-08475	7C
W77-08476	7C
W77-08477	7C
W77-08478	2F
W77-08479	7C
W77-08480	7C
W77-08481	2E
W77-08482	2E
W77-08483	5A
W77-08484	4B
W77-08485	7C
W77-08486	2L
W77-08487	5C
W77-08488	5C
W77-08489	5C
W77-08490	6E
W77-08491	6E
W77-08492	8C
W77-08493	5B
W77-08494	5B
W77-08495	5C
W77-08496	5D
W77-08497	5A
W77-08498	5A
W77-08499	5C
W77-08500	5D
W77-08501	5G
W77-08502	5C
W77-08503	5A
W77-08504	5C
W77-08505	2D
W77-08506	9A
W77-08507	5C
W77-08508	5B
W77-08509	5A
W77-08510	5B
W77-08511	5D
W77-08512	8D
W77-08513	5F
W77-08514	5B
W77-08515	5D
W77-08516	5A
W77-08517	5B
W77-08518	5A
W77-08519	5A
W77-08520	5A
W77-08521	5A
W77-08522	5D
W77-08523	5D
W77-08524	5D
W77-08525	5C
W77-08526	5D
W77-08527	5D
W77-08528	5D
W77-08529	5D
W77-08530	5D
W77-08531	5D
W77-08532	5D
W77-08533	5D
W77-08534	5D
W77-08535	5D
W77-08536	5D
W77-08537	5D
W77-08538	5A
W77-08539	5A
W77-08540	5D
W77-08541	5D
W77-08542	8A
W77-08543	5F
W77-08544	5D
W77-08545	5D
W77-08546	5A
W77-08547	8A
W77-08548	5D
W77-08549	8G
W77-08550	8C
W77-08551	8G
W77-08552	8E
W77-08553	8G
W77-08554	8G
W77-08555	5E
W77-08556	8F
W77-08557	5D
W77-08558	5D
W77-08559	5E
W77-08560	5D
W77-08561	5D
W77-08562	5D
W77-08563	5E
W77-08564	5D
W77-08565	5D
W77-08566	5D
W77-08567	5G
W77-08568	5A
W77-08569	5D
W77-08570	5E
W77-08571	5D
W77-08572	5D
W77-08573	5D
W77-08574	5D
W77-08575	5D
W77-08576	5E
W77-08577	5D
W77-08578	5D
W77-08579	5D
W77-08580	5D
W77-08581	5E
W77-08582	5E
W77-08583	3D
W77-08584	5D
W77-08585	5D
W77-08586	5D
W77-08587	5D
W77-08588	5D
W77-08589	5D
W77-08590	5D
W77-08591	5D
W77-08592	5A
W77-08593	5D
W77-08594	5E
W77-08595	5D
W77-08596	5D
W77-08597	5D
W77-08598	8G
W77-08599	5D
W77-08600	5D

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OURCE	ACCESSION NUMBER	TOTAL
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Illinois State Water Survey, Hydrology	W77-08110 08215--08216 08218--08250 08302 08408--08429 08431--08438 08440--08442	70
National Water Well Association, Water Well Construction Technology	W77-08310--08320 08325--08328	15
University of Arizona, Arid Land Water Resources	W77-08452--08461	10
University of Florida, Eastern U. S. Water Law	W77-08111--08121 08123--08125 08127--08159 08186--08188 08353--08363 08365--08407 08490--08491	106
University of North Carolina, Metropolitan Water Resources Planning and Management	W77-08209	1
University of Wisconsin, Eutrophication	W77-08217	1

SOURCE	ACCESSION NUMBER	TOTA
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W77-08101--08107 08189--08208 08284--08301 08303--08309 08329--08333 08340--08352 08443--08450 08493--08497 08499--08508 08510--08511	
C. OTHER		
Agricultural Research Service	W77-08464--08465	
BioSciences Information Service	W77-08122, 08126 08160, 08179 08253--08254 08256 08321--08324 08364, 08430 08439 08462--08463 08498, 08509	
Bureau of Reclamation	W77-08492, 08512	
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W77-08210	
Ocean Engineering Information Service (Patents)	W77-08251--08252 08255 08257--08264	
Office of Water Research and Technology	W77-08108--08109 08334--08335	
Rensselaer Polytechnic Institute	W77-08336--08339 08451	
U. S. Geological Survey	W77-08161--08178 08180--08185 08466--08489	

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- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
- WATER RESOURCES PLANNING
- RESOURCES DATA
- ENGINEERING WORKS
- MANPOWER, GRANTS, AND FACILITIES
- SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

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A16	10.50	E16	37.00	T16	800.00
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A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 18
SEPTEMBER 15, 1977

W77-08601 – W77-09100

Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent nographs, journal articles, reports, and other publication mats. The contents of these documents cover the water-ated aspects of the life, physical, and social sciences as ll as related engineering and legal aspects of the charac-istics, conservation, control, use, or management of water. ch abstract includes a full bibliographical citation and a set descriptors or identifiers which are listed in the **Water sources Thesaurus.** Each abstract entry is classified into fields and 60 groups similar to the water resources re-arch categories established by the Committee on Water sources Research of the Federal Council for Science and chnology.

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lected Water Resources Abstracts is designed to serve e scientific and technical information needs of scientists, gineers, and managers as one of several planned services the Water Resources Scientific Information Center RSIC). The Center was established by the Secretary of the erior and has been designated by the Federal Council for ience and Technology to serve the water resources com-unity by improving the communication of water-related search results. The Center is pursuing this objective by co-dinating and supplementing the existing scientific and tech-al information activities associated with active research d investigation program in water resources.

provide WRSIC with input, selected organizations with tive water resources research programs are supported as enters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

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1. NATURE OF WATER

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W77-08840

2. WATER CYCLE

2A. General

A PRIMER ON LIMNOLOGY,
Minnesota Univ., Minneapolis. Linmological Research Center.
For primary bibliographic entry see Field 2H.
W77-08605

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North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
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W77-08609

HISARS - HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM - REFERENCE MANUAL,
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For primary bibliographic entry see Field 7C.
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For primary bibliographic entry see Field 2G.
W77-08825

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W77-08933

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Purdue University, West Lafayette, Indiana.
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W77-08935

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Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-08941

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Utah Water Research Lab., Logan.
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W77-09014

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Waterloo Univ. (Ontario). Dept. of Civil Engineering.
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W77-09015

2B. Precipitation

POINT STOCHASTIC ANALYSIS OF DAILY RAINFALL OCCURRENCE WITH APPLICATION TO INDIANA,
Purdue University, West Lafayette, Indiana.
M. L. Kavvas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 006, Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Thesis, May 1975. 190 p, 14 tab, 6 ref, 3 append. OWRT B-036-IND(6).

Descriptors: *Rainfall, *Stochastic processes, *Indiana, *Statistical models, Statistical tests, Probability, *Model studies.
Identifiers: *Rainfall occurrences, *Cyclicity, Stochastic analysis, Stochastic models, Poisson method.

The point stochastic analysis of daily rainfall occurrences in Indiana is discussed. The point statistical analysis was performed utilizing some statistical functions and some statistical tests of hypotheses. First, the analysis of trends in the daily rainfall counting process was performed. There are cyclicities both in the first and the second moments of the point stochastic process. Physicaly meaningful annual and 15-day cycles were significant. There is also a slight downward trend in the rate of daily rainfall occurrence in Indiana. The data were homogenized under the independent counting increments assumption and the Poisson model was tested by formal statistical tests and by statistical functions. The model was rejected for the daily rainfall counting process in Indiana. From the behavior of the spectrum and the variance-time function of the daily rainfall counts a clustering of the daily rainfalls in terms of storms is apparent. The Neyman-Scott cluster process was constructed in the time dimension to model this physical dependence. Physical concepts were attached to various components of the model. The model fits the data quite well. Due to its very flexible spectral structure and to its physical interpretation of the various components of the rainfall occurrence, Neyman-Scott cluster model deserves further investigation in different climates of the world.
W77-08935

2C. Snow, Ice, and Frost

SNOWMELT: A TWO-DIMENSIONAL TURBULENT DIFFUSION MODEL,
Canterbury Univ., Christchurch (New Zealand).
R. N. Weisman.
Water Resources Research, Vol. 13, No. 2, p 337-342, April 1977. 7 fig, 2 tab, 18 ref.

Descriptors: *Snowmelt, *Heat transfer, *Diffusion, *Turbulent flow, *Model studies, Mathematical models, Winds, Heat, Latent heat, Melting, Snowpacks, Water vapor, Humidity, Temperature, Turbulence, Melt water.
Identifiers: *Turbulent diffusion models.

The melt from a ripe snowpack due to sensible and latent heat flux was considered. The problem is two-dimensional; the snow field has a well-defined leading edge. The equations that describe the airflow over the snow are the conservation of momentum, sensible heat, and water vapor. The turbulent diffusion is formulated by semi-empirical turbulence theory. The solution showed the manner in which the point melt varies downwind from the landing edge, and the average melt varies with the fetch of the snowpack for varying degrees of atmospheric stability conditions. The results indicated that a reasonably accurate estimate of total melt can be achieved by using the one-dimensional formulae with temperature, humidity, and velocity measurements taken over the central part of the snow field. (Sims-ISWS)
W77-08823

WATER AND ICE POTENTIALS IN FROZEN SOILS,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
P. H. Groenevelt, and B. D. Kay.
Water Resources Research, Vol. 13, No. 2, p 445-449, April 1977. 3 fig, 19 ref.

Descriptors: *Frozen soils, *Moisture content, *Ice, *Model studies, Mathematical models, Porous media, Soils, Soil water, Voids, Hysteresis, Temperature, Freezing, Frozen ground, Frost, Frost action.

The envelope pressure potentials of the liquid water and ice in a frozen soil were defined. The envelope pressure potential of liquid water is a generalization of the definition of the envelope pressure potential (overburden potential) of the water in an unfrozen swelling soil. In order to express the envelope pressure potentials in terms of volume ratios, use was made of the void ratio, the moisture ratio equivalent, and the ice ratio equivalent. A new development was initiated by the formulation and derivation of the frost potential of both the liquid water and the ice. These frost potentials were expressed in terms of the ice ratio, the moisture ratio, the ice ratio equivalent, and the moisture ratio equivalent. The relations between these variables are intrinsic properties of the porous medium which have to be determined experimentally. (Sims-ISWS)
W77-08828

WAS THERE A LATE-WURM ARCTIC ICE SHEET,
Maine Univ. at Orono. Dept. of Geological; and Maine Univ. at Orono. Inst. for Quaternary Studies.
T. Hughes, G. H. Denton, and M. G. Grosswald.
Nature, Vol 266, No 5603, p 596-602, April 14, 1977. 4 fig, 1 tab, 46 ref.

Descriptors: *Glaciers, *Ice, *Arctic, *Antarctic, Geomorphology, Glaciation, Icebergs, Movement, Water levels, Glaciology.
Identifiers: *Ice sheets, Ice domes, Ice shelves, Ice streams, Calving bays.

A simplification and synthesis of late-Wurm Northern Hemisphere glaciation is possible by postulating an Arctic Ice Sheet that behaved as a single dynamic system. (Sims-ISWS)
W77-08839

STUDY OF AN ICE CORE TO THE BEDROCK IN THE ACCUMULATION ZONE OF AN ALPINE GLACIER,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
M. Vallon, J-R. Petit, and B. Fabre.
Journal of Glaciology, Vol 17, No 75, p 13-28, 1976. 12 fig, 30 ref, append.

Descriptors: *Glaciers, *Ice, *Stratigraphy, *Cores, Glaciology, Firn, Crystals, Cryology, Density, Ablation, On-site investigations, Physical properties, Optical properties, Cold regions, Permeability, Analysis.
Identifiers: *Alpine glaciers, Temperate glaciers, Foliation.

A water table appearing every summer where the ice begins, at a depth of approximately 30 m, ac-

celerates the transformation of firn into ice during the summer (80% of the ice formed every year appears in less than 2 months). The ice formed in the mentioned way contains from 0 to 0.6% water. The average water content increases gradually with the depth because of the heat of deformation. But, near bedrock, between 180 and 187 m, the permeability of the blue ice is such that the water content drops (0.3% as compared to 1.3% between 160 and 180 m). From a depth of 33 m, a foliation of sedimentary origin gradually develops in the ice. Foliation dip increases regularly to a depth of 145 m. At 145 m, foliation jumps suddenly from 20 deg to 40 deg, then at 170 m from 40 deg to 65 deg, which can be explained by old modification in the bergschrund. The foliation disappears near bedrock (180-187 m), where there are no bubbles in the ice. The average size of an ice crystal increases slowly in the firn, shows seasonal fluctuations between 30 and 50 m, then jumps from a diameter of 1 or 2 mm to 10 or 20 mm between 50 and 80 m. Between 180 and 187 m, the ice is made of large crystals (3-10 cm diamter; the figure, however, probably is inexact due to a recrystallization of the samples). The very strong sub-vertical orientation of the optic axes of the firn crystals disappears quickly, and from 66 m on, in ice with large crystals, a fabric of multiple maxima appears (generally, 3 or 4 directions, forming a triangle or a rhombus). On the other hand, in the small crystals that form bands parallel to the plane of foliation, only one direction of preferential orientation can be seen, or two close to one another. Crystals of intermediate size (10 to 50 mm) generally have two directions of preferred orientation at an angle of approximately 50 deg to one another. No matter how big the crystals are, the angle between the most common c-axis orientation and the vertical does not change from 60 to 170 m depth. (Humphreys-ISWS)
W77-08846

TESTS OF OIL RECOVERY DEVICES IN BROKEN ICE FIELDS. PHASE I,
ARCTEC, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W77-08915

AN ASSESSMENT OF SNOWPACK DEPLETION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 3B.
W77-08933

THE MAXIMUM EXTENT OF GLACIERS IN PART OF WEST FALKLAND,
Aberdeen Univ. (Scotland). Dept. of Geography.
C. M. Clapperton, and D. E. Sugden.
Journal of Glaciology, Vol. 17, No. 75, p 73-77, 1976. 4 fig, 7 ref.

Descriptors: *Glaciation, *Geomorphology, *On-site investigations, *Glaciers, Cirques, Exploration, Evaluation, Glacial drift, Till, Topography, Pleistocene epoach.
Identifiers: *Falkland Islands.

Although it is known that cirque glaciers once existed in the Falkland Islands, it has remained in doubt whether or not the islands were ever covered by ice caps or an ice sheet during the Cainozoic. This paper scrutinized geomorphological evidence on the southeastern flank of a high massif in West Falkland. It was suggested that, at the time of their maximum extent in the Cainozoic, the largest glaciers were no more than 2.7 km long. Unless the raised beaches are later shown to be related to glacio-isostatic movements within the Falkland Islands, it is reasonable to conclude that, at the time of the maximum extent of glaciers in West Falkland, ice did not extend beyond the cirques and the upper reaches of associated valleys. (Humphreys-ISWS)
W77-09032

AN EXPERIMENTAL STUDY OF THE MOTION OF ICE PAST OBSTACLES BY THE PROCESS OF REGELATION,
Bristol Univ. (England). H. H. Willis Physics Lab.
E. M. Morris.
Journal of Glaciology, Vol. 17, No. 75, p 79-98, 1976. 10 fig, 1 tab, 17 ref.

Descriptors: *Glaciers, *Ice, *Movement, *Laboratory tests, Glaciology, Freezing, Melting, Velocity, Theoretical analysis, Laboratory equipment, Viscometers, Temperature.
Identifiers: *Basal sliding, *Regelation, Temperate glaciers.

The results of regelation experiments, in which a single object is pulled through ice, cannot be applied directly to the problem of basal sliding in glaciers becasuse the two systems have different geometries. When the force applied to a single object is small, impurities trapped in the regelation water layer around the object inhibit the regelation process. At larger forces, above the Drake-Shreve transition point, impurities are shed in a trace behind the object. However, when ice moves over a series of obstacles, a trace may exist above and below the transition point. The regelation velocity below the transition point is not reduced by the effect of trapped impurities. In an experiment in which brass cylinders of various cross-sections rotate in ice, the ratio between the expected regelation velocity, calculated using the basal-sliding theory of Nye, and the measured regelation velocity is 8+ or - 2, both above and below the transition point. The same ratio has been obtained by other workers with wires of similar thermal conductivity above the transition point. Measurements of temperature differences indicate that supercooling cannot be the main source of the unexpectedly low regelation velocities above the transition point. (Humphreys-ISWS)
W77-09033

2D. Evaporation and Transpiration

ASPECTS OF THE DAILY AND SEASONAL COURSE OF TRANSPIRATION INTENSITY IN MEADOW PLANTS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
L. N. Alekseenko.
Bot Zh (Leningr) 60(12); p 1740-1749, 1975.

Descriptors: *Transpiration, *Variability, *Fluctuations, Vegetation, Cycles, Water supply, Plant physiology, Biorhythms.
Identifiers: *Meadow plants, *Transpiration intensity, USSR.

During a plentiful water supply, daily changes in transpiration intensity (TI) corresponded, in 30 meadow species, to environmental changes. TI increased from morning to noon, reached a maximum in the early afternon and decreased toward evening. Highest TI was often observed in mid-morning and sometimes in the late afternoon. TI curve may have 2 peaks with a midday depression or more than 2 peaks. The changes in TI during an adequate water supply indicated that transpiration rates were determined by plant physiology and not by environment during some hours of the day. A similar conclusion was reached in reference to TI variations during the vegetative period. In the majority of species, the seasonal course of TI was asymetric, reaching a maximum at the beginning of heading and budding with a gradual decrease until fruit and seed ripening.
W77-08709

TRANSPIRATION INTENSITY OF MEADOW PLANTS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
L. N. Alekseenko.
Bot Zh (Leningr) 60(10), p 1456-1466, 1975.

Descriptors: *Transpiration, Vegetation, Water utilization, Consumptive use.
Identifiers: Hygrophytes, Meadow plants, Eumesophyte, Intensity, Hygromesophytes.

The transpiration intensities (TI) of 41 spp. of primarily meadow plants are given. A small group of species with an average TI of < 0.60 g.h/g fresh weight was distinguished. The majority of meadow plants have an average TI from 0.60-0.90 and spp. from 0.90-1.47 g.h/g fresh weight. The majority of the plants species consume about 95-110% of the water supply in the leaves per hour, and during daylight it is renewed 20-22 times. There are no statistically significant differences with respect to the average TI between eumesophytes, hygromesophytes and hygrophytes. No correlation was found between TI and size and shape of the leaf blade.
W77-08714

EVAPORATION FROM SEVEN RESERVOIRS IN THE DENVER WATER-SUPPLY SYSTEM, CENTRAL COLORADO,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, Lakewood, Colo.
J. F. Ficke, D. B. Adams, and T. W. Danielson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 323. Price codes: A09 in paper copy, A01 in microfiche. Water-Resources Investigations 76-114, April 1977. 170 p, 48 fig, 15 tab, 15 ref.

Descriptors: *Evaporation, *Reservoirs, *Colorado, Data collections, Analytical techniques, Energy budget, Mass transfer, Evaporation pans, Evaluation, Water supply.
Identifiers: Central Colorado.

Seven reservoirs in central Colorado, operated by the Denver Board of Water Commissioners, were studied during 1967-73 to determine evaporation losses. These reservoirs, Elevenmile Canyon, Dillon, Gross, Antero, Cheesman, Williams Fork, and Ralston, are located on both sides of the Continental Divide. Methods for computing evaporation include energy-budget, mass-transfer, and pan relationships. Three reservoirs, Elevenmile Canyon, Dillon, and Gross, had mass-transfer coefficients calibrated by energy-budget studies. At the remaining reservoirs, an empirical technique was used to estimate the mass-transfer coefficient. The enery-budget-calibrated methods give the most accurate evaporation values; the empirical coefficients give only a best estimate of evaporation. All reservoirs should be calibrated by energy-budget studies. The pan method of computing evaporation is the least reliable method because of problems of advected energy through the sides of the pan, representative pan exposure, and the irregularity of ratios of reservoir to pan evaporation. (Woodard-USGS)
W77-08736

2E. Streamflow and Runoff

FLOODS IN THE BIG CREEK BASIN, LINN COUNTY, IOWA,
Geological Survey, Iowa City, Iowa. Water Resources Div.
A. J. Heinitz.
Open-file report 77-209, January 1977. 35 p, 8 fig, 5 tab, 4 ref.

Descriptors: *Floods, *Flood data, *Flood profiles, *Flood recurrence interval, *Streamflow, Flow rates, Peak discharge, State-discharge relations, Flood frequency.
Identifiers: *Linn County(Iowa), *Big Creek basin.

Flood information for the Big Creek basin in Linn County, Iowa, should be of use to those concerned with the design of bridges and other structures on the flood plains of the streams. Water-surface profiles for the flood of May 1974 are given for Big Creek and its major tributaries, East Big, Crabap-

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ple, Elbow, and Abbe Creeks. The May 1974 flood was at least a 50-year flood on East Big Creek and along certain reaches of Big and Abbe Creeks. Also included for Big Creek are a profile of the December 1971 medium-stage flow and a partial profile for the minor flood of July 1971. Profiles for the low-water condition of October 26, 1972, are shown for all reaches. Water-surface profiles for the 25- and 50-year floods are estimated in relation to the May 1974 flood. (Woodard-USGS)
W77-08731

MISSOURI STREAM AND SPRINGFLOW CHARACTERISTICS LOW-FLOW FREQUENCY AND FLOW DURATION,
Geological Survey, Rolla, Mo. Water Resources Div.
J. Skelton.
Missouri Department of Natural Resources, Geological Survey, Rolla, Water Resources Report No 32, 1976. 71 p, 24 fig, 1 plate, 5 tab, 13 ref.

Descriptors: *Low flow, *Statistical methods, *Low-flow frequency, *Flow duration, *Missouri, Hydrologic data, Streamflow, Flow rates, Regulated flow, Seepage, Droughts.

A statistical analysis of low-flow information for Missouri streams contains low-flow frequency data for 460 continuous- and partial-record gaging stations, discharge measurements and approximate frequency data for 66 partial-record stations, and flow-duration data for 84 long-time continuous-record stations. Maps showing seepage-run data collected in Ozarks basins are included to supplement tabulated frequency information from the gaging stations and to permit extrapolation of these frequency data to many additional sites. Low-flow characteristics of streams vary among physiographic regions in Missouri. The low-flow potential of most Plains streams is poor because of the low hydraulic conductivity of the clays and shales in the area. Storage reservoirs are required for effective utilization of surface-water supplies in this region. Ozark streams generally have the best sustained low flows in the state because of groundwater inflow from extensive natural reservoirs in the soluble carbonate rocks, but this pattern is not consistent in the region. The solution cavities result in water losses and nonconformance to areal patterns in some basins. Low flows in the Southeastern Lowlands are second in magnitude to those of the Ozarks because of groundwater inflow from the extensive alluvial aquifer. (Woodard-USGS)
W77-08743

SOME COMPUTATIONAL ASPECTS OF ONE- AND TWO-DIMENSIONAL UNSTEADY FLOW SIMULATION BY THE METHOD OF CHARACTERISTICS,
Geological Survey, Reston, Va. Water Resources Div.
C. Lai.
In: International Symposium on Unsteady Flow in Open Channels, held at University of Newcastle-upon-Tyne, England, April 12-15, 1976: BHRA Fluid Engineering, Cranfield, Bedford, England, p D1-1 - D1-12, 1976. 5 fig, 1 tab, 12 ref.

Descriptors: *Model studies, *Open channel flow, *Unsteady flow, *Numerical analysis, *Computer models, Mathematical models, Analytical techniques, Input-output analysis, Evaluation, Correlation analysis.
Identifiers: *Method of characteristics, One-dimensional flow, Two dimensional flow, Specified-time-interval scheme.

The method of characteristics is well suited to the simulation of one-dimensional, unsteady, open-channel flow. When a numerical scheme based upon specified time intervals is employed, one can solve the characteristics equations to second-order accuracy by the trapezoidal rule using iteration, or by applying an extrapolation procedure to two sets of linear computations using two different sizes of time interval. Numerical experiments showed virtually the same results for the two techniques. The second technique, however, is preferred for it generally consumes less computer time, and offers the option of selecting first- or second-order results. In attempting to extend the method of characteristics to two-dimensional flow in a wide river, or embayment, one finds a number of dissimilarities as well as similarities between the two cases. Many favorable features of the method of characteristics for one-dimensional flow are lost in the two-dimensional case, thus complicating the flow computation. Again, if the specified-time-interval scheme is used, second-order results may be obtained by the trapezoidal rule with iteration, or by the extrapolation procedure applied to two linear systems. However, the iteration technique in the two-dimensional flow is extremely cumbersome and solution - despite many favorable results - is not always successful. The latter offers an advantage of requiring no iteration, but it requires more memory. (Woodard-USGS)
W77-08745

INDIANA STREAM-TEMPERATURE CHARACTERISTICS,
Geological Survey, Indianapolis, Ind. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08755

NETWORK CHARACTERISTICS IN SUBURBANIZING STREAMS,
Iowa Univ., Iowa City. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W77-08830

SEASONAL VARIATIONS IN THE IMPACT OF SUBURBAN DEVELOPMENT ON RUNOFF RESPONSE: PETERBOROUGH, ONTARIO,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W77-08831

EFFECT OF PONDS AND SMALL RESERVOIRS ON RIVER RUNOFF IN THE FOREST-STEPPE AND STEPPE ZONES OF THE VOLGA BASIN,
For primary bibliographic entry see Field 4A.
W77-08834

EFFECT OF AGRICULTURAL AND SILVICULTURAL PRACTICES ON THE RUNOFF FROM DRAINAGE BASINS OF THE NIZHNEDEVITSKAYA HYDROLOGIC STATION,
For primary bibliographic entry see Field 4C.
W77-08835

PERFORMANCE CHARACTERISTICS OF A GRASSED-WATERWAY TRANSITION,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
For primary bibliographic entry see Field 4D.
W77-08849

EFFECTS OF STREAM CHANNELIZATION ON BOTTOMLAND AND SWAMP FOREST ECOSYSTEMS,
North Carolina State Univ. at Raleigh. School of Forest Resources.
For primary bibliographic entry see Field 4A.
W77-08920

SEASONAL PATTERNS OF DISSOLVED OXYGEN, NUTRIENTS, AND METALS IN NATURAL AND CHANNELIZED SWAMP STREAMS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5B.
W77-08932

COUPLED DYNAMIC STREAMFLOW-TEMPERATURE MODELS,
Utah Water Research Lab., Logan.
D. S. Bowles, D. L. Fread, and W. J. Grenney.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings Paper 12929, p 515-530, May 1977. 7 fig, 2 tab, 13 ref, 1 append.

Descriptors: *Computer models, *Forecasting, *Texas, Model studies, Heat balance, Hydraulics, Rivers, Mathematical models, Streamflow forecasting, Systems analysis, Temperature, *Water temperature.
Identifiers: *Systems engineering, *Dynamic streamflow, *Brazos-Little River System(Texas), Stream-water quality, Dynamic stream temperature model, Heat exchange, Parameters.

Interest in stream temperature prediction stems largely from concern for the possible deleterious environmental consequences of thermally polluted surface waters. Stream temperature is an important determinant of the solubility fo dissolved gases, biological reaction kinetics, the distribution of fish and lower forms of aquatic life, and the efficiency of water treatment for domestic and industrial use. Th epaper described the Hynamic Stream Temperature Model (DSTEMP). The model is suitable for prediction of stream temperatures over a diurnal cycle and over extended periods of time. The DSTEMP model can be used for unsteady flow conditions by linkage with a dynamic streamflow routing model (DNRT). Alternatively, steady flow conditions may be specified. Data requirements are realistic in terms of data types usually collected by the National Weather Service, NOAA, and the United States Geological Survey. In addition to describing the model, an application of DNRT-DSTEMP to the Brazos-Little Rivers, Texas, was included to illustrate that the models provide a practical tool for streamflow-stream temperature forecasting. (Roberts-ISWS)
W77-09014

PRINCIPLES OF GRAPHICAL GRADUALLY VARIED FLOW MODEL,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
N. Kouwen, R. A. Harrington, and S. I. Solomon.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings Paper 12939, p 531-541, May 1977. 7 fig, 5 ref, 2 append.

Descriptors: *Backwater, *Model studies, *Flow, Computers, Gradually varied flow, *Graphical analysis, Graphical methods, Hydraulics, Open channel flow, Flow profiles, Equations, Rivers.
Identifiers: *Backwater models, *Hydraulic transform graphs, Water surface profiles.

Any gradually varied flow computation requires the solution of the energy and continuity equations. To this end, many techniques are available. For prismatic channels, the Direct Step Method gives a result without requiring iteration. However, for nonprismatic channels, it is necessary to resort to some variation of the Standard Step Method, thereby requiring some iterative procedure. A graphical solution, using a simple program to construct a set of curves, can eliminate iteration as well as retain flexibility with regard to flow variations along the reach. To accomplish this, a graphical solution of the energy equation was presented which uses hydraulic transform graphs for river cross sections along a reach. (Lee-ISWS)
W77-09015

DRAG AND INERTIA FORCES ON A CYLINDER IN PERIODIC FLOW,
Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W77-09017

CHEMICAL CHARACTER OF HEADWATER STREAMS IN VERMONT AND NEW HAMPSHIRE,
Dartmouth Coll., Hanover, N.H.
For primary bibliographic entry see Field 2K.
W77-09027

MULTIVARIATE DISTRIBUTIONS IN HYDROLOGY AND RIVER REGULATION,
N. A. Kartvelishvili, and L. T. Gottschalk.
Nordic Hydrology, Vol. 7, No. 5, p 265-280, 1976. 5 fig, 2 tab, 7 ref.

Descriptors: *Runoff, *Rivers, *Model studies, Mathematical models, *Regulated flow, *River regulation, Markov processes, Finite element analysis, Hydrology, *Distribution patterns.
Identifiers: *Multivariate distributions.

It is assumed that the river runoff process can be approximated by a Markov process. The process is described by M distribution functions. Fundamental hypothesis of relations between multivariate distributions and corresponding maginal distributions was given. A finite difference scheme for multisite and multilag generation of river runoff was derived. The derivation is based on the multivariate normal distribution. Different methods of determination of the order of the finite difference scheme were discussed as well as the influence of model order and method of parameter estimation on properties of the model. (Sims-ISWS)
W77-09029

ROUGHNESS EFFECTS ON THE FLOW DIRECTION NEAR CURVED STREAM BEDS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
For primary bibliographic entry see Field 8B.
W77-09038

DISPERSION MEASUREMENT ON THE DANUBE,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5B.
W77-09040

SPECIES DIFFERENCES IN BREAKDOWN OF TREE LEAVES IN STREAMS--SIGNIFICANCE FOR COMPOSITION OF STREAM COMMUNITIES,
California Univ., Santa Barbara, Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-09056

FLOOD-PLAIN DELINEATION FOR DIFFICULT RUN BASIN, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-09071

A REVIEW OF VELOCITY-MEASURING DEVICES,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-09085

COMPUTER APPLICATIONS FOR STEP-BACKWATER AND FLOODWAY ANALYSES,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-09090

2F. Groundwater

GEOPHYSICAL EXPLORATION FOR POTABLE GROUNDWATER SUPPLIES IN THE KALAHARI GEMSBOK NATIONAL PARK,
Ruker (Richard) and Associates, Bryanston (South Africa).
For primary bibliographic entry see Field 4B.
W77-08654

FAULT CONTROL OF SUBSIDENCE, HOUSTON, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 4B.
W77-08662

GROUND WATER BUDGET OF THE MOUNTAINOUS REGIONS OF HUNGARY, (IN HUNGARIAN),
Hungarian State Geological Inst., Budapest.
L. Szebenyi.
Magy All Foldtani Intez Evi Jel. 1971; p 221-228, 1973.

Descriptors: *Groundwater, Europe, Mountains, Infiltration, *Groundwater basins, *Base flow, *Karst hydrology, *Water yield, Mountains, Ephemeral streams, Karst, Hydrogeology.
Identifiers: *Hungary.

The dynamic ground water reserves of Hungary's basins were calculated in profiles plotted on the basin margins. The ground water reserves communicating through filtration in these profiles are complemented with the surplus of the infiltrated waters returning to the surface within the confines of the mountains. The quantity of ground waters infiltrating in the mountainous regions and returning to the surface in one and the same region is defined by the base flow of the water-courses. In Hungary, on the basis of the data so far available, this base flow is best characterized by the Aug. discharge of 85% frequency. Dividing this by the corresponding drainage area, one can obtain the hydrogeological characteristics of the region. Values higher than 150m3/day/km2 are characteristic of Mesozoic karstic areas; 50 to 150m3/day/km2 are uncharacteristic, occurring in areas of insignificant size; 21-50m3/day/km2 are characteristic of the Oligocene-Miocene areas of NE Hungary and of some volcanic zones; 10-20m3/day/km2 are most characteristic of the internal parts of most of the mountainuous regions, areas least-covered by Pleistocene; 10-15m3/day/km2 are characteristic of the less elevated parts of these regions, areas carrying a comparatively thicker loess-and-loam (red clay) overburden. Drainage basins having a module lower than 9m3/day/km2 occur on the margins of the mountains, where the debris cones appear. These data are characteristic of the drier late-summer period. In addition to this, the potential winter accumulation of water reserves in karstic areas is considerable, where winter accumulation attains about one and the half of the base flow yield.--Copyright 1974, Biological Abstracts, Inc.
W77-08663

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
For primary bibliographic entry see Field 2K.
W77-08677

TEMPERATURE AND CHEMISM OF GROUND WATERS IN THE WESTERN AREAS OF THE EAST EUROPEAN PLATFORM,
Akademiya Nauk SSSR, Moscow. Interagency Geophysical Committee.
For primary bibliographic entry see Field 2K.
W77-08683

THE HYDROGEOLOGIC REGIME OF GLACIAL-TERRAIN LAKES, WITH MANAGEMENT AND PLANNING APPLICATIONS,
Wisconsin Univ. Extension, Madison.
S. M. Born, S. A. Smith, and D. A. Stephenson.
An Inland Lake Renewal and Management Demonstration Project, 1974. 73 p, 14 fig, 6 tab, 90 ref, 1 append.

Descriptors: *Hydrogeology, *Groundwater, *Infiltration, *Hydrologic budget, *Soil water movement, *Surface water, *Lakes, Rainfall-runoff relationships, *Wisconsin, *Groundwater-surface water relationships, Planning, Natural resources, Water management(Applied).
Identifiers: *Regime dominance, *System efficiency, *Lake environments, Snake Lake Rehabilitation Project, Upper Great Lakes Regional Commission, Lake management.

Hydrogeologic information is not conventionally given adequate attention in planning and managing lake resources. The ground water regime in the vicinity of lakes is often unknown. The authors chose to study the hydrogeology in the glaciated, temperate states in the U.S. The objectives of the paper are: compile available hydrogeologic information; describe hydrogeologic aspects of lakes emphasizing ground water/surface water relationships; specify and classify critical hydrogeologic informational needs for evaluating lake environments; and show the utility of hydrogeological information for lake management and development activities. Hydrogeologic factors needed to assess lake environments are; regime dominance (relative magnitude of ground water in a lake's water intake); system efficiency (the rate of ground water/lake interchange); and position of a lake within a ground-water flow system. The Snake Lake rehabilitation project in northern Wisconsin and the planning of a recreational new town in northwestern Wisconsin illustrate the application of lake/ground-water information. (Gentry-NC)
W77-08724

RECORDS OF WELLS, WATER-LEVEL MEASUREMENTS, AND DRILLERS' LOGS, RED RIVER VALLEY, LOUISIANA,
Geological Survey, Little Rock, Ark. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08734

GUIDE FOR DATA COLLECTION TO CALIBRATE A PREDICTIVE DIGITAL GROUND-WATER MODEL OF THE UNCONFINED AQUIFER IN AND NEAR THE CITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. W. Page.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 602, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-41, February 1977. 46 p, 19 fig, 1 tab, 30 ref.

Descriptors: *Groundwater resources, *Model studies, *Hydrogeology, *Water table aquifers, *California, Alluvial aquifers, Groundwater movement, Pumping, Specific yield, Transmissivity, Groundwater recharge, Water levels, Specific retention.
Identifiers: *San Joaquin Valley(Calif), Modesto area(Calif).

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he city of Modesto encompasses about 12 square iles in the northeastern part of the San Joaquin alley, Calif. The ground-water model encomasses about 542 square miles. In the Modesto rea, ground water occurs in an unconfined quifer a confined aquifer. both of which are comosed of unconsolidated materials, and a conolidated-rock aquifer. Only the unconfined quifer was modeled, using several simplifying assumptions concerning hydrologic conditions in the round-water basin. A program is used that comutes the net rate of recharge and discharge under teady-state conditions. The model was then odified until reasonable values of recharge and ischarge were computed. Testing of the model indicated that simulated water levels were especially ensitive to tansmissivity, storage coefficient, irigation return, and riverbed hydraulic conductivi-y; amond the parameters that affected water evels least were the vertical hydraulic conductivi-y and specific storage of the confining bed, the o-called E-clay. (Woodard-USGS)
W77-08735

SIMULATIONS OF WATER-LEVEL DRAWDOWNS IN PROPOSED WELL-FIELD AREAS, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08739

WATER-LEVEL CHANGES IN NORTHWESTERN KANSAS, 1950-76,
Geological Survey, Lawrence, Kans. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08742

ARTIFICIAL RECHARGE FOR SUBSIDENCE ABATEMENT AT THE NASA-JOHNSON SPACE CENTER, PHASE I,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08744

GROUND-WATER DATA FOR MICHIGAN, 1975,
Geological Survey, Lansing, Mich. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08753

SIMULATION OF POLLUTANT MOVEMENT IN GROUNDWATER AQUIFERS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-08807

SURFACE-GROUNDWATER INTERACTIONS AND THE CONJUNCTIVE USE OF THE WATER RESOURCES OF THE MULLICA RIVER BASIN, NEW JERSEY,
Rutgers - The State Univ. New Brunswick N. J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-08810

EXPERIMENTAL STUDY OF MULTI-CATION DIFFUSION IN AN ARTIFICAL QUARTZ SANDSTONE,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-08811

SIMULATION OF TWO-DIMENSIONAL CONTAMINANT TRANSPORT WITH ISOPARAMETRIC HERMITIAN FINITE ELEMENTS,
Princeton Univ., N.J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08829

A MATHEMATICAL MODEL STUDY OF FRESH-WATER LENSES,
Aston Univ., Birmingham (England). Dept. of Civil Engineering.
T. R. E. Chidley, and J. W. Lloyd.
Ground Water, Vol 15, No 3, p 215-222, May-June 1977. 8 fig, 9 ref.

Descriptors: *Groundwater, *Islands, *Model studies, Mathematical models, Saline water-freshwater interfaces, Aquifers, Permeability, Water levels, Fluctuations, Water levels fluctuations, Groundwater movement, Groundwater recharge, Groundwater resources.
Identifiers: *Freshwater lenses, *Caribbean Sea, *Grand Cayman Island.

An analysis of the unsteady flow in a freshwater lens on a small tropical thickness. An alternative view of the problem to that most commonly given was presented. Results were shown for some lenses on Grand Cayman Island in the Caribbean Sea. The aquifer material is a micro-karst limestone. The chief result of engineering significance was that the conventional steady-state analysis was shown to be a sound basis for estimating the long-term yield if drought sequences are not long. (Sims-ISWS)
W77-08837

DIGITAL MODEL STUDIES OF STEADY-STATE RADIAL FLOW TO PARTIALLY PENETRATING WELLS IN ALLUVIAL PLAINS,
Indian Inst. of Tech. Kanpur. Dept. of Civil Engineering.
V. Lakshminarayana, and S. P. Rajagopalan.
Ground Water, Vol 15, No 3, p 223-230, May-June 1977. 5 fig, 4 tab, 4 ref.

Descriptors: *Groundwater, *Groundwater movement, *Water wells, *Model studies, Mathematical models, Drawdown, Wells, Water levels, Water table, Flow, Aquifers, Screens, Well screens, Permeability, Anisotropy, Pumping, Computer models.

A digital simulation model for the steady-state radial flow towards partially penetrating wells in the alluvial plains was presented. As the deposits in these plains are heterogenous with several good water-bearing formations crisscrossed with silty layers, the deposits were treated as a single anisotropic aquifer with water table conditions prevailing. The iterative alternate direction implicit technique was used for the solution of the steady-state flow. The digital simulation model was used to study the effects of anisotropy, screen setting, and screen length on the discharge per unit length of screen. The model also was used to evaluate the errors involved in determining lateral permeability from distance-drawdown data. The digital simulation model was applied to field pumptest data for purposes of identification of aquifer anisotropy and radius of influence of well; and the model was used in evaluation of errors in determining lateral permeability from distance-drawdown data. (Sims-ISWS)
W77-08838

SEEPAGE UNDER STRUCTURE ON N STRATA OF SOIL,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
C. W. Lenau.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings Paper 12911, p 483-497, May 1977. 4 fig, 2 tab, 2 ref, 4 append.

Descriptors: *Underseepage, *Stratification, *Hydraulic structures, *Mathematical models, Equations, Groundwater movement, Underflow, Seepage, Permeability, Aquifers, Confined water, Artesian heads, Dams.
Identifiers: Boundary conditions.

A solution was developed for the discharge under a structure resting on N srrata of equal thickness. The solution was an asymptotic approximation of the exact solution for large values of the structure length. However, because neglected terms are exponentially small, the solution is accurate for a very wide range of conditions. Because successive strata can have equal permeability, the solution can be applied to almost any combination of strata thicknesses and permeabilities. (Visocky-ISWS)
W77-08843

FINITE ELEMENT SOLUTION OF THE TWO-DIMENSIONAL UNSATURATED FLOW EQUATION,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 2G.
W77-08923

SHAPE OF A STREAMLINE WATER TABLE NEAR INFLOW AND OUTFLOW BOUNDARIES,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
C. W. Boast.
Water Resources Research, Vol 13, No 2, p 325-328, April 1977. 3 fig, 1 tab, 12 ref.

Descriptors: *Water table, *Shape, *Boundaries(Surfaces), *Flow nets, Mathematical models, Inflow, Discharge, Slopes, Equations, Graphical analysis, Dupuit-Forchheimer theory, Dams.
Identifiers: Streamlines, Hodographs.

A streamline water table usually is pictured to leave an inflow boundary perpendicular to the surface and to approach an outflow boundary tangential to the surface for vertical surfaces or for inclined surfaces with the porous medium 'below' the surface. The hodograph solution for the problem of flow through a vertical walled dam proved that, theoretically, the water table streamline leaves the inflow boundary horizontally and approaches the outflow boundary vertically. However, the solution shows that at a practical scale the water table meets the boundaries at finite nonzero slopes. The actual water table shape deviates considerably from the usual way that the water table is sketched. The cause of the difference lies in an intuitive but incorrect assumption that the slope of the water table does not change dramatically near the endpoints of the water table. (Visocky-ISWS)
W77-09023

TRANSIENT ANALYSIS OF PHREATIC AQUIFERS LYING BETWEEN TWO OPEN CHANNELS,
Punjab Agricultural Univ., Ludiana (India). Dept. of Soil and Water Engineering.
S. R. Singh, and C. M. Jacob.
Water Resources Research, Vol 13, No 2, p 411-419, April 1977. 3 fig, 1 tab, 16 ref.

Descriptors: *Aquifers, *Groundwater movement, *Hydrodynamics, *Model studies, Mathematical models, Groundwater, Channels, Hydraulic conductivity, Water table, Water levels, Precipitation(Atmospheric), Infiltration, Recharge, Withdrawal, Hydraulics.

The unsteady-state flow of water through an unconfined aquifer can be represented by the Boussinesq equation. The nonlinear term involving the highest derivative in this equation was approximated by a linear term, and the resulting ap-

proximate Bossinesq was linearized to a Fokker-Planck equation by the method of functional transformation. Solutions to the problem of groundwater flow through phreatic aquifers lying between (1) constant water level boundaries and (2) variable water level boundaries were obtained from the general solution of the Fokker-Planck equation for constant and variable rates of recharge and withdrawal. Variable rates of recharge and withdrawal were approximated by periodic step functions which represented two different rates, one each for both rainy and dry seasons. Variable water levels in the open channels were approximated by step functions, and the initial condition was represented by straight line segments. An analytical solution of the approximate Boussinesq equation was compared with the finite difference solution of the original Boussinesq equation. The difference between the two solutions was almost negligible, and therefore, the applicability of the analytical solutions to groundwater resource management was established. The effect of variable water level boundaries on groundwater dynamics was studied by performing a sample calculation. (Sims-ISWS)
W77-09026

GROUND WATER MODEL FOR THE ISLAND OF ANHOLT, DENMARK,
Roskilde Univ. Center. (Denmark).
N. Schroder, and H. Obro.
Nordic Hydrology, Vol. 7, No. 5, p 281-292, 1976. 11 fig, 6 ref.

Descriptors: *Groundwater, *Groundwater movement, Islands, *Model studies, Mathematical models, Saline water-freshwater interfaces, Recharge, Withdrawal, Groundwater recharge, Infiltration, Precipitation(Atmospheric), Sewage, Foreign countries, Foreign research, Cesspools, Geology, Hydrology, *Computer models.
Identifiers: *Anholt Island(Denmark), *Denmark, *Groundwater models.

The development and application of a digital computer model of the groundwater reservoir of the island of Anholt were described. The model was based on a finite difference, two-dimensional approach. It was used successfully to investigate if the groundwater at a planned well field might be polluted by sewage from nearby cesspools. Although the model was an approximation of the real aquifer conditions, the model was very useful, and it was suggested that modelling techniques be more widely used in groundwater resource investigations. (Sims-ISWS)
W77-09030

TRANSJOEN, A GROUNDWATER INFLUENCED LAKE WITH SPECIAL REDOX AND SULPHATE CONDITIONS,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 2H.
W77-09031

SOLUTE TRAVEL TIMES TO WELLS,
Iowa State Univ., Ames. Dept. of Agronomy; and Iowa State Univ., Ames. Dept. of Physics.
For primary bibliographic entry see Field 5B.
W77-09042

CHARACTER OF SEEPAGE OF PRECIPITATION TO THE WATER TABLE IN THE CENTRAL FOREST STEPPE,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 4B.
W77-09043

ARTIFICIAL RECHARGE TO A FRESHWATER-SENSITIVE BRACKISH-WATER SAND AQUIFER, NORFOLK, VIRGINIA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09066

ANALOG SIMULATION OF THE GROUNDWATER SYSTEM, YUMA, ARIZONA,
Geological Survey, Reston, Va. Water Resources Div.
E. P. Patten, Jr.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $1.35. Professional Paper 486-I, 1977. 10 p, 4 fig, 1 plate, 3 tab, 6 ref.

Descriptors: *Groundwater movement, *Analog models, *Arizona, *Mexico, *International Bound and Water Comm, Groundwater resources, Aquifers, Pumping, Water utilization, Irrigation, Water supply, Water demand, Projections, Groundwater availability.
Identifiers: *Yuma area(Ariz).

An electric analog model was used to simulate the ground-water system of the Yuma area, Arizona, and to predict the magnitude of southwesterly flow of ground water across the limitrophe section of the Colorado River. An evaluation of alternative ground-water recovery plans indicated that there would be little effect on the flow across the limitrophe section but a substantial decrease in flow across the Arizona-Sonora international boundary. (Woodard-USGS)
W77-09067

HYDROLOGIC RECONNAISSANCE OF THE GEOTHERMAL AREA NEAR KLAMATH FALLS, OREGON, WITH A SECTION ON PRELIMINARY INTERPRETATION OF GEOPHYSICAL DATA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09070

REPORT ON PRELIMINARY DATA FOR MADISON LIMESTONE TEST WELL NO. 1, NE1/4SE1/4 SEC. 15, T. 57 N., R. 65 W., CROOK COUNTY, WYOMING,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09072

GROUND-WATER RESOURCES AND GEOLOGY OF WALWORTH COUNTY, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
R. G. Borman.
Wisconsin Geological and Natural History Survey, Madison, Information Circular No 34, 1976. 45 p, 24 fig, 1 plate, 2 tab, 33 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water quality, *Water utilization, Water wells, Water yield, Surface-groundwater relationships, Streamflow, Low flow, Chemical analysis.
Identifiers: *Walworth County(Wis).

In Walworth County, Wis., good-quality water is available from the sand-and-gravel, Niagara, Galena-Platteville, and sandstone aquifers. Yields of more than 1,000 gallons per minute are available from glacial drift where it contains a sufficient thickness of saturated sand and gravel. The Niagara aquifer is a dolomite that occurs in the eastern fourth of the county. It is capable of yielding over 100 gallons per minute. The Galena-Platteville aquifer is also a dolomite, but occurs in the west half of the county. It is capable of yielding over 500 gallons per minute. The sandstone aquifer underlies the entire county and is capable of yielding 1,000 gallons per minute to wells in the county. The sand-and-gravel and sandstone aquifers are the principal sources of municipal water. The chemical quality of water from the four aquifers is similar. Median values for hardness and dissolved solids range from 300 to 350 milligrams per liter. Iron and manganese are present in bothersome amounts. About 6.6 million gallons per day was pumped in the county in 1971, 53 percent from the sand-and-gravel aquifer and 41 percent from the sandstone aquifer. About 40 percent of the water pumped was for residential use and 38 percent was for industrial and commercial use. (Woodard-USGS)
W77-09081

CHEMICAL AND ISOTOPIC INVESTIGATIONS OF GROUNDWATER IN POTENTIAL GEOTHERMAL AREAS IN HAWAII,
Hawaii Inst. of Geophysics, Honolulu; and Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-09082

GROUND-WATER HYDROLOGY OF BERKELEY COUNTY, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09083

WATER-LEVEL RECORDS FOR THE SAN LUIS VALLEY OF COLORADO, 1973-77,
Geological survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09088

INTEGRAL EQUATION FOR THE DESCRIPTION OF STREAM-AQUIFER INTERACTION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 123, Price codes: A02 in paper copy, A01 in microfiche. Report CEP74-75HJM35, Engineering Research Center, Colorado State University Fort Collins, January 1975. 21 p, 24 ref. OWRT B-109-Colorado(1). 14-31-0001-4067.

Descriptors: *Groundwater, *Surface-groundwater relationships, Aquifers, Base flow, *Equations, Flow systems, Pumping, Flooding.
Identifiers: Groundwater models, Flow routing, *Stream-aquifer interactions.

An integral equation is derived which completely characterizes the interaction between a stream and the alluvial aquifer. Expressed in finite difference form the equation is of great practical utility to solve pure flooding problems (negligible effect of pumping on river flows) as it relates river stages to return flows, or pure conjunctive use of surface and groundwater problems (negligible river stage fluctuations) as it relates return flows to pumping rates, or composite problems. The numerical procedures to calculate the response function coefficients in terms of the physical characteristics of the system are given in detail.
W77-09092

2G. Water In Soils

NITROGEN REMOVAL FROM SECONDARY EFFLUENT BY A LABORATORY SOIL COLUMN,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-08607

THE EFFECT OF SOIL MOISTURE ON THE DEVELOPMENT OF SOIL MICROFLORA IN

CONDITIONS OF FIELD EXPERIMENTS, (IN SLOVAK),
Vyskumny Ustav Rastlinnej Vyroby, Piestany (Czechoslovakia).
For primary bibliographic entry see Field 5B.
W77-08696

AN ECOLOGICAL MODEL FOR HEAVY METAL CONTAMINATION OF CROPS AND GROUND WATER,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5B.
W77-08706

STRENGTH OF SOIL AGGREGATES: INFLUENCE OF SIZE, DENSITY AND CLAY AND ORGANIC MATTER CONTENT,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
A. S. Rogowski, and D. Kirkham.
In: 3rd International Symposium on Soil Conditioning, Med. Fac. Landbouww. Rijksuniv. Gent 41/1-1976, p 85-100, 1 fig, 5 tab, 39 ref.

Descriptors: *Soil aggregates, *Soil strength, Size, Organic matter, Soil type, Raindrops, Impact(Rainfall), Cracks, Failure, Rill, Erosion, Soil density, Shear stress, *Iowa.
Identifiers: *Dry aggregate strength, Detachment(Soils), Soil conditioners, Wet aggregate strength.

Aggregates from the plowlayer of three Iowa soils were separated into several size-density groups by gravity fractionation. Carbon, clay, water stability and strength analysis were performed on each group. The density groups could best be described by ranges which showed some tendency to overlap. Aggregate strength decreased with size. Between the soils, large increases in clay content were accompanied by large increase in strength. Raindrop impact and associated shear stress is the principal mechanism of detachment. Processes which promote cracking within the soil mass are likely to facilitate detachment. It is hypothesized that rills are likely to develop on soils where low density values are distributed unevenly over an areal, particularly in the zones of streamline convergence. Use and development of soil conditioners to counteract the shear and seepage forces as well as to provide a skeletal structure for low density material is desirable. (ARS).
W77-08707

SOIL TESTING FOR SLUDGE DISPOSAL.
For primary bibliographic entry see Field 5E.
W77-08728

SOIL-MOISTURE STRESS AS RELATED TO PLANT-MOISTURE STRESS IN BIG SAGEBRUSH,
Geological Survey, Lakewood, Col. Water Resources Div.
F. A. Branson, and L. M. Shown.
Journal of Range Management, Vol 28, No 3, p 212-215, May 1975. 4 fig, 16 ref.

Descriptors: *Sagebrush, *Soil-water-plant relationships, *Moisture stress, *Evapotranspiration, *Plant growth, Seasonal, Fluctuations, Phenology, Watersheds(Basins), *Colorado, River basins.
Identifiers: *Internal-plant stress range, *Soil-moisture stress, Soil salinity, Leaf persistence, *Eagle River basin(Colo).

Seasonal variation in internal-moisture stress in big sagebrush (Artemisia tridentata Nutt.) is significantly related (correlation coefficient +0.68) to the lowest soil-moisture stresses in the soil profile. Seasonal values for internal-plant stresses range from 15.3 to 59.8 bars; for lowest soil stress the range was 0.2 to 36.4 bars. Hour of day, wind, and net radiation are also significantly related to internal-moisture stress in plants. The results presented support the hypothesis that inexpensive internal-plant stress measurements may be used to estimate soil-moisture stress and soil-moisture storage. (Woodard-USGS)
W77-08751

MOVEMENT OF MANURIAL NITROGEN IN COOL, HUMID CLIMATES,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-08819

ATMOSPHERIC SULFATE ADDITIONS AND CATION LEACHING IN A DOUGLAS FIR ECOSYSTEM,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 2K.
W77-08822

EFFECTS OF SPATIAL VARIABILITY OF SOIL HYDRAULIC PROPERTIES IN WATER BUDGET MODELING,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Land Resources Management.
A. J. Peck, R. J. Luxmoore, and J. L. Stolzy.
Water Resources Research, Vol. 13, No. 2, p 348-354, April 1977. 4 fig, 4 tab, 22 ref.

Descriptors: *Soil properties, *Hydraulic properties, *Hydrologic budget, *Model studies, *Tennessee, Soil horizons, Hydraulic conductivity, Precipitation(Atmospheric), Rain-runoff relationships, Soil water, Soil profiles, Darcys law, Retention, Infiltration, Evapotranspiration.
Identifiers: Spatial variability, Scaling factor.

There is appreciable spatial variability of soil properties on the scale of a watershed or a field even in a single soil type. The spatial variation of soil water characteristics in an area was simulated from average properties and the assumption of scale heterogeneity. Simulated soil water characteristics and other data representing forest vegetation were used in a model to simulate water budgets over part of a watershed in eastern Tennessee for average April and July weather. Precipitation was assumed to be uniform over the area, and there was no runoff even from the least permeable soil during the months simulated. The spatial variability of soil water conditions had only a small effect on evapotranspiration. Water storage in the soil profile changed, so that the drainage flux beyond the root zone tended to become uniform throughout the area simulated. The characteristic microscopic length of the soil was assumed to be normally distributed in an area, and equations were developed for calculating average soil water characteristics from the retention curves and hydraulic conductivities of a number of soil samples. Components of the water budgets simulated with average soil water characteristics were in excellent agreement with the simulated behavior of the spatially variable soil unit as a whole. The result does not imply similar agreement for other distribution functions and soil-plant-weather combinatons, but the methodology developed may be applied to investigate similar problems. (Visocky-ISWS)
W77-08825

FLOW CHARACTERISTICS DURING INFILTRATION INTO A HORIZONTAL SAND COLUMN,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
A. Poulovassilis.
Water Resources Research, Vol. 13, No. 2, p 369-374, April 1977. 9 fig, 13 ref.

Descriptors: *Infiltration, *Diffusivity, *Soil water movement, Soil water, Flow, Laboratory tests, Darcys law, Hydraulic conductivity, Permeability, Groundwater, Groundwater movement, Hysteresis, Soil moisture, Reynolds number, Tensiometers, Porous media, Soils.

Experimental water content profiles established during infiltration into a horizontal sand column were compared with theoretical profiles calculated from the soilwater diffusivity, which was determined independently of the infiltration process. Discrepancies between the theoretical and experimental profiles were found. In particular, the experimental profiles for small times showed a retardation of the penetration which became more pronounced as the water content increased, and no unique relationship between the water content and the variable lambda= x/sq root of t (x being the distance and t the time) was found. Thus, the experimental profiles gave incorrect and varying soilwater diffusivities. The comparison of the actual flow rate q with the rate q' given by the product of the hydraulic conductivity and the observed potential gradient showed that q= alpha q', where alpha is between 0 and 1, alpha varying with the water content and the potential gradient. The effect of the 'less than proportional' flow on the profile development was discussed. It was argued that the infiltration process at relatively late times was conditioned by the profile development during the very early stages. Previous experimental infiltration work was discussed, and it was argued that two mechanisms able to produce non-Darcian behavior may be responsible for the various reported infiltration patterns. Finally, the results of the present work were discussed in terms of a critical Reynolds number where the flow becomes non-Darcian. (Sims-ISWS)
W77-08826

WATER AND ICE POTENTIALS IN FROZEN SOILS,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 2C.
W77-08828

SIMULATION OF TWO-DIMENSIONAL CONTAMINANT TRANSPORT WITH ISOPARAMETRIC HERMITIAN FINITE ELEMENTS,
Princeton Univ., N.J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08829

RETENTION AND FLOW CHARACTERISTICS OF POLYMER SOLUTIONS IN POROUS MEDIA,
Kansas Univ., Lawrence.
J. G. Dominguez, and G. P. Willhite.
Society of Petroleum Engineers Journal, Vol 17, No 2, p 111-121, April 1977. 11 fig, 6 tab, 23 ref.

Descriptors: *Retention, *Flow, *Polymers, *Porous media, *Aqueous solutions, Porosity, Cores, Permeability, Laboratory tests, Dispersion, Laboratory equipment, Analytical techniques, Wettability, Velocity, Interstices.
Identifiers: *Linear displacement, *Teflon, Resistance factor, Mechanical entrapment.

Retention and flow characteristics of a solution containing Pusher 700, a high-molecular-weight, partially hydrolyzed polyacrylamide, were studied in an 86-md core made by compacting Teflon powder. The quantity of polymer retained during linear displacement experiments ranged from 10 to 21 microgram/gm for polymer concentrations of 100 to 500 ppm in 2% NaCl solutions. Nearly all retention was attributed to mechanical entrapment because of low polymer adsorption on the Teflon surface. Flow rate affected polymer retention. An increase in velocity was accompanied by polymer retention. Polymer was expelled when the flow

rate was reduced. Inaccessible pore volume was about 19% of the total pore volume. Resistance factors in different sections of the core ranged from 2 to 10 for solutions of 100 to 500 ppm polymer concentration in 2% NaCl. Permeability reduction resulting from polymer retention produces the resistance factor in most of the core at a velocity of 3.2 ft/D. Resistance factors in the Teflon cores were 2 to 3 times lower than those reported for natural porous media where polymer is also retained by adsorption. (Visocky-ISWS)
W77-08850

FINITE ELEMENT SOLUTION OF THE TWO-DIMENSIONAL UNSATURATED FLOW EQUATION,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, Jr., G. Zyvoloski, and J. M. Sloss.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 999, Price codes: A06 in paper copy, A01 in microfiche. College of Engineering, (UCSB-ME-75-2), August, 1975. 100 p, 8 fig, 1 tab, 17 ref, append. (California Water Resources Center Project UCAL-WRC-W-336). OWRT A-039-CAL(12).

Descriptors: *Finite element analysis, *Mathematical studies, *Analytical techniques, *Unsaturated flow, *Groundwater movement, Computer programs, Equations, Methodology, Moisture content, Loam, Sands, Clays, Soils.

The two-dimensional partial differential equation describing the movement of groundwater is investigated using the finite element method. The relevant finite element theory is introduced using the two-dimensional linear diffusion equation and then applied to the unsaturated flow equation. The technique employed to solve the equation utilized isoparametric finite elements of the linear or quadratic type. The approach consists of expanding the nonlinear terms in shape functions and employing successive substitution until a fixed error criterion was satisfied. Convergence is usually very fast. Several examples are given comparing the results obtained to similar studies using finite difference techniques. A sample computer program is also provided. The theoretical questions of uniqueness and convergence are considered in detail and a rigorous derivation of error estimates is presented. (Snyder-California, Davis)
W77-08923

PROBLEMS OF OPTIMUM SOIL MOISTURE LEVEL: DETERMINATION AND CONTROL, (IN RUSSIAN),
Moscow State Univ. (USSR).
I. I. Sudnitsin, N. A. Muromtsev, and M. E. Ginzburg.
Vestn Mosk Univ Ser 6 Biol Pochvoved. 29(3), p 32-42, 1974.

Descriptors: *Soil moisture, Transpiration, Soil moisture meters, Loam, Sands, Soil types, Plant physiology.
Identifiers: *Optimum soil moisture.

To find the optimum range of soil moisture for plants, the relationships between soil moisture availability for plants (relative transpiration) and soil moisture potential must be determined. These relationships are not the same for various plants and environments. Soil moisture availability at the same potential is higher for xerophytic than mesophytic and hydrophytic plants; for plants grown on loamy than on sandy soils; for plants with dense roots; for plants during middle stages of their growth; for plants which had survived previous droughts.--Copyright 1975, Biological Abstracts, Inc.
W77-08952

INFILTRATION EQUATIONS FOR SIMPLE SOIL SYSTEMS,
Sydney Univ. (Australia). Dept. of Soil Science.
N. Collis-George.
Water Resources Research, Vol 13, No 2, p 395-403, April 1977. 3 fig, 1 tab, 24 ref.

Descriptors: *Infiltration, *Soil properties, *Model studies, Mathematical models, Equations, Soils, SOil water, *Soil water movement, Hortons law, *Infiltration rates, Dispersion.
Identifiers: Green-Ampt equation, Fokker-Planck equation, van der Want equation.

Empirical equations and physically based equations used to describe vertical infiltration into simple soil systems were compared with experimental data. An empirical equation was proposed which satisfies the conditions that cumulative infiltration is proportional to the sq root of time at short times and reaches a steady-state infiltration rate at long times. The equation, i = i sub o (sq root of tanh T) + Kt, describes the observed behavior of simple soil systems at all times; where i is the cumulative infiltration at time t, K is the infiltration rate at steady-state, i sub o = S(sq root of t sub c), and T = t/t sub c. The sorptivity, S, and a time parameter, t sub c, are soil properties determinable experimentally. The Green and Ampt equation and the Horton equation do not satisfy observed behavior at all times, the former failing at long times and the latter at short times. The equation of van der Want, the linearized Fokker-Planck equation of Philip, and the nonlinearized Fokker-Planck equation of Knight and Philip do not describe the observed behavior of simple soil systems over the whole time range as precisely as the proposed empirical equation. Since i sub o is not an independent part of the equations, its numerical value is defined by the independent parameters S and K; and for the materials examined, the numerical value is generally not the same as the experimental value. Procedures were outlined for treating experimental data, not necessarily complete for all times, to produce the three parameters, K,S, and t sub c for simple systems, and for description infiltration into cracking clays or in cases where ultrashort time effects occur. (Sims-ISWS)
W77-09025

WETTABILITY OF COAL-MINE SPOILS IN NORTHWESTERN NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W77-09041

ADSORPTION AND VERTICAL MOVEMENT OF THE ZINC AND MANGANESE IONS IN THREE TYPES OF SOIL,
Tuskegee Inst., Ala. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 5B.
W77-09054

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENT - PHASE I,
Massachusetts Univ., Amherst. Environmental Engineering.
For primary bibliographic entry see Field 5E.
W77-09063

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENTS, PHASE II,
Massachusetts Univ., Amherst. Environmental Engineering.
For primary bibliographic entry see Field 5E.
W77-09064

2H. Lakes

A PRIMER ON LIMNOLOGY,
Minnesota Univ., Minneapolis. Linmological Research Center.
J. B. Lundquist.
Available from the National Technical Information Service Springfield, VA as PB-268 778, Price codes: A03 in paper copy, A01 in microfiche. University of Minnesota, Water Resources Research Center, Minneapolis, Public Report Series Number 1, August 1975. 28 p. OWRT A-999-MINN(38).

Descriptors: *Limnology, *Lakes, Eutrophication, Pollution.

This publication provides an introduction to limnology, identifies some of the lake problems that are influenced by human activities, and outlines some prodcedures for studying individual lakes. This is an introduction to Limnology and it should be comprehensible to readers with junior high and high school science background.
W77-08605

HYDROLOGY OF THREE RECREATIONAL LAKES IN EASTERN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-08608

ADVANCED WASTE TREATMENT DESIGN PROTECTS LAKE ALTON,
For primary bibliographic entry see Field 5G.
W77-08631

FISH FAUNA OF LAKES OF THE LOWER REACHES OF THE ZARAFSHAN RIVER AND ITS FISHERY USE, (IN RUSSIAN),
Bukharskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
M. A. Abdullaev, and D. Urchinov.
Uzb Biol Zh 19(5); p 54-56, 1975.

Descriptors: *Commercial fish, *Lakes, *Fisheries, *Lake fisheries, Reservoirs, Freshwater fish.
Identifiers: Acipenseridae, Cobitidae, Cyprinidae, Gobiidae, Percidae, Poecilidae, Siluridae, USSR, Uzbek SSR, Zarafshan River.

Reservoirs and lakes play a major role in fishery in the lower reaches of the Zarafshan River in the Uzbek SSR (USSR). Fishes (28 spp.) belonging to 7 families (Acipenseridae 1 sp.), Cyprinidae (19), Cobitidae (3), Siluridae (1), Poecildae (1), Percidae (2), Gobiidae (1) inhabit these lakes. The most important fisheries are indicated and some data are given on commercial fish species.--Copyright 1976, Biological Abstracts, Inc.
W77-08708

AN EVALUATION OF THE NATIONAL EUTROPHICATION SURVEY DATA,
National Eutrophication Survey, Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-08710

THE HYDROGEOLOGIC REGIME OF GLACIAL-TERRAIN LAKES, WITH MANAGEMENT AND PLANNING APPLICATIONS,
Wisconsin Univ. Extension, Madison.
For primary bibliographic entry see Field 2F.
W77-08724

PALEOHYDROLOGIC PHENOMENA RECORDED BY LAKE SEDIMENTS,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-08750

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va. Water Resources Div.

For primary bibliographic entry see Field 7B.
W77-08752

THE EFFECT OF THE IMPOUNDMENT OF LAKE KAINJI, NIGERIA, ON THE INDIGENOUS SPECIES OF MORMYRID FISHES,
Reading Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-08772

A STUDY OF HEAVY METALS IN LAKE ABBAYA, ETHIOPIA, AND THE INCIDENCE OF NON-PARASITIC ELEPHANTIASIS,
London Univ. (England). Dept. of Pharmaceutics.
For primary bibliographic entry see Field 5A.
W77-08774

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATION AREA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 6B.
W77-08805

DENSITY AND DISTRIBUTION OF BENTHOS IN LAKE KEOWEE, SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-08818

EFFECTS OF HYPOLIMNETIC AERATION ON NITROGEN AND PHOSPHORUS IN A EUTROPHIC LAKE,
Adelphi Univ., Garden City, N.Y.; and Adelphi Univ., Oakdale, N.Y. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-08824

EFFECT OF PONDS AND SMALL RESERVOIRS ON RIVER RUNOFF IN THE FOREST-STEPPE AND STEPPE ZONES OF THE VOLGA BASIN,
For primary bibliographic entry see Field 4A.
W77-08834

ROLE OF RIVER RUNOFF AND OF WATER EXCHANGE IN THE SALINITY OF THE NORTHERN CASPIAN SEA,
Ye. G. Arkhipova, D. N. Katunin, V. V. Kryukov, and Yu. A. Khvatskaya.
Soviet Hydrology, Selected Papers, No 4, p 300-309, 1975. 5 fig, 10 tab, 7 ref. Translated from Trudy Gosudarstvennogo Okeanograficheskogo Instituta, No 125, p 125-144, 1975.

Descriptors: *Runoff, *Estuaries, *Salinity, Rivers, Freshwater, Surface runoff, Sea water, Salts, Foreign countries, Foreign research, Spatial distribution, Temporal distribution, Water levels, Oceanography.
Identifiers: *Caspian Sea, *Volga River, *USSR, Salinity distribution, Salinity variations.

Despite the relatively large number of papers devoted to the salt regime of the northern Caspian Sea, the origin of salinity requires further study because of the complexity of the phenomenon. The roles of river runoff, wind, and salt exchange with the central Caspian Sea in the origin of the salinity field of the northern Caspian Sea were identified on the basis of a study of the space-time variations of salinity from observational data for 1940-1971. The possible future salinity distribution after a reduction in river runoff volume was determined. (Sims-ISWS)
W77-08836

THE USE AND MISUSE OF PURE WATER PVT PROPERTIES FOR LAKE WATERS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
C-T. Chen, and F. J. Millero.
Nature, Vol. 266, No. 5604, p 707-708, April 21, 1977. 1 fig, 17 ref.

Descriptors: *Lakes, *Water properties, *Salts, Temperature, Water temperature, Pressure, Volume, Density, Salinity, Water quality, Limnology.

Although dissolved substances affect the thermodynamic properties of lake waters, many limnologists still consider lake water as pure water. This can be a good assumption if used with caution: lake water is by no means pure water, especially when the precise pressure, volume, temperture (PVT) properties are considered. PVT properties of lake water can be determined from an equation of state for seawater, provided that the total mass fraction of dissolved salts in seawater and lake water are equated. In addition, the total mass fraction of dissolved salts affects calculations concerning the temperature of maximum density and thus stability. Therefore, in the absence of direct PVT measurements on a particular lake, it is at present most appropriate to use an equation of state for seawater when examining effects of PVT properties in lakes. Presented here was a short equation of state determined with a precision of 0.000002 g/cu cm in density over the appropriate range for most freshwater lakes, 0-0.6 parts per thousand salinity, 0-30 C, and 0-180 bar. (Sims-ISWS).
W77-08840

INLAND WATERS. MONOGRAPHS FROM LIMNOLOGY AND RELATED AREAS, VOL. 26, PART 1. THE ZOOPLANKTON OF INLAND WATERS,
H. Rick.
E. Schweizerbart'sche Verlagsbuchhandlung: Stuttgart, West Germany. 1972, 294 p.

Descriptors: *Freshwater, *Zooplankton, *Systematics, *Lakes, Limnology, Ecology.
Identifiers: Chaoboridae, Craspedacusta sowerbii, Hydrachnellae, *Inland waters, Keys, Mollusca, Mysidacea, Ostracoda, Rotatoria, Taxonomy.

This book presents monographs on planktonic Testacea and Heliozoa, Ciliata, fresh water medusae, specifically Craspedacusta sowerbii, Rotatoria, Ostracoda, Mysidacea, Chaoboridae, Hydrachnellae and Mollusca from inland waters. Morphology, biology, ecology, taxonomic and systematic data, including keys to genera and species, and distribution are discussed. A bibliography is found with each article, and an index of genera is included.--Copyright 1973, Biological Abstracts, Inc.
W77-08861

LAKE-SHORELAND MANAGEMENT PROGRAMS: SELECTED PAPERS,
Massachusetts University, Amherst, Water Resources Research Center.
B. B. Berger, J. A. Kusler, and S. Klinginer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 014, Price codes: A12 in paper copy, A01 in microfiche. Publication No. 69, Technical Report, February 1976. 224 p, 38 ref. OWRT A-075-MASS(2).

Descriptors: *Conferences, Water quality, Lakes, *Lake shores, *Management, *Water pollution control, *Path of pollutants, Institutions, Water policy, Wisconsin, Massachusetts, Minnesota, Maine, *Environmental effects, Data collections, Zoning, Legal aspects, *Forecasting.
Identifiers: *Lake restoration, *Lake-shoreland management.

The collection of papers and abstracts were presented by speakers in a lake-shoreland management seminar conducted by the University of Massachusetts Water Resources Research Center on the Amherst campus during the spring 1975: Issues, Approaches, and General Recommendations for Lake Shoreland Management Programs, by Jon A. Kusler; Problems of Lake Quality, by A. F. Bartsch; Massachusetts Division of Water Pollution Control Lakes Study Programs, by John R. Elwood; The Minnesota Shoreland Zoning Program, by Michael Hambroke; Data Collection and Management: A Look at Maine's Lake Program, by Matthew Scott; Shoreland Management in Maine, by Millard W. Hall; Reconnaissance study of Lakes in Washington, by Gilbert C. Bortleson; Determining the Capacity of Lakes for Development, by Peter J. Dillon; Techniques for Predicting Physical Process within Lakes, by Peter A. Mangarella; Predicting the Fate and Behavior of Chemical Species in Lakes, by Stuart Ludlam; Techniques for Predicting Behavior and Fata of Chemical Substances in Lakes, by Francis A. DiGiano; Lake Policies and Institutions for Massachusetts, by Andrew J. W. Scheffey; Lake Management Institutions in Massachusetts, by Emerson Chandler; and The Wisconsin Inland Lake Demonstration Project, by Stephen M. Born. One of the three appendices contains information on Lake-Shoreland Management Statutes.
W77-08924

INDUCED VERTICAL MIXING IN A STRATIFIED IMPOUNDMENT BY A SUBSURFACE WARM WATER DISCHARGE,
Wisconsin University, Madison. Department of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-08929

A PREDICTIVE PHOSPHORUS MODEL FOR LAKES - DEVELOPMENT AND TESTING,
North Carolina University, Chapel Hill, Department of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W77-08930

ESTIMATING WAVE GENERATION ON RESTRICTED FETCHES,
California State Dept. of Navigation and Ocean Development, Sacramento; and Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-09021

ESTIMATION OF WINDS OVER THE GREAT LAKES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
D. T. Resio, and C. L. Vincent.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 103, No WW2, Proceedings Paper 12951, p 265-283, May 1977. 13 fig, 30 ref, 1 append.

Descriptors: *Winds, *Great Lakes, *Coastal engineering, Numerical analysis, Model studies, Equations, Surges, Estimating equations, Winds, Velocity, Lakes, Mathematical models, Wind pressure, Wind velocity, Theoretical analysis.
Identifiers: Geostrophic wind, Wind estimates.

Past efforts to estimate wind speeds over a large lake have met with very limited success. The purpose of this study was to demonstrate that, with a combined theoretical-empirical approach, winds over a lake can be obtained from transformed wind speeds at nearby land stations. The theoretical results provided a basis for comparison of many empirical data sets and established a rational means of analyzing the expected differences between winds over land and winds over a marine surface, which, in turn, afforded a means of examining systematic variations in the ratio of wind speeds over a lake to wind speeds over land. The good agreement between theory and observation indicated that wind estimates over the lake could be made for a wide range of synoptic conditions with an rms error of 5 knots. The theoretical curve

for the lake wind/land wind ratio provided an estimate of lake winds well beyond wind speeds for which there were good empirical data. (Roberts-ISWS)
W77-09022

HYPEROXYGEN CONCENTRATIONS IN THE HYPOLIMNION PRODUCED BY INJECTION OF LIQUID OXYGEN,
Limnological Associates, Ojai, Calif.
For primary bibliographic entry see Field 5G.
W77-09028

TRANSJOEN, A GROUNDWATER INFLUENCED LAKE WITH SPECIAL REDOX AND SULPHATE CONDITIONS,
Oslo Univ. (Norway). Dept. of Limnology.
G. S. Bremmeng, and A. E. Kloster.
Nordic Hydrology, Vol. 7, No. 5, p 307-320, 1976. 7 fig, 4 tab, 18 ref.

Descriptors: *Groundwater, *Lakes, *Physical properties, *Chemical properties, *Sulfates, Surveys, Measurement, Groundwater movement, Precipitation(Atmospheric), Temperature, Water temperature, Oxygen, Foreign countries, Foreign research, Alkalinity, Hydrogen ion concentration, Conductivity, Calcium, *Oxidation-reduction potential, Chemicals, Stratification.
Identifiers: *Transjoen Lake(Norway), *Norway.

Transjoen, a lake in S. E. Norway investigated hydrographically from October 1969 to October 1971, consists of two basins, both of which are meromictic (lake with lower layer which does not participate in the periodic circulations). The lake has a large influx of groundwater of varying chemical composition. The calcium content is high, and precipitated calcium carbonate and electrolyte rich groundwater is assumed to be the main reason for the meromictic stability. The redox potentials of monimolimnion (the lower layer which does not participate in the periodic circulation) are extremely low, but in spite of this fact, the content of sulphate is high. (Sims-ISWS)
W77-09031

ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W77-09059

A COMPARATIVE STUDY OF ORGANIC CARBON AND NUTRIENTS IN LAKE SEDIMENT,
Washington State Univ., Pullman. Dept. of Environmental Science.
For primary bibliographic entry see Field 5A.
W77-09065

LIMNOLOGICAL INVESTIGATION OF SIX LAKES IN SOUTHEAST ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.; and Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 7C.
W77-09069

HYDROLOGIC CONSIDERATIONS IN DEWATERING AND REFILLING LAKE CARLTON, ORANGE AND LAKE COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-09080

2I. Water In Plants

DISTRIBUTION OF CORN ROOTS IN SANDY SOIL WITH A DECLINING WATER TABLE,
Agricultural Research Service, Mandan, N.D. Northern Great Plains Research Center.
R. F. Follett, R. R. Allmaras, and G. A. Reichman.
Agron J. 66(2), p 288-292, 1974.

Descriptors: *Water table, *Root distribution, *Crop response, *Soil moisture, *Root development, *Water levels, Evapotranspiration, Crop production, Plant growth, Regression analysis, Water requirements, Oxygen, Sands, Depth, Root zone.
Identifiers: Corn, Corn roots, Sandy soil, Zea mays.

Knowledge of root response to declining water tables is important for proper crop production management. Roots from 10 monoliths (91 cm deep), centered over and perpendicular to the corn (Zea mays L.) row, were obtained at about full silk (Aug. 26) from corn growing in 91-cm rows. Water table depths ranged 1.33-2.64 m at silking after declining at the rate of about 1.3 cm/day since July 1. About 20% of the evapotranspiration was supplied by natural precipitation with the remaining 80% from soil water depletion and the water table for the period July 1-Sept. 16 (final harvest). Shoot growth was maximum at intermediate water table depths. An equation describing root distribution was obtained from a regression fit of root depth (Y) as a function of water table depth (X1) and cumulative root weight (X2). A similar fit was made using root length as X2. In no case was more than 10% of the total measured root weight or more than 20% of the total measured root length below 75 cm. The distribution of roots with depth indicates water requirements for corn in these sandy soils must be supplied to a root zone with maximum depth of about 100 cm. Retarded root growth was observed where soil O2 diffusion rate (ODR) was less than 26 g/cm2/108 min. Such ODR values were obtained at depths greater than 30 cm at the shallow water table site. Apparent normal root development occurred when ODR values were greater than 30 g/cm2/108 min and matric suctions were about 100 mbar.
W77-08676

EFFECT OF WATER DEFICIENCY ON THE GROWTH RATE OF SOME WINTER SOFT WHEAT CULTIVARS, (IN BULGARIAN),
Bulgarian Academy of Sciences, Sadovo. Agricultural Experimental Station.
For primary bibliographic entry see Field 3F.
W77-08716

SOIL-MOISTURE STRESS AS RELATED TO PLANT-MOISTURE STRESS IN BIG SAGEBRUSH,
Geological Survey, Lakewood, Col. Water Resources Div.
For primary bibliographic entry see Field 2G.
W77-08751

ATMOSPHERIC SULFATE ADDITIONS AND CATION LEACHING IN A DOUGLAS FIR ECOSYSTEM,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 2K.
W77-08822

EVALUATION OF WHEAT PLANTS WITH REGARD TO DROUGHT- AND HEAT-RESISTANCE UNDER FIELD CONDITIONS, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Botaniki.
For primary bibliographic entry see Field 3F.
W77-08877

ZOOPLANKTON DEVELOPMENT IN INTENSIVELY EXPLOITED FISHERY PONDS, (IN RUSSIAN),
Moscow State Univ. (USSR).
T. S. Mal'Tsman.
Gidrobiol Zh. 10(2), p 36-41, 1974.

Descriptors: *Zooplankton, Fisheries, Ponds, *Biomass, Carp, Fry, Plankton.
Identifiers: Aristichthys-nobilis.

Zooplankton development in intensively exploited fishery ponds is distinctly dependent on its rate of consumption by fish. Consumption of 200 kg/ha (density of carp fry, 80,000 individuals/ha) has no negative effect on zooplankton development. The zooplankton biomass decreases only with joint rearing of Cyprinus carpio and Aristichthys nobilis (at more than 1000 individuals/ha) when the consumption rate increases to 300-400 kg/ha/season (10-20% of average daily biomass). In this case, the relationship of total consumption to the average daily biomass is close to the P/B (production/biomass) coefficient of zooplankton.—Copyright 1975, Biological Abstracts, Inc.
W77-08945

SPECIES DIFFERENCES IN BREAKDOWN OF TREE LEAVES IN STREAMS--SIGNIFICANCE FOR COMPOSITION OF STREAM COMMUNITIES,
California Univ., Santa Barbara, Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-09056

STUDIES OF THE FISH POPULATIONS IN TWO EASTERN NORTH CAROLINA SWAMP STREAMS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
W. H. Tarplee, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 104, Price codes: A04 in paper copy, A01 in microfiche. M. S. Thesis, 1975. 66 p, 6 fig, 17 tab, 22 ref, append. OWRT B-049-NC(2), 14-31-0001-3626.

Descriptors: *Surveys, *Swamps, *Fish populations, Freshwater fish, Warm-water fish, Trapping, *Fish types, Pounds fish per acre, Number fish per acre, *North Carolina, Streams.
Identifiers: *Duke Swamp(NC), *Hoggard Mill Creek(NC), Unchannelized wetlands, Fish species.

Fish populations were examined in two northeastern North Carolina swamp stream ecosystems from March through August 1972. The abundance of fishes susceptible to wire trapping was estimated during March and April by the Schnabel method. During low water conditions in June, July, and August abundance was estimated by the Petersen technique based on fishes collected with wire traps, gill nets, seines, and an electrofishing unit. Relative abundance of the various species captured during March and April was determined, and a rotenone sample was collected during August. Comparisons were made of fish species and numerical abundance of fishes between Hoggard Mill Creek and Duke Swamp, two unchannelized wetland areas. The study was one part of a prechannelization analysis to assess the effects of stream channelization and wetland drainage on fish and wildlife. (Stewart-NC State)
W77-09062

2J. Erosion and Sedimentation

THE HYDROLOGY OF A SMALL CATCHMENT BASIN AT SAMARU, NIGERIA: IV: ASSESSMENT OF SOIL EROSION UNDER

VARIED LAND MANAGEMENT AND VEGETATION COVER;
Institute for Agricultural Research, Zaria (Nigeria).
For primary bibliographic entry see Field 4D.
W77-08698

TRAP-EFFICIENCY INVESTIGATION BERNALILLO FLOODWATER RETARDING RESERVOIR NO. 1 (PIEDRA LISA ARROYO) NEAR BERNALILLO, NEW MEXICO, WATER YEARS 1956-1974,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 4D.
W77-08741

HYDROLOGIC CHANGES AFTER LOGGING IN TWO SMALL OREGON COASTAL WATERSHEDS,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-08746

PALEOHYDROLOGIC PHENOMENA RECORDED BY LAKE SEDIMENTS,
Geological Survey, Lakewood, Colo. Water Resources Div.
T. C. Winter, and H. E. Wright, Jr.
EOS, Vol 58, No 3, March 1977. American Geophysical Union, p 188-196, 1977. 6 fig, 27 ref.

Descriptors: *Paleohydrology, *Paleolimnology, *Lake sediments, *Sedimentology, Watershed management, Planning, Hydrology, History, Sedimentation rates, Palynology, Dating, Trophic level, Microbiology, *Minnesota, Lakes, Marshes.
Identifiers: *Lake Carlson(Minn), *Kirchner Marsh(Minn).

To understand and predict the magnitude and recurrence of dynamic hydrologic phenomena, especially for events that have a recurrence interval of one hundred years or more, indirect methods of determining hydrologic fluctuations must be used. Lake sediments contain a hydrologic record extending thousands of years into the past. Pollen and seed remains in the sediment of Lake Carlson and Kirchner Marsh, Minnesota, suggest that four droughts with a recurrence interval of 300 to 1,000 years occurred in that vicinity between 5,000 and 7,000 years ago. Pollen, seeds, leaves, diatoms, and other plant, animal, and chemical remains can be used to determine past lake levels, trophic conditions, and changes in sedimentation rates. The effects of land disturbances on lakes and their drainage basins can be assessed. In many cases, abrupt changes in types or abundance of fossils clearly mark the onset of land disturbances, and sedimentation rates usually increase significantly. Through sediment studies, it is possible to determine patterns of predisturbance water-level fluctuation and trophic conditions. This information, which is usually not available from written records, can be used to assess the magnitude of the disturbance, and it provides goals for lake management. (Woodard-USGS)
W77-08750

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-08752

REACTIONS IN THE AQUEOUS ENVIRONMENT OF LOW MOLECULAR WEIGHT ORGANIC MOLECULES,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-08754

MINERAL DISTRIBUTION WITHIN THE SEDIMENTS OF PEARL HARBOR,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2L.
W77-08815

CURRENT-METER RECORDINGS OF LOW-SPEED TURBIDITY CURRENTS,
Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div.
For primary bibliographic entry see Field 2L.
W77-08847

GRAIN-SIZE PARAMETERS OF INSOLUBLE RESIDUES IN MIXXED TERRIGENOUS-SKELETAL CARBONATE SEDIMENTS AND SEDIMENTARY ROCKS: SOME NEW ZEALAND EXAMPLES,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
For primary bibliographic entry see Field 2L.
W77-08848

PRESENT-DAY SLUMPING AND EROSION PHENOMENA ON IRRIGATED LANDS (EXEMPLIFIED BY SOUTHEASTERN CISCAUCASIA), (IN RUSSIAN),
Industrial Research Inst. of Engineering, Survey and Construction, Stavropol (USSR).
V. A. Vasil'Ev.
Izv Sev Kavk Nauchn Tsentra Vyssh Shk Estestv Nauki. 1, p 57-59, 1974.

Descriptors: *Erosion, *Irrigated lands, Loess, Gullies.
Identifiers: Exemplified, *Slumping(Erosion), *USSR(Southeastern Ciscaucasia), *Anthropogenic processes.

Discussions are presented on the anthropogenic relief-forming processes occurring on irrigated lands composed of loess deposits: slumping on irrigation canals and irrigated fields, piping and erosion phenemona, formation of gullies, sheet erosion and irrigation erosion. The anthropogenic processes constitute the main factor in relief formaton.--Copyright 1975, Biological Abstracts, Inc.
W77-08885

MEANS AND METHOD FOR CONTROLLING BEACH AND SANDBAR EROSION,
For primary bibliographic entry see Field 8B.
W77-08894

DUNE STABILIZATION WITH PANICUM AMARUM ALONG THE NORTH CAROLINA COAST,
North Carolina State Univ. at Raleigh. Dept. of Botany; and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2L.
W77-08908

COMPARISON OF REMOTELY SENSED CONTINENTAL-SHELF WAVE SPECTRA WITH SPECTRA COMPUTED BY USING A WAVE REFRACTION COMPUTER MODEL,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2L.
W77-08911

DESIGNING FOR SEDIMENT TRANSPORT,
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4D.
W77-08962

BEACH SAND TRANSPORT: DISTRIBUTION AND TOTAL DRIFT,
Oregon State Univ., Corvallis. Estuarine and Coastal Research Program.
For primary bibliographic entry see Field 2L.
W77-09019

EFFECT OF SEDIMENT LOAD ON STABLE SAND CANAL DIMENSIONS,
Roorkee Univ. (India), Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-09020

EFFECT OF TEMPERATURE AND HYDROXY ALUMINUM INTERLAYERS ON THE ADSORPTION OF TRACE RADIOACTIVE CESIUM BY SEDIMENTS NEAR WATER-COOLED NUCLEAR REACTORS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Soils and Water.
For primary bibliographic entry see Field 5B.
W77-09024

ROUGHNESS EFFECTS ON THE FLOW DIRECTION NEAR CURVED STREAM BEDS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
For primary bibliographic entry see Field 8B.
W77-09038

FLOW REGIMES IN DEBRIS FLOW,
State Univ. of New York at Binghamton.
P. Enos.
Sedimentology, Vol 24, No 1, p 133-142, February 1977. 4 fig, 27 ref. NSF GA-28 621.

Descriptors: *Flow characteristics, *Laminar flow, *Sediments, *Reynolds number, *Boundary layers, Slurries, Turbulent flow, Sewage sludge, Velocity, Froude number.
Identifiers: *Debris flow, *Bingham number, Plastic flow, Clasts.

The Bingham model was suggested for the rheological behavior of debris flow. Velocity plotted against yield strength uniquely defines turbulent and laminar flow in published experimental data on flow of Bingham materials. The regimes are not defined by a unique value of the Bingham number even though it includes both of the critical parameters, yield strength and velocity. Laminar flow in at least the final stages natural debris flows is suggested by sediments with parallel-to-flow or inclined clast fabris, preservation of delicate clasts, blocks projecting from the top of the deposit and an absence of flutes. (Singh-ISWS)
W77-09045

PRELIMINARY SUMMARY OF THE 1976 ATLANTIC MARGIN CORING PROJECT OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, Reston, Va. Geologic Div.
For primary bibliographic entry see Field 2L.
W77-09089

2K. Chemical Processes

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
1976. 143 p. IAHS-AISH Publication No 119, Proceedings of the Grenoble Symposium, August/September, 1975.

Descriptors: *Geothermal studies, *Conferences, *Thermal water, Heated water, *Geochemistry, Thermal pollution, Water pollution, *Distribution, Path of pollutants, Reviews.

The International Commissions on Subsurface Water and Water Quality, both of IAHS, were responsible for the symposium reported. The proceedings includes 15 papers by authors from USSR, United States, France, Greece, India, Japan, New Zealand, Poland, Romania, and Taiwan. The papers discuss the geochemistry, distribution, and utilization of thermal waters throughout the world. (See W77-08678 thru W77-08691) (Chilton-ORNL)
W77-08677

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, (LES PROBLEMES THERMIQUES ET CHIMIQUES DES EAUX THERMALES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
For primary bibliographic entry see Field 5B.
W77-08678

SOME FEATURES OF THE GEOCHEMISTRY OF THERMAL WATER IN PLATFORM AREAS FROM EXPERIMENTAL DATA,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 5B.
W77-08679

THE HELIUM ISOTOPES IN THERMAL FLUIDS,
Akademiya Nauk SSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 5B.
W77-08680

HYDROTHERMAL PROCESSES IN THE ATLANTIC OCEAN CRUST, 26 DEGREES N,
Texas A and M Univ., College Station. Dept. of Geology.
R. B. Scott, and A. Hajash, Jr.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 35-46, 4 fig, 1 tab, 51 ref. NSF GA 3545 & DES 74-18567.

Descriptors: *Geochemistry, Hydrology, *Heated water, Chemistry, Hydrothermal studies, Flow, Geology, *Atlantic Ocean, *Thermal water.

Evidence is presented which indicates extensive hydrothermal activity at oceanic spreading centers. Manganese oxides at the study site were found to have chemistries similar to hydrothermal manganese and growth rates two orders of magnitude faster than hydrogenous ferromanganese. Thermal activity which has continued at least sporadically for 100,000 years is indicated by the occurence of hydrothermal crusts coated with hydrogenous crusts. Experimental reactions between seawater and basalt also confirm hydrothermal activity. It was concluded that hydrothermal fluids rise through temperature, pressure, oxygen fugacity and sulfur fugacity gradients with fault zones in the rift valley wall acting as migration paths for the fluids. (See also W77-08677) (Chilton-ORNL)
W77-08681

GEOCHEMISTRY OF THERMAL WATERS FROM VARIOUS GEOTHERMAL PROVINCES OF INDIA,
National Geophysical Research Inst., Hyderabad(India).
M. L. Gupta, H. Narain, and V. K. Saxena.
In: Thermal and Chemical Problems of Thermal Water, Proceedings of the Grenoble Symposium, August/September, 1975. p 47-58, 3 fig, 3 tab, 12 ref.

Descriptors: *Geothermal studies, Geology, *Geochemistry, Heated water, Energy, *Thermal water.
Identifiers: *India.

Data analysis has shown the existence of several geothermal provinces of India with sub-surface thermal waters of varying chemical characters. These include the Himalayan Orogen Geothermal Province, the Konkan Geothermal Province and the Cambay Geothermal Province. Geodata indicated the earth's heat is a viable source of future energy development in India. (See also W77-08677) (Chilton-ORNL)
W77-08682

TEMPERATURE AND CHEMISM OF GROUND WATERS IN THE WESTERN AREAS OF THE EAST EUROPEAN PLATFORM,
Akademiya Nauk SSSR, Moscow. Interagency Geophysical Committee.
G. V. Bogomolov, and Y. G. Bogomolv.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 59-67, 3 fig, 2 ref.

Descriptors: *Hydrothermal studies, *Geochemistry, Hydrology, Geology, *Thermal water, Heated water, *Distribution.
Identifiers: Cold water.

Analysis of distribution of a natural thermal field and geothermal field on the surface of a crystalline foundation is used to outline some general regularities involved with geothermic and hydrochemical zonation intimately related to geologic structures. (See also W77-08677) (Chilton-ORNL)
W77-08683

GEOCHEMISTRY AND ORIGIN OF THERMAL WATERS IN POLAND,
Polish Academy of Sciences, Warsaw. Inst. of Geological Science.
J. Dowgiallo.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 69-77, 2 fig, 2 tab, 9 ref.

Descriptors: *Geothermal studies, *Hydrothermal studies, *Geochemistry, Heated water, Brines, *Thermal water.
Identifiers: *Poland.

Two hydrochemical types of thermal waters (brines characteristic of deep sedimentary aquifers of the North-European Lowland and the Flysch Carpathians and the slightly mineralized waters of the Inner Carpathians and the Sudetic granites and gneisses) are identified. The brines are identified as being mainly of relict/connate/or mixed origin. The Carpathian and Sudetic 'acratothermae' are infiltration waters. (See also W77-08677) (Chilton-ORNL)
W77-08684

THERMAL WATERS IN TAIWAN, A PRELIMINARY STUDY,
Mining Research and Service Organization, Taipei (Taiwan).
For primary bibliographic entry see Field 4B.
W77-08685

THE CONTENT OF SILICA IN HOT MINERAL WATERS OF FRANCE IN RELATION TO TEMPERATURE, SODIUM CONTENT AND BICARBONATES (LA TENEUR EN SILICE DES EAUX THERMOMINERALES DE FRANCE EN RELATION AVEC LA TEMPERATURE, LA TENEUR EN SODIUM ET EN BICARBONATES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
M. Schoeller.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium August/September, 1975. p 89-99, 3 fig, 5 ref.

Descriptors: *Geochemistry, *Geothermal studies, *Temperature, *Silica, Heated water, *Thermal water, *Mineral water, Correlation analysis, *Sodium, *Bicarbonates.
Identifiers: *France(Pyrenes), *Hot mineral water.

The study explores the correlation between silica content and temperature. Data from geochemical study of hot springs in the Pyrenees show that sodium and potassium also influence silica content. The springs studied all had temperatures below 80 C and flowed from crystalline rocks, granite, gneiss. (See also W77-08677) (Chilton-ORNL)
W77-08686

SOME GEOCHEMICAL PROBLEMS IN THE UTILIZATION OF GEOTHERMAL WATERS,
Department of Scientific and Industrial Research, Wellington (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 5B.
W77-08687

STUDY OF THE CHEMICAL AND GASEOUS COMPOSITION OF THERMAL WATERS OF THE EASTERN PART OF THE PANNONIAN DEPRESSION (CONSIDERATIONS SUR LA COMPOSITION CHIMIQUE ET GAZEUSE DES EAUX THERMALES DE LA PARTIE ORIENTALE DE LA DEPRESSION PANNONIQUE (ROUMANIE)),
Institutul de Geologie si Geofizica, Bucharest (Rumania).
T. Bandrabur, and P. Craciun.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 110-118, 11 fig, 6 ref.

Descriptors: *Geothermal studies, *Geology, Hydrothermal studies, Chemistry, Mineralogy, Water chemistry, Heated water, *Thermal water.
Identifiers: *Romania(Pannonian Depression).

The geologic structural, geothermic and hydrogeological condition in the eastern part of Pannonian Depression are presented. The chemical composition of water (mineralization degree, ionic composition, and hydrochemical type as well as the origin of the mineralization and gaseous composition) from the Pontian, Pannonian, Miocene, Cretaceous and Triasic is discussed. (See also W77-08677) (Chilton-ORNL)
W77-08688

STUDIES BY THE DYNAMIC METHOD ON THE REACTION OF ROCK WITH HOT SPRING WATER OF THE TAMAGAWA HOT SPRINGS IN JAPAN,
Toho Univ., Tokyo (Japan). Dept. of Chemistry.
I. Iwaji, Y. Yuzo, Y. Seiko, and O. Teiko.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 119-127, 4 fig, 4 tab, 22 ref.

Descriptors: *Geothermal studies, *Geochemistry, *Hot springs, *Rocks, Chemistry, Water chemistry, *Heated water, Thermal water.
Identifiers: *Japan.

Variations in concentrations of rock components in hot spring water after reaction with water and rock were determined. Generally, concentrations of each component of rock in the hot spring water increased with the lapse of reaction time and reached maximum concentrations of up to 650mg/l in less than 20 minutes to several hours. After this the concentrations decreased according to the nature of the components in rock and water. Generally, extraction of components into hot spring water was effective only at the earlier stage of interaction of rock and water. (See also W77-08677) (Chilton-ORNL)
W77-08689

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IPORTANT GEOTHERMAL SITES IN REECE, ON THE BASE OF THER-OMINERAL SPRING LAYINGS, AND THE OSSIBILITIES OF THEIR EXPLOITATION ND UTILISATION,
ational Technical Univ., Athens (Greece). In-tute of Mineral Layings, Science and Applied eology.
or primary bibliographic entry see Field 4B.
77-08690

OTAL ENERGY USE IN AN URBAN-GRICULTURAL POWER PLANT COMPLEX,
regon State Univ., Corvallis. Dept. of Soil cience.
or primary bibliographic entry see Field 5G.
77-08691

XPERIMENTAL STUDY OF MULTI-CATION IFFUSION IN AN ARTIFICAL QUARTZ ANDSTONE,
ouisiana State Univ., Baton Rouge. Dept. of eology.
. K. Stoessell.
vailable from the National Technical Informa-on Service, Springfield, VA 22161 as PB-268 812, rice codes: A08 in paper copy, A01 in microfiche.
l. S. thesis, December 1974. 136 p, 34 fig, 12 tab, 8 ref, 3 append. OWRT A-031-LA(1).

escriptors: *Ion exchange, *Cation adsorption, Water softening, *Waste disposal, Aquifers, In-ection, Diffusion, Sandstones, Porosity, Porous ledia, Diffusivity, Storage.
dentifiers: Artificial quartz sandstone.

ntegral diffusion coefficients were measured at 35 C in the interstitial solution of an artificial quartz anstone. The porous medium was chemically nert, had a porosity of 29.3%, an average grain ize of 200 microns and a formation factor of 1.44. The diffusion coefficients range from 0.0000012 sq cm/sec for CaC12 solution to 0.0000022 sq cm/sec for NaC1 solution. The flux was measured per unit area of liquid saturated pore space. A preliminary study of diffusion in an nterstitial solution of artificial sea water indicated hat diffusion processes deprese the ion/C1(-) ratio for Ca(++), Mg(++) and S04(--) and increase the ratio for K(+) and Na(+). The relative rates of dif-fusion in sea water were K(+) Na(+) C1(-) Ca(++) Mg(++) S04(--). Two quantitative evalua-tions were made on the effect of diffusion in the storage of fresh water in salt water aquifers. The first treatment was concerned with diffusion of Na(+) from the confining shales. The second treatment also took into consideration the release of Na(+) from exchange sites within the shales. The second treatment showed an increase of Na(+) concentration within the fresh water of nearly 300% as compared to the concentration given by the first treatment. It was found in the second treatment that in thin aquifers, appreciable quantities of Na(+) could occur in the fresh water in short time periods. In one hypothetical case treated in this study, the concentration of Na(+) in the fresh water reached 600 mg/liter after only 200 days.
W77-08811

ATMOSPHERIC SULFATE ADDITIONS AND CATION LEACHING IN A DOUGLAS FIR ECOSYSTEM,
Washington Univ., Seattle. Coll. of Forest Resources.
D. W. Cole, and D. W. Johnson.
Water Resources Research, Vol. 13, No. 2, p 313-317, April 1977. 5 fig, 2 tab, 16 ref.

Descriptors: *Precipitation(Atmospheric), *Chemistry of precipitation, *Acidic water, *Leaching, Forests, Douglas fir trees, Soils, Soil horizons, Soil water, Cations, Anions, Chemistry, Rainfall, Sulfates, Hydrogen ion concentration, Conductivity, Acids, Ecosystems.

Precipitation sulfuric acid input was small in comparison to sulfate and cation transfers within the ecosystem studies. Most of the annual incoming hydrogen ions were removed in the forest canopy, presumably through an exchange process. Therefore, canopy leaching appears to be most strongly affected by acid rainfall, whereas soil leaching appears to be dominated by mechanisms internal to the ecosystem, such as carbonic acid leaching and sulfur release from decomposing litter. (Sims-ISWS)
W77-08822

SOME HYDROCHEMICAL CHARACTERISTICS OF THE MOUTH REACHES OF THE ANABAR, LENA, YANA, AND INDIGIRKA RIVERS,
For primary bibliographic entry see Field 2L.
W77-08833

HYDROTHERMAL FLUIDS OF SEAWATER SALINITY IN OPHIOLITIC SULPHIDE ORE DEPOSITS IN CYPRUS,
Oxford Univ. (England). Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 2L.
W77-08854

MOLYBDENUM CONTENT IN THE SUBSURFACE WATERS OF THE VINNITSA OBLAST, (IN RUSSIAN),
Vinnitskii Meditsinskii Institut (USSR).
N. K. Val'chuk, and I. N. Chipik.
Gig Sanit. 4, p 97-98, 1974.

Descriptors: *Molybdenum, Subsurface waters, *Artesian wells, Water wells, Water analysis, Water chemistry.
Identifiers: Artesoam, *USSR(Vinnitsa Oblast).

Artesian wells (343) in the Vinnitsa district (Ukrainian SSR, USSR) were analyzed with respect to the Mo content in subsurface waters. The Mo content in the well water varied considerably both within each region and in the district as a whole. An analysis of the Mo content in crops as a function of the soil-climatic zones established that the maximum content is found in products from regions of the southern forest-steppe soil-climatic zone, where the maximum content was also found in the water. No correlation was found between the Mo level in the environment and the incidence of goiter among the population.--Copyright 1975, Biological Abstracts, Inc.
W77-08882

FREQUENCY OF ORGANIC COMPOUNDS IDENTIFIED IN WATER,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5A.
W77-08944

CHEMICAL CHARACTER OF HEADWATER STREAMS IN VERMONT AND NEW HAMPSHIRE,
Dartmouth Coll., Hanover, N.H.
A. H. Johnson, and R. C. Reynolds, Jr.
Water Resources Research, Vol 13, No 2, p 469-473, April 1977. 3 fig, 3 tab, 12 ref.

Descriptors: *Streams, *Chemical properties, *Water chemistry, *Water quality, *Vermont, *New Hampshire, Watersheds(Basins), Chemistry, Dissolved solids, Chemical analysis, Chemistry of precipitation, Hydrogen ion concentration, Calcium, Magnesium, Sodium, Potassium, Analytical techniques.
Identifiers: *Headwater streams, *Dissolved constituents, Bedrock types, Green Mountains, White Mountains, Plutonic rocks, Solute content.

Streamwater samples were collected from headwater streams in Vermont and New Hampshire during low-flow periods in the fall. Then the samples were analyzed for principal dissolved constituents. Dissolved solids are qualitatively and quantitatively related to bedrock type. Streams draining watersheds underlain by plutonic bedrock are acid, mixed cation sulfate waters with little buffering capacity and very low solute content (about 16 mg/l). Streams draining metamorphic and sedimentary terrains are characterized by neutral pH, alkaline earth cations, and mixed anions or bicarbonate. Concentrations of Ca + Mg + Na + K and pH of streams draining granitic bedrock are lower than those of streams draining similar rock types in small watersheds in the Sierra Nevada and Sangre de Cristo mountains. (Henley-ISWS)
W77-09027

ADSORPTION AND VERTICAL MOVEMENT OF THE ZINC AND MANGANESE IONS IN THREE TYPES OF SOIL,
Tuskegee Inst., Ala. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 5B.
W77-09054

HYDROLOGIC RECONNAISSANCE OF THE GEOTHERMAL AREA NEAR KLAMATH FALLS, OREGON, WITH A SECTION ON PRELIMINARY INTERPRETATION OF GEOPHYSICAL DATA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09070

CHEMICAL AND ISOTOPIC INVESTIGATIONS OF GROUNDWATER IN POTENTIAL GEOTHERMAL AREAS IN HAWAII,
Hawaii Inst. of Geophysics, Honolulu; and Geological Survey, Reston, Va. Water Resources Div.
G. M. McMurtry, P. F. Fan, and T. B. Coplen.
American Journal of Science, Vol 277, No 4, p 438-458, April 1977. 7 fig, 3 tab, 41 ref.

Descriptors: *Geothermal studies, *Hawaii, *Chemical analysis, *Temperature, *Groundwater, Wells, Springs, Precipitation(Atmospheric), Steam, Geophysics, Volcanoes, Evaluation, Isotope studies, Stable isotopes.

The chemical and isotopic compositions of Hawaiian groundwater were studied to locate and evaluate potential geothermal areas. Analyses were made of forty-three samples from twenty-seven wells, two coastal springs, local precipitation, and stream. Three methods of chemical geothermometry were applied: (1) silica, (2) Na-K-Ca, and (3) stable isotope or deuterium-oxygen-18. Based on the silica and stable isotope methods, the most promising geothermal areas are the summit of Kilauea Volcano and the area near geothermal test hole 3 in the Puna district (east rift zone of Kilauea Volcano). There, temperatures calculated from dissolved silica range from about 160 degrees to 275 degrees C. Mixing with cooler groundwaters appears to be a significant feature of these geothermal reservoirs. Seawater intrusion, possibly due to thermal disruption of the equilibrium of the Ghyben-Herzberg lens in geothermal areas, tends to interfere with the geothermometry of the Na-K-Ca and stable isotope methods. (Woodard-USGS)
W77-09082

PRELIMINARY SUMMARY OF THE 1976 ATLANTIC MARGIN CORING PROJECT OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, Reston, Va. Geologic Div.

For primary bibliographic entry see Field 2L.
W77-09089

2L. Estuaries

APPLICATION OF PHYSICO-CHEMICAL TREATMENT AS A METHOD OF ACHIEVING PARTIAL STANDARDS ON SEWAGE EFFLUENTS DISCHARGED IN ESTUARIAL AND COASTAL SITUATIONS,
Anglian Water Authority, Huntingdon (England). Directorate of Scientific Services.
For primary bibliographic entry see Field 5D.
W77-08634

HYDROTHERMAL PROCESSES IN THE ATLANTIC OCEAN CRUST, 26 DEGREES N,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-08681

HEAVY METAL TOLERANCE OF MARINE PHYTOPLANKTON. III. COMBINED EFFECTS OF COPPER AND ZINC IONS ON CULTURES OF FOUR COMMON SPECIES,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
For primary bibliographic entry see Field 5C.
W77-08692

THE ROLE OF METHYLMERCURY PRODUCTION IN THE TRANSFER OF MERCURY IN A SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W77-08697

THE BEHAVIOUR OF DISSOLVED IRON, MANGANESE AND ZINC IN THE BEAULIEU ESTUARY, S. ENGLAND,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W77-08701

EFFECTS OF MERCURY, CADMIUM, AND LEAD SALTS ON REGENERATION AND ECDYSIS IN THE FIDDLER CRAB, UCA PUGILATOR,
Rutgers - The State Univ., Newark, N.J. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 5C.
W77-08702

THE DISTRIBUTION OF TRACE METALS IN THE WESTERN NORTH ATLANTIC OFF NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5B.
W77-08703

TRACE ELEMENT INVENTORY FOR THE NORTHERN CHESAPEAKE BAY WITH EMPHASIS ON THE INFLUENCE OF MAN,
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-08704

EFFECTS OF A SPILL OF MARINE DIESEL OIL ON THE MEIOFAUNA OF A SANDY BEACH AT PICNIC BAY, HONG KONG,
Chinese Univ. of Hong Kong. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08760

PHYTOPLANKTON STANDING CROP AND SEWAGE NUTRIENT ENRICHMENT ALONG THE CENTRAL COAST OF LEBANON,
American Univ., Beirut (Lebanon). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08762

METHOD FOR DETERMINING ACUTE TOXICITY OF AN ACID WASTE AND LIMITING PERMISSIBLE CONCENTRATION AT BOUNDARIES OF AN OCEANIC MIXING ZONE,
EG and G Environmental Consultants, Waltham, Mass.
For primary bibliographic entry see Field 5C.
W77-08771

EUTROPHICATION OF AN IMPOUNDED ESTUARINE LAGOON,
Tasmania Univ., Hobart (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-08778

STUDIES ON MERCURY CONTENT IN SELECTED FISH SPECIES FROM POMERANIAN GULF AND SZCZECIN FIRTH (BADANIA NAD ZAWARTOSCIA RTECI OGOLNEJ W WYBRANYCH GATUNKACH RYB ZATOKI POMORSKIEJ I),
Institute of Marine Food Technology, Szczecin (Poland).
For primary bibliographic entry see Field 5C.
W77-08781

CONCENTRATIONS OF PCBS, DIELDRIN AND DDT RESIDUES IN MARINE ANIMALS FROM LIVERPOOL BAY,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08788

SOME EFFECTS OF OIL DISPERSANTS ON THE FEEDING BEHAVIOUR OF THE BROWN SHRIMP, CRANGON CRANGON,
Southampton Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08790

ECOLOGY OF TOXICITY IN MARINE SPONGES,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
For primary bibliographic entry see Field 5C.
W77-08793

EFFECT OF THE WATER-SOLUBLE FRACTIONS OF CRUDE, REFINED AND WASTE OILS ON THE EMBRYONIC AND LARVAL STAGES OF THE QUAHOG CLAM MERCENARIA SP.,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08794

A CERTAIN MARINE CATENATE DINOFLAGELLATE TENTATIVELY APPLIED FOR DETECTING CARCINOGENS,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
For primary bibliographic entry see Field 5A.
W77-08795

THE EFFECT OF WARM EFFLUENT FROM THE NOVOROSSIYSK THERMAL POWER PLAN ON ZOOPLANKTON,
Kuban State Univ., Novorossisk (USSR). Marine Biology Research Station.
For primary bibliographic entry see Field 5C.
W77-08804

MINERAL DISTRIBUTION WITHIN THE SEDIMENTS OF PEARL HARBOR,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
B. W. Turner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 896. Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, August 1975. 93 p, 15 fig, 9 tab, 4 ref. OWRT A-043-HI(1). 14-31-0001-4011, 14-31-0001-5011 (Part.).

Descriptors: *Sediment deposits, *Anaerobic conditions, *Montmorillonite, *Metals, *Hawaii, Harbors, Distribution, Mineralogy, Chromium, Nickel, Iron, Lead, Zinc, Copper, Water pollution sources.
Identifiers: Estuarine stratification, *Stratified water column, Forminifera, Pearl Harbor(Hawaii), *Mineral distribution.

Some of the metal concentrations reported for areas in Pearl Harbor, Hawaii may be the result of natural processes, i.e., chromium and nickel in relation to the basaltic mineral suite, and iron, zinc, lead, and copper to the distribution of anaerobic bottom conditions. Such conditions would probably occur in the Harbor in its natural state, although they are greatly enhanced by man's activity and large contribution of organic detritus. Montmorillonite is found in greatest abundance in the southeast Loch area near the bentonitic Salt Lake tuff; its general distribution throughout the Harbor is governed by proximity to highly montmorillonitic soils and tuffs and the degree of vertical mixing within the stratified water column. The distribution of authigenic pyrite in the Harbor is related to the depth to the anaerobic layer and to the distribution of organic matter. Estuarine stratification is pronounced in West and Middle Lochs, and the stability of the water column combined with the high influx of organic matter renders the bottom layer anoxic. In West Loch the production of H2S in the sediments may restrict the habitat of foraminifera to the shallow (probably the upper 5 m) periphery of the Loch; the character of the foraminiferal population fluctuates greatly with the volume of fresh water influx and the effects of prevailing winds on the brackish layer. Coral fragments and clayey carbonaceous sediments indicate dredge spoils.
W77-08815

EFFECT OF THE BOUNDARY SURFACE BETWEEN SEA AND FRESH WATERS ON THE DISTRIBUTION OF DISSOLVED OXYGEN IN THE MOUTH REGION OF THE DNIEPER RIVER,
For primary bibliographic entry see Field 5B.
W77-08832

SOME HYDROCHEMICAL CHARACTERISTICS OF THE MOUTH REACHES OF THE ANABAR, LENA, YANA, AND INDIGIRKA RIVERS,
A. N. Zubakina.
Soviet Hydrology, Selected Papers, No. 4, p 229-233, 1975. 2 fig, 1 tab, 12 ref. Translated from Trudy Gosudarstvennogo Okeanograficheskogo Instituta, No. 118, p 44-55, 1974.

Descriptors: *Estuaries, *Rivers, *Water chemistry, *Arctic, Ions, Cations, Chlorides, Carbonates, Sulfates, Foreign countries, Foreign research, Phosphates, Silicates, Mineral waters, Chemistry, On-site investigations.
Identifiers: *USSR, *Yakutia(USSR).

n recent years, many industrial organizations of ne Yakut USSR, primarily the fishing industry, ave shown interest in the water chemistry of the outh reaches of rivers in northern Yakutia. An ttempt was made to describe some aspects of the ydrochemical regime in the mouths of rivers Anabar, the Bykovskiy arm of the Lena, Yana, ndigirka), which have not as yet been described in ne literature because of the lack of necessary ob-ervational data. The observations were confined o the main phases of the hydrologic regime of the ivers, which, undoubtedly, could not reflect ompletely the effect of the sea on the ydrochemical regime of the river mouths. (Sims-SWS)
W77-08833

ROLE OF RIVER RUNOFF AND OF WATER EXCHANGE IN THE SALINITY OF THE NORTHERN CASPIAN SEA,
For primary bibliographic entry see Field 2H.
W77-08836

A MATHEMATICAL MODEL STUDY OF FRESH-WATER LENSES,
Aston Univ., Birmingham (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-08837

SURFACE PARTICLE ORBITS IN UNIFORM WAVES,
Liverpool Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-08845

CURRENT-METER RECORDINGS OF LOW-SPEED TURBIDITY CURRENTS,
Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div.
F. P. Shepard, P. A. McLoughlin, N. F. Marshall, and G. G. Sullivan.
Geology, Vol 5, No 5, p 297-301, May 1977. 6 fig, 9 ref. NSF DES74-22089, ONR N00014-69-A-0200-6049.

Descriptors: *Currents(Water), *Ocean currents, *Turbidity currents, *Submarine Canyons, Coasts, *Current meters, Tides, Canyons, Sediment transport, Flow, Turbidity, Oceanography, Sediments.

Turbidity currents of high velocity may occur during catastrophic conditions, but records suggest that currents of little more than 1 knot (= 0.5 m/s) may be quite common in submarine canyons. Three current-meter records of such currents were obtained (1) during an onshore storm at La Jolla, California, (2) during relatively high swells off the Rio Balsas Delta in western Mexico, and (3) in Abra Canyon off the Abra Delta in northwest Luzon during flood conditions. A pattern observed in all these occurrences included a preceding, relatively large, upcanyon flow, a rapid buildup of the downcanyon turbidity current, a slow decay, and a following interval of no current. The currents may be particularly common where deltas have built across the continental shelf and where large masses of sediment are being introduced into canyon heads. The relatively weak currents may transport large quantities of sediment down the canyon. (Sims-ISWS)
W77-08847

GRAIN-SIZE PARAMETERS OF INSOLUBLE RESIDUES IN MIXXED TERRIGENOUS-SKELETAL CARBONATE SEDIMENTS AND SEDIMENTARY ROCKS: SOME NEW ZEALAND EXAMPLES,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
C. S. Nelson.
Sedimentology, Vol 24, No 1, p 31-52, February 1977. 14 fig, 1 tab, 27 ref.

Descriptors: *Particle size, *Beaches, *Deposition(Sediments), Environment, Sieve analysis, Sediment distribution, Geologic investigations, Carbonates, Sediment transport, Sediment sorting, Histograms, On-site investigations, Foreign countries, Foreign research.
Identifiers: *Terrigenous-skeletal sediments, *New Zealand, Depositional processes.

Grain-size parameters derived from the mechanical analysis of acid-insoluble residues from mixed terrigenous-shell beach sediments from Auckland, New Zealand, are more effective for interpreting the depositional processes and for characterizing the beach environment on textural scatter plots than are parameters based on the analysis of the total beach samples. This results mainly from the wide variations in size of hydraulically equivalent skeletal carbonate grains in the sediment, especially in the coarser size grades, but may also be accentuated by the local origin and by susceptibility to alteration of the shell material. Compared with the total sediment grain-size distribution, the insoluble residues from the beach deposits are characteristically finer-grained, better sorted, and more consistently coarse-skewed and leptokurtic. The grain-size distribution characteristics of insoluble residues from several stratigraphic units in a sequence of Oligocene mixed terrigenous-skeletal shelf sediments in the South Auckland region distinguish depositional mechanisms and environmental energy levels for each unit that are consistent with interpretations made on the basis of carbonate petrography and palaeontology. With regard to the bulk content of terrigenous mud in the insoluble residues, the grain-size distribution of the fraction coarser than 4 phi is alone diagnostic of the energy-time trends in these sediments. (Visocky-ISWS)
W77-08848

OCEANOGRAPHIC FEATURES, CURRENTS, AND TRANSPORT IN CABOT STRAIT,
Quebec Univ., Rimouski. Dept. of Oceanography.
M. I. El-Sabh.
Journal of the Fisheries Research Board of Canada, Vol 34, No 4, p 516-528, April 1977. 13 fig, 3 tab, 38 ref.

Descriptors: *Straits, *Estuaries, *Currents(Water), *Canada, *St Lawrence River, Flow, Water temperature, Salinity, Variability, Runoff, Surface runoff, Rivers, On-site investigations, Model studies, Mathematical models, Oceanography.
Identifiers: *Cabot Strait(Canada).

Seventy oceanographic sections across Cabot Strait, taken at various times of the year between 1950 and 1974, were utilized to describe the average oceanographic features, currents, and volume transport patterns as well as their variations with depth and time. The water mass structure in Cabot Strait is a two-layered structure; the water in the upper 50-100 m typically is moving seaward, while below that depth it is commonly found to be moving into the Gulf. The character of the upper layer which is normally not of uniform thickness across the Strait, but is distinctly wedge-shaped, is subject to considerable seasonal variation, whereas that of the lower is quite uniform the year round. Seasonal and long-term variations of the physical properties in Cabot Strait were described. Outflow through Cabot Strait was shown to be concentrated in the upper layer off Cape Breton and is balanced by inflow at intermediate depths on the Newfoundland side and in the deep portions of the section. The maximum and minimum transports, both inflow and outflow, occur in August and June, respectively. The net outward volume transport through the Strait increases from 9000 cu m/s in April to 2500 cu m/s in August and decreases to about 100 cu m/s in February. The weighted mean value, 13000 cu m/s agrees well with the value obtained from an estimate of net freshwater input rate (run-off plus precipitation minus evaporation) above the section. The maximum transport occurs at times of surface minimum salinity. Horizontal advective transport of salt was found to be more important than horizontal diffusive transport. Recommendations for future transport studies in Cabot Strait were presented. (Sims-ISWS)
W77-08851

SOURCES OF TAR POLLUTION ON ISRAELI MEDITERRANEAN COAST,
Israel Petroleum Inst., Tel-Aviv.
For primary bibliographic entry see Field 5B.
W77-08852

COMPREHENSIVE OCEANOGRAPHIC BASELINE STUDY AT BARCELONETA, PUERTO RICO.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W77-08853

HYDROTHERMAL FLUIDS OF SEAWATER SALINITY IN OPHIOLITIC SULPHIDE ORE DEPOSITS IN CYPRUS,
Oxford Univ. (England). Dept. of Geology and Mineralogy.
E. T. C. Spooner, and C. J. Bray.
Nature, Vol 266, No 5605, p 808-812, April 28, 1977. 4 fig, 1 tab, 41 ref.

Descriptors: *Hydrothermal studies, *Mineralogy, *Sulfides, *Sea water, Pyrite, Freezing, Salinity, Copper, Convection, Metamorphic rocks, Microscopy, Economic impact.
Identifiers: *Ore deposits, *Cyprus, *Metal transport, Freezing points, Oceanic crust layer 2, Fluid inclusions, Thin sections.

Freezing points of fluid inclusions in vein quartz intergrown with sulphides from ophiolitic cupriferous pyrite ore deposits in Cyprus indicate a hydrothermal fluid of seawater salinity and confirm the hypothesis of metal transport in hot seawater. Therefore, it was suggested that the economic potential of oceanic crust layer 2 is probably neligible. (Visocky-ISWS)
W77-08854

SINKAGE AND RESISTANCE FOR SHIPS IN CHANNELS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-08873

MEANS AND METHOD FOR CONTROLLING BEACH AND SANDBAR EROSION,
For primary bibliographic entry see Field 8B.
W77-08894

WAVE HEIGHT MEASURING DEVICE,
Texaco Inc., New York.
For primary bibliographic entry see Field 7B.
W77-08897

HIGH SENSITIVITY FLOWMETER,
Office of the Secretary (Navy), Washington, D.C.
For primary bibliographic entry see Field 7B.
W77-08898

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W77-08900

IDENTIFICATION OF WEATHERED OIL FILMS FOUND IN THE MARINE ENVIRONMENT,
Exxon Research and Engineering Co., Linden, N. J. Governmental Research Lab.
For primary bibliographic entry see Field 5A.
W77-08901

ANALYSIS OF POLLUTION FROM MARINE ENGINES AND EFFECTS ON THE ENVIRONMENT.
Environmental Control Technology Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W77-08902

TESTING OF A TECHNIQUE FOR REMOTELY MEASURING WATER SALINITY IN AN ESTUARINE ENVIRONMENT,
National Aeronautics and Space Administration, Bay Saint Louis, Mo. Earth Resources Lab.
G. C. Thomann.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-22634, Price codes: A03 in paper copy, A01 in microfiche. Report No. 118, January 1975. 37 p, 11 fig, 8 tab, 4 ref.

Descriptors: *Salinity, *Remote sensing, *Estuarine environment, *Resources development, Baseline studies, Environmental effects, Estuaries, Mississippi.
Identifiers: *Outer Continental Shelf, *Mississippi Coast.

An aircraft experiment was flown on November 7, 1973 to test a technique (Thomann, 1973) for remote water salinity measurement. Apparent temperatures at 21 cm and 8-14 micro m wave lengths were recorded on eight runs over a line along which the salinity varied from 5 to 30 o/oo. Boat measurements were used for calibration and accuracy calculations. Overall RMS accuracy over the complete range of salinities was 3.6 o/oo. Overall RMS accuracy for salinities greater than o/oo, where the techniques is more sensitive, was 2.6 o/oo. Much of this error is believed to be due to in ability to exactly locate boat and aircraft positions. The standard deviation over the eight runs for salinities approximately 10 o/oo is 1.4 o/oo; this error contains a component due to mislocation of the aircraft also. It is believed that operational use of the technique is possible with accuracies of 1-2 o/oo under conditions specified in the paper. (Sinha-OEIS)
W77-08903

A TRANSIENT, TWO-DIMENSIONAL, DISCRETE-ELEMENT, FAR-FIELD MODEL FOR THERMAL IMPACT ANALYSIS OF POWER PLANT DISCHARGES IN COASTAL AND OFFSHORE REGIONS. PART I: GENERAL DESCRIPTION OF THE MATHEMATICAL MODEL AND RESULTS OF AN APPLICATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W77-08905

N2 : AR, NITRIFICATION AND DENITRIFICATION IN SOUTHERN CALIFORNIA BORDERLAND BASIN SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5A.
W77-08907

DUNE STABILIZATION WITH PANICUM AMARUM ALONG THE NORTH CAROLINA COAST,
North Carolina State Univ. at Raleigh. Dept. of Botany; and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
E. D. Seneca, W. W. Woodhouse, Jr., and S. W. Broome.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-023 178, Price codes: A03 in paper copy, A01 in microfiche. U.S. Army Coastal Engineering Research Center Miscellaneous Report NO 76-3, February 1976. 43 p, 16 fig, 13 tab, 8 ref. DACW72-73-C-0025.

Descriptors: *Stabilization, *Dunes, *North Carolina, Coasts.
Identifiers: *Panicum amarum, Bitter panicum, Ammophila breviligulata, American beachgrass, Dune building, Resources management, *Dune stabilization.

Dune stabilizing and dune building potential of Panicum amarum (bitter panicum) along the North Carolina coast was studied. A nursery was established with transplants collected from two coastal locations to provide transplants for field experiments. Techniques for propagation, handling, processing, and planting bitter panicum for use in coastal areas were determined. Experimental plantings with emphasis on bitter panicum together with Ammophila breviligulata (American beachgrass) and Uniola paniculata (sea oats) were made at two coastal locations. On a sandy site about 300 meters inland where there was relatively little sand moving, bitter panicum contributed more of the estimated cover through two growing seasons than either of the other two grasses. Over a 24-month period at a foredune site, bitter panicum accumulated about one-fourth the sand accumulated by either three selections of American beachgrass or mixed species plantings involving all three grasses. Results indicate that the principal values of bitter panicum are in stabilizing sandy coastal areas and in mixed species plantings to build and stabilize coastal foredunes in the southeastern United States. (Sinha-OEIS)
W77-08908

COMPARISON OF REMOTELY SENSED CONTINENTAL-SHELF WAVE SPECTRA WITH SPECTRA COMPUTED BY USING A WAVE REFRACTION COMPUTER MODEL,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
L. R. Poole.
National Aeronautics and Space Administration, Technical Note NASA TN D-8353, December 1976. 43 p, 10 fig, 12 ref.

Descriptors: *Remote sensing, *Continental shelf, *Computer models, *Refraction(Water waves), Geophysics, Shoals, Energy.
Identifiers: *Wave spectra, Wave refraction, Mid-Atlantic Ocean.

An initial attempt was made to verify the Langley Research Center and Virginia Institute of Marine Science mid-Atlantic continental-shelf wave refraction model. The model was used to simulate refraction occurring during a continental-shelf remote sensing experiment conducted on August 17, 1973. Simulated wave spectra compared favorably, in a qualitative sense, with the experimental spectra. However, it was observed that most of the wave energy resided at frequencies higher than those for which refraction and shoaling effects were predicted. In addition, variations among the experimental spectra were so small that they were not considered statistically significant. In order to verify the refraction model, simulation must be performed in conjunction with a set of significantly varying spectra in which a considerable portion of the total energy resides at frequencies for which refraction and shoaling effects are likely. (Sinha-OEIS)
W77-08911

WAVE REFRACTION DIAGRAMS FOR THE BALTIMORE CANYON REGION OF THE MID-ATLANTIC CONTINENTAL SHELF COMPUTED BY USING THREE BOTTOM TOPOGRAPHY APPROXIMATION TECHNIQUES,
National Aeronautics and Space Administration Langley Station, Va. Langley Research Center.
L. R. Poole.
National Aeronautics and Space Administration Technical Memorandum NASA TM X-3422 December 1976. 155 p, 52 fig, 1 tab, 4 ref.

Descriptors: *Continental Shelf, *Compute models, *Refraction(Water waves), *Submarin canyons.
Identifiers: *Outer Continental Shelf, *Wav refraction, Mid-Atlantic, Oceanographic data *Baltimore Canyon, Bottom topography.

The Langley Research Center and Virginia In stitute of Marine Science wave refraction com puter model was applied to the Baltimore Canyo region of the mid-Atlantic continental shelf. Wav refraction diagrams for a wide range of normall expected wave periods and directions were com puted by using three bottom topography approx mation techniques: quadratic least squares, cubi least squares, and constrained bicubic interpola tion. Mathematical or physical interpretation c certain features appearing in the computed dia grams is discussed. (Sinha-OEIS)
W77-08912

HARBOR AND NEARSHORE CURRENTS OSWEGO HARBOR, NEW YORK,
National Oceanic and Atmospheric Administra tion, Ann Arbor, Mich.
G. S. Miller.
Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-254 651 Price codes: A03 in paper copy, A01 in microfiche NOAA Technical Report No ERL 360-GLERL 7 January 1976. 32 p, 19 fig, 14 ref. Also as GLERL Contribution No 59.

Descriptors: *New York, *Currents(Wate waves), *Cooling water, Harbors, Lake Ontario Powerplants, Water temperature.
Identifiers: *Nearshore currents, *Seasonal varia tion, *Wind stress, *Oswego Harbor(NY).

The results of a study to determine current pat terns in the harbor and adjacent nearshore are and to relate these patterns to main generatin forces is presented. The results of this report an several other coastal investigations conducted i the Oswego area indicate persistant eastwar flowing baroclinic coastal currents. It has been ob served that wind stress transports warm Lake On tario surface water toward the south shore thereby resulting in strong baroclinic coastal cu rents toward the east. Airborne thermal mappin of the harbor area indicates that the outflow o warm river water and power-plant cooling effluen from the harbor affects the water temperature an nearshore flow patterns out to more than 4 kilome ters in the lake and that the higher temperatur water is evident through all seasons. Dynami height analysis also indicates a northward bulge a Oswego. (Sinha-OEIS)
W77-08913

STORM TIDE FREQUENCY ANALYSIS FO THE COAST OF GEORGIA,
National Weather Service, Silver Spring, Md. Of fice of Hydrology.
F. P. Ho.
Available from the National Technical Informa tion Service, Springfield, VA 22161 as COM 7411746, Price codes: A03 in paper copy, A01 i microfiche. NOAA Technical Memorandum NWS HYDRO-19, September 1974. 31 p, 8 fig, 4 tab, 1 ref.

Descriptors: *Tides, *Georgia, *Floods, *Lan use, Storms, Frequency analysis, Hurricanes Coasts, Insurance, *Flood plain insurance.
Identifiers: *Storm tides.

Storm tide height frequency distributions are developed on the Georgia coast for the National Flood Insurance Program by computing storm tides from a full set of climatologically representative hurricanes, using the National Weather Service hydrodynamic storm surge model. Tide levels are shown in coastal profile between annual frequencies of 0.10 to 0.002. This report is intended for use in estimating actuarial risk to buildings from coastal floods and in land use management. (Sinha-OEIS)
W77-08914

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY--TEXAS: AREA DESCRIPTION,
National Marine Fisheries Service, Galveston, Tex. Gulf Coastal Fisheries Center.
R. A. Diener.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 511, Price codes: A07 in paper copy, A01 in microfiche. NOAA Technical Report NMFS CIRC-393, September 1975. 136 p, 55 fig, 26 tab, 52 ref.

Descriptors: *Estuaries, *Baseline studies, *Water pollution, *Environmental effects, *Texas, *Gulf of Mexico, Shellfish, Waste disposal.
Identifiers: Outer Continental Shelf, Resource availability, Inventory.

Seven Texas estuarine areas are described in terms of their dimensions; major vegetation types; geology and geological history, drainage basins and stream discharge records; hydrological, biological, and benthic properties; populations and economic development; pollution; and navigation projects. These areas include the Sabine Lake, Galveston Bay, Matagorda Bay-Brazos River Delta, San Antonio Bay, Copano-Aransas Bay, Corpus Christi Bay, and the Laguna Madre. A list of pertinent literature is also presented. The Texas coast is important for its sport and commercial fisheries and for waterfowl hunting. Pollution from domestic and industrial sources has forced the closing of about 325,090 acres of open bay waters to shellfishing and an additional 16,600 acres closed on a conditional basis. Over 1,050 miles of Federal navigation channels are situated on the Texas coast, the most important of which is the Gulf Intracoastal Waterway, which extends from the Sabine River to Brownsville. Large areas of open estuarine waters, especially in the Sabine Lake and Galveston Bay areas, have been displaced by large spoil areas. (Sinha - OEIS)
W77-08916

ANALYTICAL MODELS FOR THE EVALUATION OF SUPPLEMENTAL AERATION IN TEXAS ESTUARIES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08917

AN EXAMINATION OF SOME PHYSICAL AND BIOLOGICAL IMPACTS OF DREDGING IN ESTUARIES,
Oregon State Univ., Corvallis. School of Engineering; and Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08918

KINETIC RESPONSE OF PERTURBED MARINE NITRIFICATION SYSTEMS,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5C.
W77-08946

FLORIDA'S SOVEREIGNTY SUBMERGED LANDS: WHAT ARE THEY, WHO OWNS THEM AND WHERE IS THE BOUNDARY,
For primary bibliographic entry see Field 6E.
W77-08951

BISCAYNE BAY SYMPOSIUM II,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 5G.
W77-08961

LEGAL BATTLES ON THE CALIFORNIA COAST: A REVIEW OF THE RULES,
National Oceanic and Atmospheric Administration, Washington, D. C. Office of Sea Grant.
For primary bibliographic entry see Field 6E.
W77-08963

A RATIONAL NATIONAL POLICY ON PUBLIC USE OF THE BEACHES,
House, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-08976

BEACH SAND TRANSPORT: DISTRIBUTION AND TOTAL DRIFT,
Oregon State Univ., Corvallis. Estuarine and Coastal Research Program.
P. D. Komar.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW2, Proceedings Paper 12916, p 225-239, May 1977. 6 fig, 18 ref, 1 append.

Descriptors: *Beaches, *Sands, *Sediment transport, Coastal engineering, Laboratory tests, Littoral drift, Scaling, Surf, Oceans.
Identifiers: Scale effect, Wave energy, Wave tanks, Longshore sand transport.

Considerable data were collected in laboratory wave basins in an attempt to relate the sand transport rate to the wave conditions. The study undertook a review of laboratory data in an attempt to determine if any scaling laws can account for the scatter, laws which might indicate how the transport rate is a function of grain size and density. No such systematic laws were found; the laboratory data did not even demonstrate a relationship between the sand transport rate and the settling velocity of the beach sediment. Solutions were developed for the distribution of longshore sand transport across the beach width. One solution ignores the stress due to the longshore currents, including only the stress of the waves; a more complicated solution includes both stress contributors. In both cases, the distributions were made to yield the correct total and transport rate, according to the field data, when the distributions are integrated across the surf zone width. (Lee-ISWS)
W77-09019

ESTIMATING WAVE GENERATION ON RESTRICTED FETCHES,
California State Dept. of Navigation and Ocean Development, Sacramento; and Scripps Institution of Oceanography, La Jolla, Calif.
R. J. Seymour.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 103, No WW2, Proceedings Paper 12924, p 251-264, May 1977. 10 fig, 3 tab, 19 ref, 1 append.

Descriptors: *Coastal engineering, *Fetch, *Model studies, Lakes, Waves(Water), Winds, Bays, Water, Equations, Measurement.
Identifiers: *Wave energy, *Wave forecasting, Wave generation, Wave spectrum, Restricted fetches, Measured spectra, Limited fetches.

The applicability of one-dimensional wave generation models to fetches that are restricted in width as well as length was considered. An analytical estimation approach, the spectral contribution method, was developed and compared with measured results from four sites with varying degrees of fetch restriction. For width restricted fetches, the spectral contribution method was a more efficient estimator than the effective fetch method. Two one-dimensional wave generation models and two directional distribution models were investigated. For limited fetches, the JONSWAP spectrum appeared to be slightly superior to the Bretschneider spectrum; and the Pierson, Neumann, and James distribution yielded better estimates than the Longuet-Higgins, Cartwright, and Smith distribution. (Roberts-ISWS)
W77-09021

THE THIRD LONDON AIRPORT STUDY,
Hydraulics Research Station, Wallingford (England).
T. J. Weare.
Journal of Hydraulics Research, Vol. 15, No. 1, p 55-72, 1977. 11 fig, 5 ref.

Descriptors: *Reclamation, *Estuary, *Model studies, *Numerical analysis, *Currents(Water), Hydraulic engineering, Momentum equation, Coriolis force, Turbulence, Sediment transport.
Identifiers: *Thames Estuary.

The proposal to construct an airport and a seaport on the reclaimed land in the Thames Estuary raised questions about the effects of reclamation on the hydraulics of the estuary. A large physical model was built to assess the local effects due to reclamation, to test the various design shapes of the reclamation, and to identify suitable borrow areas for the large quantities of fill material required. In addition to the physical model, a numerical model study was carried out, the principal function of which was to fill a supporting role complementary to that of the physical model. The physical model was found to be critically sensitive to the current generator controls. Some processes such as Coriolis force, sediment transport, surface wind, changing friction due to changing bed forms, and diffusion, which cannot be easily modeled and varied in a physical model, can be included in a numerical model. This is the complementary supporting role for such models. It is reasonable to expect that an increasing proportion of hydraulic investigations will be undertaken by numerical techniques as computing sources continue to develop. (Singh-ISWS)
W77-09037

A RECONNAISSANCE OF THE HYDROLOGY OF THE EDISTO AND ASHEPOO ESTUARIES, SOUTH CAROLINA,
Geological Survey, Columbia, S.C. Water Resources Div.
F. A. Johnson.
South Carolina Water Resources Commission, Columbia, Report No 6, 1976. 53 p, 13 fig, 10 tab, 16 ref.

Descriptors: *Tidal effects, *Estuaries, *South Carolina, *Saline water intrusion, *Saline water-freshwater interfaces, Water quality, Stratification, Mixing, Low flow.
Identifiers: *Edisto estuary(SC), *Ashepoo estuary(SC).

A reconnaissance study has been made to provide background information on some of the physical and chemical characteristics of the Edisto and Ashepoo estuaries in South Carolina. Data were collected from the estuaries on the physical dimensions, tidal stages, saltwater intrusion at high and low tides, and water-quality above the saltwater intrusion. The times of the high and low tides at the upper ends of the estuaries lag those at the lower end by several hours. Tidal range is reduced at the upper ends by about 70 percent. During

average freshwater inflow conditions, the interface between freshwater and saltwater penetrates the Edisto estuary to mile 19.5 and the Ashepoo estuary to mile 24 at high tide. During periods of very low freshwater inflow, such as the 7-day 10-year low flow, the interface at high tide might penetrate to mile 32 (near Jacksonboro) on the Edisto River. During a similar low-flow period, the Ashepoo River would be brackish or salty to about mile 38. Above the saltwater interface, the water of both estuaries is of good quality and suitable for most uses if treated for iron and color. The bed sediments throughout the study area, with the exception of iron, have little or no indications of heavy metals, herbicides or pesticides. (Woodard-USGS)
W77-09076

A RECONNAISSANCE OF THE HYDROLOGY OF THE INTRACOASTAL WATERWAY FROM BUCKSPORT TO LITTLE RIVER INLET, SOUTH CAROLINA,
Geological Survey, Columbia, S.C. Water Resources Div.
F. A. Johnson.
South Carolina Water Resources Commission, Columbia, Report No 7, 1977. 33 p, 7 fig, 7 tab, 8 ref.

Descriptors: *Saline water-freshwater interfaces, *Navigable waters, *Coasts, *South Carolina, Canals, Inflow, Rivers, Tidal effects, Tidal streams, Estuaries, Salinity, Travel time, Tracers, Dye releases, Saline water intrusion, Stratification, Water quality, Evaluation, Water utilization.
Identifiers: *Intracoastal Waterway(SC).

Some of the physical and chemical characteristics of the Intracoastal Waterway (ICWW) between Bucksport and Little River Inlet, South Carolina, have been related to tidal conditions and freshwater inflow; also the suitability of the water for use has been considered. Dye tracing techniques have been used to determine the time-of-travel from mile 375 where the Waccamaw River enters the ICWW to Little River Inlet below mile 342. Fresh surface-water flow is contributed only by one major tributary, the Waccamaw River, which divides at mile 375, with two-thirds flowing southward. The one-third that flows northward takes about 6 days to reach Little River Inlet. The position of the saltwater interface at high tide in the ICWW is largely controlled by the portion of the Waccamaw River flow that goes northward and is itself probably governed by the amount of backwater caused by the Pee Dee River through Bull Creek. The interface at high-slack tide changes position by only a few miles between low and high freshwater inflow, usually remaining within 6 to 10 miles of Little River Inlet. The water above the interface is of good quality and suitable for most uses. (Woodard-USGS)
W77-09077

PRELIMINARY SUMMARY OF THE 1976 ATLANTIC MARGIN CORING PROJECT OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, Reston, Va. Geologic Div.
J. C. Hathaway, J. S. Schlee, C. W. Poag, P. C. Valentine, and E. G. A. Weed.
Open-file report 76-844, November 1976. 217 p, 4 append.

Descriptors: *Core drilling, *Core logging, *Continental shelf, *Atlantic Ocean, *United States, Coasts, Petrology, Offshore platforms, Sedimentology, Freshwater, Salinity, Aquifers, Stratigraphy, Chemical analysis, Environment.

The U.S. Geological Survey Atlantic Margin Coring Project, 1976, a 60-day expedition to obtain core samples by drilling beneath the floor of the Continental Shelf and Slope of the eastern United States, was carried out in July, August, and September 1976 aboard D/V GLOMAR CONCEPTION. The coring penetrated as much as 310 meters below the sea floor at 19 sites along the continental margin from Georgia to Georges Bank off New England in water depths ranging from 20 to 300 meters; 1,020 meters of material were recovered in 380 cores, ranging in age from Late Cretaceous to Holocene. One of the major findings was the discovery of relatively fresh water (salinities less than 3 parts per thousand) extending beneath the Continental Shelf as much as 60 nautical miles seaward from the New Jersey coast. Water of about 1 part per thousand salinity was found beneath the shelf more than 7 nautical miles off Ocean City, Maryland and Barnegat Inlet, New Jersey. Analyses for light hydrocarbons in the cores show the highest concentrations (as much as 412,000 ppm) at sites in water depth greater than 200 meters (the shelf-slope break), principally in Pleistocene sediments, although methane concentrations greater than 400,000 ppm also were found in Miocene sediments at one site near the shelf edge. (Woodard-USGS)
W77-09089

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

NEW DIRECTIONS IN ION EXCHANGE,
Water Purification Associated, Cambridge, Mass.
For primary bibliographic entry see Field 5D.
W77-08719

WATER RESOURCES AND WATER UTILIZATION IN ISRAEL,
Office of Naval Research, London (England).
For primary bibliographic entry see Field 6E.
W77-09011

3B. Water Yield Improvement

DEVELOPMENT OF A LOW COST ASPHALT-RUBBER MEMBRANE FOR WATER HARVESTING CATCHMENTS AND RESERVOIR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
R. K. Frobel, C. B. Cluff, and R. A. Jimenez.
Available from the National Technical Information Service Springfield VA as PB-268 779, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, June 1977, 50 p, 17 fig, 8 tab, 13 ref, 2 append. OWRT A-075-ARIZ(2), 14-34-0001-7006.

Descriptors: *Seepage control, Water harvesting, *Asphalt, *Rubber, Water conservation, Testing, Absorption, Viscosity, *Reservoir leakage.
Identifiers: Waterproof membranes, *Asphalt rubber membranes.

This project was concerned with the laboratory and field investigation of asphalt-rubber for use in water seepage control applications. Laboratory testing utilized for physical property determination included viscosity, ductility (ASTM D113-74), flow/slope stability, brittleness/impact resitance (ASTM D994-72), water vapor transmission (ASTM E96-72, Procedue BW), water absorption (ASTM 570-72)I, and permeability. Also, some specialized laboratory equipment was desinged and fabricated for the testing. The results of the testing showed that the asphalt-rubber is relatively impermeable as a membrane, and that the rubber does not effect an otherwide impermeable asphalt film. Physical properties of the base asphalt that are increased with the addition of rubber include water absorption, viscosity, and impact resistance. The tests that exhibited lower physical property values were ductility and slope stability. Investiga
tions of field appliations of asphalt-rubber resulte
in preliminary subgrade preparation specifica
tions. Also, the field installations supported th
hypothesis that the asphalt-rubber can be effec
tively used as a water seepage barrier. Preliminar
specifications for asphalt-rubber mixing and fiel
appliation are also included.
W77-08601

CLEARCUTTING IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Schoo
of Forest Resources.
For primary bibliographic entry see Field 4C.
W77-08712

**EVAPORATION FROM SEVEN RESERVOIR
IN THE DENVER WATER-SUPPLY SYSTEM
CENTRAL COLORADO,**
Geological Survey, Reston, Va. Water Resourc
Div.; and Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 2D.
W77-08736

**SURFACE-GROUNDWATER INTERACTION
AND THE CONJUNCTIVE USE OF TH
WATER RESOURCES OF THE MULLIC
RIVER BASIN, NEW JERSEY,**
Rutgers - The State Univ. New Brunswick N.
Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-08810

**SOIL AND ROCK STRATA TO TRAP, FILTE
AND STORE WATER FOR RURAL DOMESTI
USE,**
Colorado State Univ., Fort Collins. Environmenta
Resources Center.
A. T. Corey, and G. L. Smith.
Available from the National Technical Informa
tion Service, Springfield, VA 22161 as PB-268 820
Price codes: A03 in paper copy, A01 in microfiche
Completion Report, Dec. 1976. 36 p, 22 fig, 1 tab,
ref. OWRT C-6176(No. 5219)(1).

Descriptors: *Aquifers, Aquifer testing, Ari
lands, *Artificial recharge, Artificial use, Ban
storage, Channel beds, Design criteria, *Domesti
water, Freshwater, *Groundwater, Overland flow
Percolation, Pervious soils, Potable water, Rain
fall, Runoff, Sands, Soil moisture, *Soil physics
Terrain, Springs, *Indian reservations, Wate
storage, New Mexico, South Dakota, Wate
supply.

Experimental rock and soil strata for collection
filtration and storage of rainfall and runoff wate
were constructed on three separate Indian Reser
vations: Ramah Navajo, and Santa Clara Pueblo i
New Mexico, and the Pine Ridge (Oglala Sioux) i
South Dakota. The artificial spring strata wer
constructed to determine their potential in th
development and use of Indian and other land
located in the arid and semi-arid sections of th
country where the availability of adequate wate
supplies for domestic use, for watering livestoc
in otherwise suitable grazing areas, and for th
production of food crops is either severely limite
as surface water, or the groundwater is non-ex
istent, excessively saline, or at very great depths
The principle objective was to provide a reliabl
source of potable water at a relatively low cost
The most important factors in the concentration o
experimental strata were site location, technique
of construction of the facility, selection of strat
material and method of placement of impermeabl
layer.
W77-08821

**AN ASSESSMENT OF SNOWPACK DEPLE
TION-SURFACE RUNOFF RELATIONSHIP
ON FORESTED WATERSHEDS,**
Arizona Univ., Tucson. Dept. of Watershe
Management.

. M. Solomon.
vailable from the National Technical Informa-on Service, Springfield, VA 22161 as PB-268 975, rice codes: A06 in paper copy, A01 in microfiche. laster of Science Thesis, 1974. 109 p, 12 fig, 6 ab, 56 ref, 6 append. OWRT A-045-ARIZ(2). 14-1-0001-5003.

escriptors: Watershed management, *Forest atersheds, Evaluation, *Snowmelt, Runoff, Vater yield, Water supply, Forest management, Arizona, *Water yield improvement, Snowpacks, *Rainfall-runoff relationships, Small atersheds.
lentifiers: New water supply, Forest manage-ent guidelines.

technique was developed for determining daily alues of runoff efficiencies from small atersheds by coupling a computer model that mulated Arizona snowmelt processes with raphical techniques of runoff hydrograph separa-on. The computer program was a USDA Forest ervice model modified to better simulate Arizona onditions. An explanation of modifications and mitations of the model is given, along with equa-ons for estimating some of the model input varia-les. Seven small watersheds with a total of 14 ears of record were used in evaluating changing atterns of runoff efficiencies within a year. Addi-onally, many physical, biological, and climatic ariables were correlated with seasonal runoff ef-iciencies not only among years and among atersheds, but also within a watershed among ears, and among watersheds within a season. Pre-iction equations were also formulated that could e of use in the identification of high water yield-ng watersheds.
W77-08933

3C. Use Of Water Of Impaired Quality

DISTRIBUTION OF CORN ROOTS IN SANDY SOIL WITH A DECLINING WATER TABLE,
Agricultural Research Service, Mandan, N.D. Northern Great Plains Research Center.
For primary bibliographic entry see Field 2I.
W77-08676

3D. Conservation In Domestic and Municipal Use

QUANTITATIVE AND QUALITATIVE IMPLI-CATIONS OF URBAN STORM RUNOFF ABATEMENT MEASURES,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-08602

GET READY FOR DUAL WATER SYSTEMS,
Weston Environmental Consultants-Designers, West Chester, Pa.
For primary bibliographic entry see Field 5G.
W77-08645

UTILITY ANALYSIS FOR THE URBAN GROWTH INSIDE THE RECHARGE ZONES OF THE GROUNDWATER RESOURCES OF SAN ANTONIO, TEXAS,
Texas Univ. at San Antonio. Dept. of Environ-mental Studies.
For primary bibliographic entry see Field 6B.
W77-08713

SEGREGATION AND RECLAMATION OF HOUSEHOLD WASTEWATER AT AN IN-DIVIDUAL RESIDENCE,
Colorado Univ., Boulder. Dept. of Civil and En-vironmental Engineering.
For primary bibliographic entry see Field 5D.
W77-08806

NORTH CAROLINA CONFERENCE ON WATER CONSERVATION.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 900, Price codes: A07 in paper copy, A01 in microfiche. Proceedings of Conference held on Sept. 3-4, 1975, at Royal Villa, Raleigh, NC. 134 p, Edited by James M. Stewart. OWRT A-999-NC(48), N/A.

Descriptors: *Water conservation, Conservation, Pulp and paper industry, Water utilization, Textiles, *Municipal water, *Industrial wastes, *Water reuse, Water rates, Pricing, Maryland, Pennsylvania, *North Carolina.
Identifiers: Hyattsville(Md), *Residential water, *Water saving devices.

This conference was designed specifically to explore ways of making better use of existing water supplies and reducing the cost of wastewater management through conservation and more efficient practices. Thirteen presentations are included on residential, food processing, pulp and paper, and textile water conservation. Papers also were presented on water saving devices and conservation in suburban Maryland and in Pennsylvania. Innovative approaches to rate-making and rate structures were topics for three presentations.
W77-08820

INTEGRATED EVALUATION PROGRAMS FOR FAIRFAX COUNTY, VA.,
Fairfax County Office of Comprehensive Planning, Va. Director's Office.
For primary bibliographic entry see Field 6B.
W77-08862

PHILADELPHIA'S WATER SYSTEM AUTOMA-TION PLAN,
Philadelphia Water Dept., Pa. Office of Water Commissioner and Chief Engineer.
For primary bibliographic entry see Field 5F.
W77-08864

ANALYSIS OF SUPPLY AND DEMAND OF URBAN ORIENTED NONRESERVOIR RECREATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W77-08871

WATER--AN ELEMENT OF LAND-USE AND URBAN GROWTH POLICIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08872

CHARACTERIZATION OF URBAN RUNOFF IN GREENFIELD, MASSACHUSETTS--PHASE I,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08939

3E. Conservation In Industry

GET READY FOR DUAL WATER SYSTEMS,
Weston Environmental Consultants-Designers, West Chester, Pa.
For primary bibliographic entry see Field 5G.
W77-08645

NORTH CAROLINA CONFERENCE ON WATER CONSERVATION.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 3D.
W77-08820

OBSERVATION RECORDS OF GROUND WATER LEVEL, (IN JAPANESE),
Geological Survey of Japan, Kawasaki.
For primary bibliographic entry see Field 4B.
W77-08904

ENERGY PLANT SITING LEGISLATION,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W77-09050

AN ENERGY ACCOUNTING EVALUATION OF SEVERAL ALTERNATIVES FOR HYDROPOWER AND GEOTHERMAL DEVELOPMENT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6B.
W77-09057

3F. Conservation In Agriculture

GROUNDWATER POLICIES NOW LEAN TOWARDS MANAGEMENT.
For primary bibliographic entry see Field 4B.
W77-08660

EFFECT OF WATER DEFICIENCY ON THE GROWTH RATE OF SOME WINTER SOFT WHEAT CULTIVARS, (IN BULGARIAN),
Bulgarian Academy of Sciences, Sadovo. Agricultural Experimental Station.
P. G. Stankova.
Fiziol Rast (Sofia) 2(1), p 13-21, 1976.

Descriptors: *Water requirements, *Wheat, *Growth rates, Plant growth, Root development, Consumptive use, Water loss.
Identifiers: Cell sap, Cultivars, Water stress, Water deficit.

Plants from 3 winter soft wheat cultivars ('Sadovska Ranozreika 3', 'San Pastore' and 'Bezostaya 1') differing considerably in morphological and biological characters were grown in Wagner type pots at soil moisture 65-70 MWC (maximum field water capacity). Water stress was achieved by stopping irrigation at stage IV (the tillering phase) and stage VIII (head formation phase) or organogenesis. The plants were kept at the state of permanent wilting for a period of 4 days. The aim of the study was to observe the changes in cell sap concentration, root system development and growth rate which occur in wheat plants of the 3 cultivars as a result of water stress, to follow up their rate and degree of recovery back to the normal state after water stress discontinued until the end of the vegetation period and to evaluate the reduction in yield inflicted to each cultivar. Water stress during stages IV and VIII of wheat organogenesis resulted in higher leaf cell sap concentration and in considerable reduction of total amount of roots and of growth rate. These deviations were more pronounced in the case of water stress during stage VIII. Recovery to normal condition of the indices was only observed in water stress occurring during stage IV and was best achieved in 'Bezostaya L.' Full compensation was not observed. Following water stress during stage IV of organogenesis 'Bezostaya L' had highest grain number and weight per plant, but following water stress at stage VIII this cultivar preserved only the highest grain weight per plant.--Copyright 1977, Biological Abstracts, Inc.
W77-08716

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1975 TO SPRING 1976,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08732

UNIVERSAL COUPLING FOR MOVABLE IRRIGATION PIPES,
Gifford-Hill and Co., Inc., Dallas, Tex. (Assignee).
J. E. Hansen.
U.S. Patent No. 3,997,192, 9 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 953, no 2, p 645, December 14, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practices, *Irrigation efficiency, Distribution systems, Flow control, Application equipment.
Identifiers: *Universal couplings.

As tower supported irrigation systems move during irrigation of land areas, changes in grade occur due to unevenness of the land surface. It is necessary that the various pipe sections that interfit to transport water from the water supply to the irrigation system be capable of vertical movement to accomodate changes in grade as well as accommodating horizontal angular misalignment responsive to tower movement. Coupled irrigation pipes with a pipe coupling that efficiently allows universal movement of the connected pipe sections so as to prevent the development of any strains that might otherwise cause deterioration of the connections between the pipe sections is provided in this invention. Another feature presents a substantially unobstructed flow passage for the water being supplied, allowing the capability of the water supply pumping system to be minimized for a given volume of water that is supplied. (Sinha-OEIS)
W77-08875

EFFECTS OF TREATED MUNICIPAL WASTEWATER AND COMMERCIAL FERTILIZER ON GROWTH, FIBER, ACID-SOLUBLE NUCLEOTIDES, PROTEIN AND AMINO ACID CONTENT IN WHEAT HAY,
Arizona Agricultural Experiment Station, Tucson.
For primary bibliographic entry see Field 5C.
W77-08876

EVALUATION OF WHEAT PLANTS WITH REGARD TO DROUGHT- AND HEAT-RESISTANCE UNDER FIELD CONDITIONS, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Botaniki.
F. A. Polimbetova, L. K. Mamonov, G. G. Kim, E. A. Vorob'eva, and S. A. Skripka.
S-Kh Biol. 9(2), p 235-237, 1974.

Descriptors: *Drought resistance, *Wheat, *Crop production, *Heat resistance, *Drought tolerance, Crop response, Moisture stress.

Field evaluation of 78 samples of soft wheat in relation to their productivity and origin was done. A positive correlation between drought- and heat-resistance was found, the level of correlation depending on the origin of the varieties.--Copyright 1975, Biological Abstracts, Inc.
W77-08877

FLOW RESTRICTOR AND TRICKLE EMITTER,
M. Lemelshtrich.
U.S. Patent No 3,998,391, 7 p, 10 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 953, no 3, p 1043, December 21, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Flow, Flow control.
Identifiers: Drip irrigation, *Flow restrictor(Irrigation).

The purpose of a flow restrictor is to retard the flow within a predetermined conduit and to reduce the pressure from the head of the source of irrigation water. As a consequence the flow is emitted in the form of a very slow trickle or dropwise. This results in economy in water expenditure and supplies the water in a steady, slow trickle to the point where it is actually needed by the plants or cultures to be irrigated. The invention is a further development of such a flow restrictor and emitter. It is composed of a hollow plate-like element in the interior of a conduit. The conduit has an inlet adapted to be connected to a feed line of water and at least one outlet leading into the open. This conduit meanders from the inlet of the element to the outlet forcing the flow to perform bows and bends within the conduit. (Sinha-OEIS)
W77-08879

EASILY MOVABLE IRRIGATION SPRINKLER SYSTEM,
J. C. St Clair.
U.S. Patent No 3,998,392, 6 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 953, no 3, p 1044, December 21, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Sprinkler irrigation, Irrigation practices, Irrigation efficiency, Distribution systems, Application equipment.

A sprinkler system weighing, when automatically drained, under 20 pounds per 1000 foot of tubing plus sprinkler heads and, that can be rapidly rolled up by a tractor carrying a reel, is made of two concentric polyester plastic tubes both 2 inches in diameter with 0.001 inch thick walls. The two concentric tubes are sealed together at the top and 0.04 inch diameter holes are spaced at 6 foot intervals along the top seal so that water flowing through the inner tube can spray out. The outer tube is aluminized to protect the polyester against the sun and a black stripe is painted along the top of the outer tube so that photoelectric cells can make the spray holes along the black line be unrolled on top when the irrigation tubing is put in place. When it is desired to move the irrigation tubing, the water is shut off and air is forced between the inner and outer tubes. This forces the water out of the inner tube making an extremely light load to roll up and carry. (Sinha-OEIS)
W77-08880

IRRIGATION SPRINKLING APPARATUS WITH ADJUSTABLE GROUND CONTACTING ELEMENTS,
Gifford-Hill and Co., Inc., Spokane, Wash. (Assignee).
H. E. Lindner, and J. E. Mertaugh.
U.S. Patent No. 3,999,569, 10 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1449, December 28, 1976.

Descriptors: *Patents, *Irrigation, *Distribution systems, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Water conveyance.

The invention describes irrigation apparatus adapted for rotation about a fixed point for irrigation of large generally circular land areas. It is directed to means for establishing positioning between the ground contacting elements of the irrigation apparatus and the respective mobile bases of the apparatus so as to allow the ground contacting elements to be positioned either in an operative position during irrigation operations or in a linear movement position, allowing the apparatus to be moved linearly to other locations in erected condition. It provides precise adjustment between the ground contacting elements of the irrigation apparatus and the respective mobile bases in order to allow wheels, for example, to precisely track an arc about the pivot point during irrigation operations. (Sinha-OEIS)
W77-08886

IRRIGATION DRAIN VALVE,
Ireco Industries, Inc., Eugene, Oreg. (Assignee).
L. W. Clements.
U.S. Patent No. 3,999,570, 3 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1449-1450, December 28, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Flow control, Valves.

The object of the invention is to provide an irrigation drain valve which dissipates the force of water being drained before discharging the water. A valve body has a large threaded inlet portion adapted to be screwed into an irrigation coupling and also has a large inlet, a tapered portion leading from the inlet to a smaller outlet portion adapted to be screwed into an irrigation coupling, and also has a large inlet, a tapered portion leading from the inlet to a smaller outlet portion with an O-ring seal in a groove in the tapered portion and a cup at the end of the outlet portion to turbulate the water. A valve closure member has a tapered head and a stem, slidable in the body, and a spring urges the head away from the O-ring seal. A nut on the stem limits movement of the valve closure member by the spring. (Sinha-OEIS)
W77-08887

ROTARY WATER SPRINKLER,
Mifal Leyitzur Mamtirim Veavizarei Hashkaya Bekibbutz Dan, Kibbutz Dan (Israel). (Assignee).
O. Katzman.
U.S. Patent No. 3,999,711, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1497, December 28, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Pressure.

A rotary water sprinkler has a housing articulatedly rotatable about a central supply coupling with an outflow nozzle fixedly mounted with respect to the housing. The coupling is screw coupled to a supply pipe. With such rotary water sprinklers, the housing and in consequence, the outflow nozzle or nozzles rotate continuously or intermittently as water flows under pressure from the supply and a circular area is sprayed. The outflow pressure can lead to variations. Such variations can be particularly disturbing when a network of sprinklers is employed, each constituent sprinkler being arranged to spray a specific area. A direct cause of such variations in output pressure are variations in the supply pressure in the main or variations in ground level. The object of the invention is to provide a rotary water sprinkler having means to reduce to a minimum the variations in outflow pressure. (Sinha-OEIS)
W77-08888

GRAVITATIONAL IRRIGATION SYSTEM AND METHOD OF INSTALLING,
M. M. Burge.
U.S. Patent No. 4,000,620, 4 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 137, January 4, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practice, *Irrigation efficiency, Distribution systems, Application equipment.
Identifiers: Plastic tubing, Drip irrigation.

A gravitational irrigation system uses preformed water-impervious flexible, collapsible plastic tubing. The tubing is laid in a shallow trench adjacent the area to be irrigated. Spades of soil are thrown at spaced intervals over the tubing to hold it in place in the trench. One end of the tubing is con

nected to a source of water and the other end is restricted to control exit of water. Annular apertures are cut in the tubing at intervals along the tubing where exit of water is desired and flexible, open-ended, annular spigots extended through the apertures, allowing water to exit from the tubing. The outer circumference of the spigot has a raised annular ridge on it which mates with a corresponding raised ridge extending around the internal surface of a matching, closed-end cap for the spigot to seal the spigot against exit of water. (Sinha-OEIS)
W77-08895

SPRINKLER HAVING IMPROVED WATER DISTRIBUTION,
M. Drori.
U.S. Patent No. 4,000,853, 6 p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 215, January 4, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Water delivery.

A rotary sprinkler comprises: a sprinkler head connected to a water supply pipe and having a nozzle through which water passes in the form of a jet; a spring-biased pivotably-mounted arm impinged by the water jet and oscillated; and a deflector carried by the arm and oscillated across the path of the water jet. The deflector includes a lower edge placed at an angle to and intercepting the line of impingement as it oscillates back and forth across the path of the water jet so that the lower edge intercepts an increasing area of the water jet section to deflect it downward during one direction of movement of the arm, and a decreasing area to deflect during the opposite direction of movement of the arm. The sprinkled water is therefore distributed uniformly from the sprinkler nozzle. (Sinha-OEIS)
W77-08899

COMPUTER MODELING FOR THE PREDICTION OF WATER QUALITY FROM AGRICULTURAL DRAINAGE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08934

WATER RESOURCES AND WATER UTILIZATION IN ISRAEL,
Office of Naval Research, London (England).
For primary bibliographic entry see Field 6E.
W77-09011

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

DEVELOPMENT OF A LOW COST ASPHALT-RUBBER MEMBRANE FOR WATER HARVESTING CATCHMENTS AND RESERVOIR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W77-08601

QUANTITATIVE AND QUALITATIVE IMPLICATIONS OF URBAN STORM RUNOFF ABATEMENT MEASURES,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-08602

USER CHARGES IN INLAND NAVIGATION POLICY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Urban Affairs.
For primary bibliographic entry see Field 6C.
W77-08604

DEVELOPMENT OF A HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W77-08609

HISARS - HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM - REFERENCE MANUAL,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W77-08610

FLOOD PLAIN INFORMATION: ALBUQUERQUE ARROYAS, PART V, ALBUQUERQUE, NEW MEXICO.
Army Engineer District, Albuquerque, New Mex.
Prepared for Albuquerque Metropolitan Arroyo Flood Control Authority, April 1975. 33 p, 4 fig, 18 plates, 5 tab.

Descriptors: *New Mexico, *Floods, Flooding, *Flash floods, *Flood profiles, *Erosion, Deposition(Sediments), *Flood plains, Silting, *Arroyos, *Control structures, Streamflow forecasting, Maximum probable flood, Channels, Obstructions to flow, Non-structural alternatives, Flood plain zoning, Building codes, Zoning, Dams, Diversion structures, Channel improvement, Floodproofing, Arid lands, Arid climates, Rio Grande River.
Identifiers: *Albuquerque Arroyos(NM), Albuquerque(NM), Standard Project Flood, Intermediate Regional Flood.

Flood plains of this study area in the southeast quadrant of Albuquerque remained relatively undeveloped, though there are 250 homes and new construction is gaining momentum as pressures for development continue unabated. Three unnamed arroyos, with a total drainage of about 2.55 sq mi, are studied. Most flood producing storms over this subbasin occur in July and August when almost half of total precipitation occurs. Thunderstorms produce flash floods in summer, but in winter there is little threat of flooding from occurring rainstorms. For an Intermediate Regional Flood, peak discharges of 1,240 cubic ft/sec (cfs), 570 cfs and 430 cfs are predicted for the three arroyos with water velocities in the channel up to 9.6 ft/sec and negligible overbank flow. In a Standard Project Flood peak discharges of 1,700 cfs, 800 cfs and 600 cfs are predicted and velocities up to 10.4 ft/sec with negligible overbank flow. Most bridges and culverts across the arroyos would be obstructive to flood flow. It is assumed that the now-abandoned railroad bridge across one arroyo would wash out. Silting can be a major problem at these obstructions. At the time of this study some of the culverts were partially blocked with silt. Both structural and non-structural flood protection works have been undertaken. These include several dam projects, diversion channels, channel improvements and building regulations. Guidelines for flood management useful to local authorities are set forth. (Smith-North Carolina)
W77-08611

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER, FORT DODGE - WILROADS GARDENS, VICINITY OF DODGE CITY, KANSAS.
Army Engineer District, Albuquerque, New Mex.
Prepared for Dodge City and Ford County, KS, June 1970. 8 p, 3 fig, 6 plates, 1 tab.

Descriptors: *Kansas, *Floods, Flooding, *Flood profiles, *Flood plains, Streamflow forecasting, Maximum probable flood, Flood data, Peak discharge, Levee, Dams.
Identifiers: *Arkansas River(KS), Dodge City(KS), *Wilroads Gardens(KS), Standard Project Flood, Intermediate Regional Flood, John Martin Dam(CO).

Developments in the flood plains of this study area are small-acreage farmsteads, buildings, including a hospital and a power plant and several roads. Above Dodge City the watershed of the Arkansas River is 30,600 sq mi including 5,583 sq mi classified as noncontributing. The major contributing sub-basin is controlled 188 mi upstream by John Martin Dam. Stream records are continuous from 1944, but are also available for 1902 1932 from a non-recording gage. In 1921 a flood had a peak discharge of 32,000 cfs, but the 1965 flood was considerably larger at 82,000 cfs, reaching a height of 1.8 feet above a Standard Project Flood (SPF). In Wilroads Gardens waters reached up to 7 feet in some locations and losses were put at $337,000 including damage to roads, utilities, a school and church, 2 businesses and 86 residences. A local levee also failed. The flood resulted from heavy rainfall in the watershed below the dam. Storms of this nature occur frequently in May through August. In an Intermediate Regional Flood (IRF) a peak discharge of 52,000 cfs can be expected along with water velocities of 9.1 feet per second in the main channel and 2.9 ft/sec in the overbank area. A SPF would have a peak discharge of 74,700 cfs and velocities of 10 and 3.1 ft/sec in the main channel and overbank areas, respectively. The IRF would rise to peak in about 14 hours hours and last 45 hours, and the SPF would reach peak in 18 hours and last 62 hours. A major bridge across the stream would not be topped by either flood. Aside from the earth levee, which provides protection for a 30-year flood, no flood control has been undertaken in the area. (Smith-North Carolina)
W77-08612

SPECIAL FLOOD HAZARD INFORMATION REPORT: MISSOURI AND KANSAS RIVERS, KANSAS CITY, KANSAS.
Army Engineer District, Kansas City, Kans.
Prepared for City of Kansas City, KA, January 1972. unp, 2 fig, 6 plates.

Descriptors: *Kansas, *Floods, *Historic floods, *Flood data, *Flood damage, *Flood plains, *Reservoirs, Flood profiles, Control structures, Levee, Floodwalls, Channel improvement, Storm sewers, *Missouri River, *Missouri.
Identifiers: *Kansas River(KA), *Kansas City(KA), Kersey Creek(KA), Standard Project Flood, Intermediate Regional Flood.

The remaining flood hazards within the city of Kansas City (KA) are summarized. Kansas City is located at the confluence of the Kansas and Missouri Rivers and has over 8,000 acres of flood plains of these streams within its city limits. About 7,200 acres has evolved into highly industrialized complexes in several major districts of the city. The areas are flat and conveniently located, each employing thousands of persons. Major floods occurred in 1844 and 1903 when both rivers flooded the area at the same time. In 1951 the uncontrolled Kansas River along produced the most disastrous flood yet recorded. The two earlier events caused relatively little damage in comparison to the 1951 flood which caused $350 million in damages. Failure of the Argentine District levee system, which was uncompleted at the time, signalled the devastation to come for the metropolitan area. Flood waters overwhelmed levees and floodwalls in the important districts of the city. Damages included loss of life. In response to the 1951 flood, raising existing levees, extending floodwalls, storm drainage and channel improvements have been undertaken to protect the city from a flood of a 500-year frequency (Standard Project Flood). Armourdale Industrial District and the Central In-

dustrial District, presently protected against a flood of 100-year frequency (Intermediate Regional Flood), must have floodwalls and levees raised to protect them against a Standard Project Flood. These additional safeguards are planned for completion by 1977. Until all parts of the protective works are completed a flood hazard situation exists. Three additional reservoirs have been authorized for the Kansas River Basin. (Smith-North Carolina)
W77-08613

FLOOD PLAIN INFORMATION: OHIO RIVER, LAWRENCE COUNTY, OHIO.
Army Engineer District, Huntington, W. Va.
Prepared for the State of Ohio, Department of Natural Resources. June 1973. 32 p, 11 fig, 18 plates, 2 tab.

Descriptors: *Ohio River, *Floods, *Flood damage, *Flood profiles, *Flood data, *Historic floods, *Dams, *Reservoirs, *Ohio, Flood flow, Peak discharge, Flow duration, Levees.
Identifiers: Ironton(OH), Intermediate Regional Flood, Lawrence County(OH), Proctorville(OH), Chesapeake(OH), Coal Grove(OH).

In this study area the Ohio River flows southward from Crown City, westward through Huntington, WV and Chesapeake, OH, then northwest for 43 mi along the boundary of Lawrence County. Its flood plains, ranging from 2,000 ft to 8,600 ft. contain commercial and residential development. Floods are caused by excessive rain from widespread spring and winter storms. Floods crest slowly (less than one-half ft per hr) and remain above bankfull for extended periods. Tributary streams and their flood plains experience backwater flooding from the Ohio River. Earthen levees, flood walls and pumping stations at Ironton, OH, protect heavily developed areas of the city. There are no flood plain zoning ordinances, building codes or other regulatory measures intended to reduce flood damage within the study reach. Thirty-seven reservoirs upstream from Ironton significantly reduce flood heights. Eight additional reservoirs are being built. A series of rainstorms created the largest recorded flood in January-February 1937. The flood created 69.4 ft above zero point on gage with an estimated peak discharge of 654,000 cubic feet per second. Ironton was inundated by 11 ft of water and completely isolated from rail and highway travel. The profile of the 1937 flood may be taken as the reasonable upper limit of probable future flooding along this stretch of the river. An Intermediate Regional Flood (IRF) is expected to crest at 552.2 ft mean sea level, 7 ft above the 1937 flood. The town of Proctorville, bottomland surrounding it, portions of Chesapeake and Coal Grove, and all of the bottomland just outside of the Ironton local protection project would be subject to great depths of flooding during an IRF. (Salzman-North Carolina)
W77-08614

FLOOD PLAIN INFORMATION: ASHUELOT RIVER, CITY OF KEENE, NEW HAMPSHIRE.
Army Engineer District, Waltham, Mass. New England Div.
Prepared for the Town of Keene, NH, December 1972. 26 p, 11 fig, 3 plates, 6 tab.

Descriptors: *Floods, Flooding, *Peak discharge, *Flow characteristics, *Flood plains, *Flood protection, *Dams, *New Hampshire, Flood data, Flood stages, Flow duration, Flood damage, Control structures, Obstructions to flow, Snowmelt.
Identifiers: *Ashuelot River(NH), Keene(NH), Faulkner and Colony Dam(NH), Intermediate Regional Flood, Standard Project Flood, Flood Plain Management Program.

The Ashuelot River, a major tributary of the Connecticut River, flows southwesterly in a meandering fashion through Keene, the economic center for the Ashuelot River watershed. With a negligible slope in the study area, the river channel has little discharge capacity and considerable depth of ponding is possible in the flood plain. The flood plains contain much residential, commercial and industrial property and pressure for development is increasing. Main flood season is in the spring when floods result from rains combined with melting snow. Intense rainfall from local thunderstorms also cause floods. A steep upper watershed area contributes to rapid runoff in the flood plain at Keene. Although the Faulkner and Colony Dam has no flood control capacity, 2 flood control dams in the upper watershed provide some protection. The city of Keene is responsible for operation and maintenance of the local protection project completed in 1954. Located along the Ashuelot River from the railroad bridge in Keene to the covered bridge at Swanzey Station, the improvement increases the usability of farm lands along the river and aids functioning of the drainage and sewerage systems. The flood with the greatest peak discharge occurred in 1938 when a flow of 18,800 cubic feet per second was recorded and a water epth of 475.3 mean sea level datum at telemark gage in Keene. An Intermediate Regional Flood and a Standard Project Flood would crest at 471.7 and 472.7 ft msld, respectively, and have peak discharges of 18,800 cfs and 22,000 cfs. This report furnishes a suitable basis for the adoption of land use controls and flood damage reduction techniques to develop a flood plain management program. (Salzman-North Carolina)
W77-08615

SPECIAL FLOOD HAZARD REPORT: BUFFALO CREEK, MEADOW GROVE, NEBRASKA.
Army Engineer District, Omaha, Nebr.
Prepared for the Village of Meadow Grove and the Nebraska Soil and Water Conservation Commission, June 1971. 14 p, 2 tab, 3 plates, 4 fig.

Descriptors: *Floods, *Peak discharge, *Flood plains, *Flood protection, *Channel improvement, *Nebraska(NB), *Flood profiles, Flooding, Historic floods, Flood data, Flow characteristics, Flood damage, Flood routing, Obstruction to flow.
Identifiers: *Buffalo Creek(NB), Meadow Grove(NB), Intermediate Regional Flood, Standard Project Flood.

This report was prepared to define the remaining flood threat along Buffalo Creek as it passes through Meadow Grove after construction of a proposed channel improvement project which should reduce flood damages about 80%. Buffalo Creek, which drains 21 square miles, has short tributaries that are sharply eroded into the hills along the creek as it meanders through the basin. The flood plain, relatively narrow in the upper basin, spreads out without definable limits. Deposition of silt from earlier floods has created somewhat higher ground close to the creek. A railway bridge, the bridge at Highway 275 and the Lewis Street extension limit flood flows. Floods usually result from severe thunderstorms and are characterized by rapid peaking and short duration. Most of Meadow Grove is subject to flooding by major floods. Six major floods have occurred in the past 33 years. In May 1944 a flood which had a peak discharge of 6,200 cubic feet per second caused damages of $144,000 at 1970 prices. In 1960 the largest flood caused damage estimated at $149,000. The improved channel will be nearly three times as wide as the old channel with sharp curves eliminated. Flow not exceeding 5,400 cfs can be carried in the new channel without overbank flooding. An intermediate Regional Flood would have a peak discharge of 9800 cfs or 58% greater than the 1944 flood. A Standard Project Flood would have a peak discharge of 19,400 cfs inundating most of the village. 'Depths of overbank flow would be shallow, usually less than 2 feet, except at the upstream side of road crossings where depths may be greater.' (Hufschmidt-North Carolina)
W77-08616

FLOOD PLAIN INFORMATION REPORT, INDIAN AND DRY CREEKS, LINN COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
Prepared for the Iowa State Natural Resources Council, December 1969. 27 p, 2 tab, 12 plates, 11 photos.

Descriptors: *Floods, *Flood control, *Flood data, *Flood profiles, *Non-structural alternatives, *Iowa, Historic floods, Flood frequency, Flood plain zoning, Building codes, Flood peak, Flood plains, Standard Project Flood.
Identifiers: *Cedar Rapids(IA), Dry Creek(IA), Indian Creek(IA), Marion(IA), Hiawatha(IA), Linn County(IA), Intermediate Regional Flood, Encroachment lines.

The study area involves 93.0 square miles of the Indian Creek and Dry Creek watershed in Linn County, IA, including the cities of Cedar Rapids, Marion, and Hiawatha. Development in the flood plain is not extensive, consisting primarily of agricultural land with scattered industrial and residential sites. Damage from past floods has consequently been light. Extensive future developments in the flood plain are anticipated due to population growth trends. Data were obtained from county records, newspaper files, and historical documents. Flooding usually occurs in the late winter and early spring and is caused by snowmelt, heavy general rains, or both. Intense local storms can cause floods at other times. Recent major floods occurred in January and April 1960, and March and November 1961. As in many previous years, damage was concentrated in lower flood plain, in and around Cedar Rapids. At the lower study limit, the Intermediate Regional Flood will discharge 22,000 cubic feet/sec, and the Standard Project Flood will discharge 31,100 cfs. Additional flood plain development will increase flood crest levels. Although intended for informational purposes, this report also describes non-structural flood control measures, including encroachment lines, zoning, subdivision regulations, building codes, and flood control regulations. (Nessa-NC)
W77-08617

FLOOD HAZARD INFORMATION: YAMPA RIVER AND TRIBUTARIES, STEAMBOAT SPRINGS, COLORADO.
Army Engineer District, Sacramento, Calif.
Prepared for Routt County Regional Planning Commission, February 1976. 13 p, 3 fig, 5 tab, 27 plates.

Descriptors: *Floods, Flooding, *Peak discharge, *Flood profiles, *Snowmelt, Flood data, Flood stages, Flow characteristics, Flood plains, Planning, Historic floods, *Colorado.
Identifiers: *Yampa River(CO), Soda Creek(CO), Butcherknife Creek(CO), Spring Creek(CO), Fish Creek(CO), Walton(CO), Burgess Creek(CO), *Steamboat Springs(CO), Intermediate Regional Flood, Standard Project Flood.

This report covers the Yampa River, a tributary of the Colorado River via the Green River, for 6.4 mi and lower reaches of its tributaries, Soda, Butcherknife, Spring, Fish, Walton and Burgess Creeks. All direct tributaries join the river in Steamboat Springs, a ski resort with a permanent population of about 5,000 supplemented by an almost equal number of winter transients plus summer tourists. Much of the annual precipitation occurs as snow and a deep snowpack develops. In late spring through early summer snowmelt augmented by rain causes flooding. General rainstorms over the Yampa River Basin have not caused significant floods. However, major flood producing rainstorms occur over western CO in September and October. Major floods occurred in June 1921 and April 1974 with the former having a peak discharge of 7,000 cubic ft per second on the Yampa, an estimated 2,000 cfs along Soda Creek. In 1974 stages on all streams in the Steamboat Springs area were higher than at any time in recent history. Many homes were damaged. Most bridges

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nd culverts in the city impede flood flow. There re no flood control projects in the study area. Using a standard project storm centered over the Grand Mesa area, estimates were made for peak flows in study area: for a 100-year flood (cfs)- Yampa River at Steamboat Springs 8,000; Soda Creek 1,300; Butcherknife Creek 320; Spring Creek 650; Fish Creek 1,800; Walton Creek 2,700; Burgess Creek 260. For a 500-year flood(cfs)- Yampa River 20,000; Soda 2,900; Butcherknife 1,300; Spring 2,400; Fish 4,600; Walton 5,600; Burgess, 1,400. Main channel velocities for Yampa River would average 10 ft/sec in a 100-year flood which could inundate about 670 acres. (Salzman-North)
W77-08619

FLOOD PLAIN INFORMATION: LLAGAS CREEK UNIT I, INCLUDING EDMUNDSON (LITTLE LLAGAS), CHURCH, SAN MARTIN, NEW, CENTER, CORRALITOS, TENNANT, MAPLE, AND FOOTHILL CREEKS, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Santa Clara Valley Water District, CA, July 1975. 31 p, 22 fig, 44 plates, 6 tab.

Descriptors: *California, *Floods, *Flash flood, *Flood profiles, *Flood plains, *Reservoirs, *Flood control, Flooding, Overflow, Streamflow forecasting, Design flood, Historic floods, Flood data, Peak discharge, Bank erosion, Obstructions to flow, Control structures, Water storage, Diversion structures, Channel improvement.
Identifiers: *Llagas Creek(Calif), *Edmundson Creek(CA), *Little Llagas Creek(CA), Standard Project Flood, Intermediate Regional Flood, San Martin Creek(CA), Corralitos Creek(CA), Foothill Creek(CA), New Creek(CA), Tennant Creek(CA), Chesbro Reservoir(CA), Church Creek(CA), Center Creek(CA), Maple Creek(CA).

Watersheds of Unit I are located on both east and west sides of South Santa Clara Valley. West side watersheds include upper reaches of Llagas Creek, Edmundson (Little Llagas) Creek and West Little Llagas Creek. East side watersheds include upper reaches of Church, New, Center, Corralitos, Tennant, Maple and Foothill Creeks. Most of the flood plain lands have agricultural uses but intensive residential and commercial development is anticipated. Most precipitation occurs from December through March with 18 to 45 inches annual precipitation on the west side, about 18 inches on the east side. Floods rise quickly, do not last long. Chesbro Reservoir on Llagos Creek, built in 1955, provides some degree of flood protection. In an Intermediate Regional Flood (IRF) a peak discharge of 5,600 cubic feet per second is expected on Llagos Creek and peak discharges of generally less than 1,000 cfs on tributaries in the Llagas Creek area. Water velocities could be from 4 to 17 ft/sec in upper reaches and 4 to 14 ft/sec in lower reaches. Overbank flow is predicted at 1 to 4 ft/sec. In a Standard Project Flood, peak discharges of 6,300 cfs on Llagas Creek are predicted, with as much as 1,400 cfs on smaller tributaries. Water velocities will be slightly higher than in the IRF. In either flood, overflow from water courses is expected. Sixteen of 22 bridges are expected to obstruct flood flow. Some additional flood protection measures undertaken are the partially implemented Upper Llagas Creek Watershed Work Plan and construction of a new channel which will divert some creeks. Construction of a supplementary water supply to the nearby Hayes Valley could reduce peak flows on Llagas Creek. (Smith-North Carolina)
W77-08620

WATER AS AN ENVIRONMENTAL CONSTRAINT IN LAND USE PLANNING,
North Carolina State Univ., Raleigh. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 6G.
W77-08721

THE HYDROGEOLOGIC REGIME OF GLACIAL-TERRAIN LAKES, WITH MANAGEMENT AND PLANNING APPLICATIONS,
Wisconsin Univ. Extension, Madison.
For primary bibliographic entry see Field 2F.
W77-08724

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 1: SUMMARY REPORT,
Wisconsin Univ. Extension, Madison; and Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
For primary bibliographic entry see Field 6B.
W77-08725

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3A: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6B.
W77-08726

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3B: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6B.
W77-08727

FLOODS IN THE BIG CREEK BASIN, LINN COUNTY, IOWA,
Geological Survey, Iowa City, Iowa. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08731

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1975.
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08737

WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1975.
Geological Survey, Helena, Mont. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08738

OUTLINE OF THE WATER RESOURCES OF THE SATUS CREEK BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08740

MISSOURI STREAM AND SPRINGFLOW CHARACTERISTICS LOW-FLOW FREQUENCY AND FLOW DURATION,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08743

SOME COMPUTATIONAL ASPECTS OF ONE- AND TWO-DIMENSIONAL UNSTEADY FLOW SIMULATION BY THE METHOD OF CHARACTERISTICS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08745

TIME-OF-TRAVEL STUDY, BLACK RIVER FROM LYONS FALLS TO DEXTER, NEW YORK,
Geological Survey, Albany, N. Y. Water Resources Div.
H. L. Shindel, and L. A. Wagner.
New York State Department of Environmental Conservation, Albany, Report of Investigations RI-16, 1977. 18 p, 6 fig, 4 tab, 10 ref.

Descriptors: *Streamflow, *Travel time, *Path of pollutants, *Tracking techniques, *Dye releases, *New York, Flow rates, Dye concentrations, Data collections, On-site investigations, Forecasting.
Identifiers: *Black River(NY), Lyons Falls-Dexter area(NY).

Time of travel of water was determined at three different times for 16 successive subreaches of the 72-mile reach of the Black River between Lyons Falls and Dexter, New York. A 40-percent solution of rhodamine B dye and 20-percent solution of rodamine WT dye were used on different occasions as tracers to measure the time of travel. Cumulative time of travel of the peak dye concentration was 115 hours for a flow of about 40-percent duration and 173 hours for a flow of about 85-percent duration. Time-of-travel data for each subreach and cumulative time-of-travel graphs for the entire reach for various discharges are presented. Dye-dispersion and peak-concentration data are give also. Graphs show the relationship between traveltime and peak dye concentration for different rates of discharge through the subreaches. (Woodard-USGS)
W77-08747

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN ATTALA, HOLMES, HUMPHREYS, ISSAQUENA, SHARKEY, AND YAZOO COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08748

INDIANA STREAM-TEMPERATURE CHARACTERISTICS,
Geological Survey, Indianapolis, Ind. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08755

PROCEEDINGS: THE CONNECTICUT RIVER SYSTEM: A WORKSHOP ON RESEARCH NEEDS AND PRIORITIES.
Massachusetts Univ., Amherst. Inst. for Man and Environment; Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08808

SURFACE-GROUNDWATER INTERACTIONS AND THE CONJUNCTIVE USE OF THE WATER RESOURCES OF THE MULLICA RIVER BASIN, NEW JERSEY,
Rutgers - The State Univ. New Brunswick N. J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-08810

NETWORK CHARACTERISTICS IN SUBURBANIZING STREAMS,
Iowa Univ., Iowa City. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W77-08830

SEASONAL VARIATIONS IN THE IMPACT OF SUBURBAN DEVELOPMENT ON RUNOFF RESPONSE: PETERBOROUGH, ONTARIO,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 4C.

W77-08831

EFFECT OF PONDS AND SMALL RESERVOIRS ON RIVER RUNOFF IN THE FOREST-STEPPE AND STEPPE ZONES OF THE VOLGA BASIN,
V. Z. Rodionov.
Soviet Hydrology, Selected Papers, No. 4, p 288-295, 1975. 2 fig, 5 tab, 13 ref. Translated from Trudy Gosudarstvennogo Gidrologicheskogo Instituta, No. 229, p 106-122, 1975.

Descriptors: *Runoff, *Ponds, *Reservoirs, Effects, Grasslands, Forests, Storage, Water storage, Evaporation, Reservoir evaporation, Watersheds(Basins), Ravines, Foreign countries, Foreign research, Gullies, Rivers, Streams.
Identifiers: *Volga Basin(USSR), *USSR.

The forest-steppe and steppe zones of the Volga basin include the Central Russian Upland, the northern part of the Oka-Don valley, and the Volga Hills. This area extends for more than 1000 km from west to east. The mentioned territory belongs mainly to the zone of deficient moisture, where most of the river runoff occurs during the spring flood period. The numerous ponds and reservoirs of the dry zones are desinged for spring flood runoff storage and for its utilization during the low-flow period for industrial purposes (mainly irrigation and water supply). The effect of ponds and reservoirs on the runoff or rivers of the forest-steppe and steppe zones of the Volga basin obeys the law of geographic zonality. The change in runoff increases from the northwest to the southwest as river water utilization increases and the total river flow decreases. The reduction in the runoff of rivers in the zone of sufficient and variable moisture is 1% in a moderately wet year and 2% in a dry year The reduction for rivers in the moisture deficient zone averages 3 and 6%, respectively, and in the dry zone, reduction reaches 24 and 4%. Because of the mentioned mass construction of ponds and reservoirs everywhere, the change in river runoff will be more considerble, especially in the dry regions of the Volga basin. (Sims-ISWS)
W77-08834

DESIGN EFFICIENCY OF STORMWATER DETENTION BASINS,
National Weather Service, Silver Spring, Md., Hydrologic Research Lab.
For primary bibliographic entry see Field 4D.
W77-08841

SEEPAGE UNDER STRUCTURE ON N STRATA OF SOIL,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-08843

PRESSURE REDUCING VALVES IN PIPE NETWORK ANALYSES,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 8B.
W77-08855

ECONOMICS OF PERMANENT FLOOD-PLAIN EVACUATION,
Atlanta City Dept. of Environment and Streets, Ga. Office of Engineering.
For primary bibliographic entry see Field 6B.
W77-08856

RESEARCH BENEFITS IN WATER RESOURCES CONSTRUCTION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 6B.
W77-08858

ECONOMIC ROLE OF THE WATERWAY IN WESTERN EUROPE,
Port of Strasbourg (France).
M. Marchal.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WW3, Proceedings paper No. 12346, August 1976, p 337-346. 2 tab, 1 ref.

Descriptors: *Channels, *Transportation, *Regional development, Canals, Canal design, Planning, Costs, Navigation.
Identifiers: *Economic analysis, *Industrial growth, *Western Europe, *Waterways, Economic decentralization, Ocean ports, Impact.

Thanks to the development of new, highly efficient techniques of navigation, inland navigation along large gage canalized waterways can offer an efficient, modern, and cheap mode of transportation. In Western Europe, the waterway is not only a mode of transportation, but its improvement can serve urban development, create recreational facilities, and help in flood control. The specific impact of large gage waterways on the economic and industrial development is the result of (1) the assurance that industries located in their vicinity still simultaneously experience a substantial and permanent decrease of their transportation costs and an increase in their size and influence; and (2) additional advantages offered to factories located on their banks, resulting in increased profit margins and reinvestments capabilities. Such advantages can only be felt, however, if the waterway crosses regions of high urban and industrial density and links zones of development of sufficient economic dimensions. (Bell-Cornell)
W77-08860

WATER SUPPLY ECONOMICS,
Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.
For primary bibliographic entry see Field 6B.
W77-08863

PHILADELPHIA'S WATER SYSTEM AUTOMATION PLAN,
Philadelphia Water Dept., Pa. Office of Water Commissioner and Chief Engineer.
For primary bibliographic entry see Field 5F.
W77-08864

REAERATION AND VELOCITY PREDICTION FOR SMALL STREAMS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08867

WATER--AN ELEMENT OF LAND-USE AND URBAN GROWTH POLICIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08872

SINKAGE AND RESISTANCE FOR SHIPS IN CHANNELS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-08873

DUNE STABILIZATION WITH PANICUM AMARUM ALONG THE NORTH CAROLINA COAST,
North Carolina State Univ. at Raleigh. Dept. of Botany; and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2L.
W77-08908

EFFECTS OF STREAM CHANNELIZATION ON BOTTOMLAND AND SWAMP FOREST ECOSYSTEMS,
North Carolina State Univ. at Raleigh. School of Forest Resources.
T. E. Maki, W. Hazel, and A. J. Weber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 021, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, October 1975. 41 p, 23 fig, 5 tab. OWRT A-085-NC(3), 14-31-0001-5033.

Descriptors: *Forest management, *Forest soils, *Ecosystems, *Channeling, *Swamps, *Channel improvement, Surface-groundwater relationships, Natural streams, Intermittent streams, Observation wells, *North Carolina.
Identifiers: *Stream channelization, Non-channelized streams, *Swamp forest ecosystems, Gates County(NC).

The general objective was to develop better understanding of the swamp forest ecosystem, including its dominant and subsidiary vegetation communities, its associated fauna, soil properties and surface stratigraphy, and the hydrology in relation to alterations of the 'natural' drainage regime. Sixteen well lines were established, representing eight channelized situations and eight non-channelized situations in ten stream bottoms from Craven County northward to Gates County, N.C., covering over a hundred miles of Coastal Plain. Within each of the eight well-line categories, 4 lines are in recently cut-over tracts and 4 are within tracts that have not seen logging activities for several decades. Some tentative conclusions from the first year's study are: (1) The swamp forest ecosystems of eastern North Carolina are largely dominated by quantities of cull trees which are the residual elements from high-grading logging operations during the past 150 years or more. (2) Surface soils to depths of 40 cm or so are quite uniform in texture and composition, with texture averaging 70 to 80 percent clay. (3) Channelized streams maintain perennial and clear flow during droughty periods in sharp contrast to the murky water in natural streams during low flow. (4) Clear-cutting substantially affects the soil moisture regime because of the temporary reduction in evapotranspiration draft. (Stewart-NC State)
W77-08920

PHYSICAL AND CHEMICAL PARAMETERS ASSOCIATED WITH PHYTOPLANKTON ABUNDANCE AND PERIODICITY IN A FERTILIZED FISH POND,
Auburn University, Auburn, Alabama, Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5C.
W77-08922

SEASONAL PATTERNS OF DISSOLVED OXYGEN, NUTRIENTS, AND METALS IN NATURAL AND CHANNELIZED SWAMP STREAMS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5B.
W77-08932

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, (PARTS I-III),
Systems Control, Inc., Palo Alto, Calif.
D. W. Bree, Jr., D. H. Budenaers, D. N. Horgan, Jr., and L. C. Markel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 964, Price codes: A10 in paper copy, A01 in microfiche. Final Report, June 1976, 192 p. OWRT C-6198(No.5221)(1).

Descriptors: *Water distribution(Applied), Operations, Planning, Networks, *Water demand, *Computer models, Water control, *Forecasting,

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*Distribution systems, *Methodology, Design, *Algorithms.
Identifiers: Operations planning, Water demand forecasting, Storage forecasting, Control software implementation.

Results are presented of a project that was directed to the development of prototype algorithms for real-time computer control of water distribution systems. The objective was to improve the capability of a water system operator/dispatcher to control the operation of this system. This is accomplished by providing computerized 'tools' which forecast and simulate system conditions, allowing the dispatcher to estimate the consequences of his control decisions before he takes action. The approach, briefly stated, is to use a reduced network model and system load forecast to simulate operation of the water system (i.e., determine the storage forecast in order to provide information to the system controller (human dispatcher or computerized optimization algorithm) which will aid in dispatching the system to meet all constraints and requirements at the lowest possible cost. Part I of this report is an overview of the work done, Part II, an Implementation Guide, describes the steps to be taken by a water utility to implement on its own system the techniques and programs described here. Part III consists of Technical Appendices describing in detail the structure and derivation of the algorithms developed. Part IV is the documentation of computer programs. (See also W77-0894 and W77-08942)
W77-08940

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, PART IV, PROGRAM DOCUMENTATION,
Systems Control, Inc., Palo Alto, Calif.
M. Piccardo, W. Winkler, and R. Siegel.
Final Report, (1976), 297 p. OWRT C-6198(No.5221)(2).

Descriptors: *Computer programs, *Water distribution(Applied), Water demand, Computer models, Forecasting, Estimating, Water control, Documentation, Methodology.
Identifiers: Computer program documentation.

This documentation covers computer programs associated with analysis and forecasting of water demand and related data. The programs can be divided into four categories: initialization, estimation, forecasting, and verification. (1) The initialization programs provide a beginning for analysis; these are subroutines which produced printer plots--histograms, time series plots, and scatter plots. The routines can be used to plot water demand over time, to plot water demand versus particular weather variables, etc., in order to understand the structure of the data. The subroutines can also be used to plot results of statistical analyses for purposes of clarification; the plotting routines are described in a separate section. (2) Helpful in leading towards a particular forecasting model are the estimation programs. One program performs quadratic regression and other performs correlation and auto-correlation analysis and for determining a forecasting model based on exogenous variables, principal components analysis is documented. (3) Forecasting programs have been developed (using San Jose Water Works data) to be used in total or adapted. The stochastic forecasting model is documented, as is a forecasting program based on weather variables. (4) Two programs were written which help to determine the accept-ability of the forecasting model. A program is described which analyzes the residuals (differences between forecasted and actual demand) produced by a single forecasting model. Also a program is described that analyzes the residuals of the stochastic and weather models jointly. (See also W77-08940 and W77-008942)
W77-08941

PROTOTYPE SOFTWARE FOR ON-LINE STORAGE FORECASTING SUPPORTED BY LOAD FORECASTING AND REDUCED SYSTEM REPRESENTATION FOR WATER DISTRIBUTION SYSTEMS,
Systems Control, Inc. Palo Alto, Calif.
For primary bibliographic entry see Field 7C.
W77-08942

WATSIM - A FORTRAN PROGRAM FOR 24 HOUR SIMULATION OF FLOWS AND RESERVOIR FLUCTUATIONS IN WATER DISTRIBUTION NETWORKS,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 7C.
W77-08943

FLORIDA'S BARGE CANAL PROSPECTS FOR THE FUTURE,
Florida State Univ., Tallahassee. Dept. of Ichthyology.
H. A. Beecher.
National Parks and Conservation Magazine, Vol 48, No 9, p 14-19 (1974). 1 map, 7 photo.

Descriptors: *Florida, *Canals, *Canal construction, *Canal design, *Environmental effects, Environmental control, Environmental engineering, Environment, Canal embankments, Channels, Engineering structures, Hydraulic structures, Civil engineering, Design flow, Ditches, Inland waterways, Saline water intrusion, Excavation.
Identifiers: *Injunctive relief, Cross-Florida Barge Canal.

Evaluated in this article are the past history and future prospects of the Cross-Florida Barge Canal. Although the idea for such a canal was originally conceived in the early 1800's, actual construction did not begin until the depression when it was maintained for a year to provide jobs for the unemployed. Construction began again in 1964 and continued until January, 1971, when a temporary injunction necessitated its halt. Conflicting reports have been produced by both sides of the construction issues and have resulted in many false predictions concerning the economic advantages of the canal and its effect upon the mid-Florida environment. The author urges that action be commenced to make the best of the existing structures while construction is halted. The main focus should be upon the Ocklawaha River and Rodman Reservoir, and should include river monitoring and objective experimentation. If the long range plans are to maintain the reservoir as such, then disposal of the sediment which will be quickly deposited during the rainy seasons will have to be arranged. (Welch-Florida)
W77-08964

A 'ROUGH CUT' MODEL OF A SOUTH FLORIDA WATER SUPPLY PLAN,
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 4B.
W77-08980

COUPLED DYNAMIC STREAMFLOW-TEMPERATURE MODELS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2E.
W77-09014

MULTIVARIATE DISTRIBUTIONS IN HYDROLOGY AND RIVER REGULATION,
For primary bibliographic entry see Field 2E.
W77-09029

DISPERSION MEASUREMENT ON THE DANUBE,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5B.
W77-09040

NONLINEAR ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5B.
W77-09047

OPTIMAL ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan, Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5B.
W77-09052

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1975.
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09074

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1975.
Geological Survey, Bismarck, N. Dak. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09075

WATER-RESOURCES INVESTIGATIONS IN KENTUCKY, 1976.
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09078

WATER-RESOURCES INVESTIGATIONS IN WISCONSIN, 1976.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09079

HYDROLOGIC CONSIDERATIONS IN DEWATERING AND REFILLING LAKE CARLTON, ORANGE AND LAKE COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-09080

A REVIEW OF VELOCITY-MEASURING DEVICES,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-09085

COMPUTER APPLICATIONS FOR STEP-BACKWATER AND FLOODWAY ANALYSES,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
J. O. Shearman.
Open-file report 76-499, 1976. 103 p, 63 fig, 18 tab, 10 ref, append.

Descriptors: *Backwater, *Computer models, *Flow profiles, Encroachment, Gradually varied flow, Land use, Planning, Floodways, Flood plain insurance, Input-output analysis, Evaluation, *Computer programs.

A computer program which can be used to computer water-surface profiles for gradually varied, subcritical flow is described. Profiles are computed by the standard step-backwater method. Water-surface profiles may be obtained for both

existing stream conditions and for stream conditions as modified by encroachment. The user may specify encroachment patterns in order to establish floodway limits for land-use management alternatives, or for flood-insurance studies. Applicable theories, computer solution methods, data requirements, and input data preparation are discussed in detail. Examples are presented to illustrate the computer output and potential program applications. (Woodard-USGS)
W77-09090

4B. Groundwater Management

GROUND WATER - SOLAR HEAT,
For primary bibliographic entry see Field 8C.
W77-08652

LAND SUBSIDENCE,
National Water Well Association, Worthington, Ohio.
T. E. Gass.
Water Well Journal, Vol 31, No 5, p 30-31, May, 1977. 1 fig.

Descriptors: *Land subsidence, *Pumping, *Water wells, Groundwater recharge, Pores, Aquifers, Clays.
Identifiers: Unconsolidated materials.

Well contractors who operate in certain areas of the U.S. Southwest are probably quite familiar with the phenomenon of land subsidence. In areas that have experienced this problem, similar geological conditions are present: (1) the surface is underlain by unconsolidated or semi-consolidated formations; (2) there is a considerable clay content in the formation, and; (3) ground water withdrawal exceeds recharge. When more water is pumped out of loose granular material than is put back in, pore spaces are emptied and gradually close. The resulting land subsidence can cause costly damage to the land surface and to structures on the surface, as well as permanently reducing the ground water storage capacity of the region. Subsidence can also occur around wells that pump sand and finer particles. Land subsidence can be prevented by careful examination of subsurface formations before well development and by taking reasonable steps to manage the regional water supply afterwards. (Eberle-NWWA)
W77-08653

GEOPHYSICAL EXPLORATION FOR POTABLE GROUNDWATER SUPPLIES IN THE KALAHARI GEMSBOK NATIONAL PARK,
Ruker (Richard) and Associates, Bryanston (South Africa).
E. Martinelli.
Water S.A., Vol 1, No 2, p 53-56, July, 1975. 3 fig, 1 tab.

Descriptors: *Resistivity, *On-site investigations, Electrical studies, Saline water-freshwater interfaces, Water supply, Africa, Groundwater resources.
Identifiers: *Vertical Electric Soundings Techniques, Kalahari Gemsbok National Park(South Africa), Freshwater lenses.

Electrical resistivity survey techniques were recently used to locate and delineate fresh water lenses as sources for future water supply in the Kalahari Bemsbok National Park. Two existing wells had been drawing water of poor quality (about 10,000 ppm dissolved solids). Information from exploratory boreholes indicated that lenses of fresh water overlay deeper brackish water bodies in the area. After determining formation porosity and resistivities of the local fresh and saline ground waters via laboratory tests, field surveys of the formation were ready to be undertaken and 75 electrical soundings eventually were completed. One large continuous lens was discovered in the survey area and three subsequent boreholes into the lens produced good supplies of drinking water. (Eberle-NWWA)
W77-08654

A CASE FOR GEOTHERMAL ENERGY,
For primary bibliographic entry see Field 8C.
W77-08655

ECONOMICS OF GEOTHERMAL ENERGY DEVELOPMENT (IN IMPERIAL COUNTY, CALIFORNIA),
California Univ., Riverside. Graduate School or Administration.
For primary bibliographic entry see Field 8C.
W77-08657

GROUNDWATER POLICIES NOW LEAN TOWARDS MANAGEMENT.
Irrigation Age, Vol. 11, No. 8, p 40, May-June, 1977.

Descriptors: *Water management(Applied), *Water policy, *Irrigation wells, *Irrigation design, Water distribution(Applied), Well permits, Well regulation, Water conservation.

During the last century, agriculture has emphasized ground water development – the emphasis has now shifted to management and maintenance of ground water reserves. Four objectives which authorities agree are crucial are prolonging aquifers' useful lives and maintaining water levels, providing equitable distribution methods, minimizing conflicts between users, and minimizing administrative costs and problems. Increased efficiency and elimination of waste in ground water utilization are high priority concerns for designing specific areal management systems and integrating all sources of water conjunctively used for irrigation and water supply. Well spacing requirements, permits to drill, allocation / water rights, and rotational use are the tools by which planners can reach rational management goals in years ahead. (Eberle-NWWA)
W77-08660

GEOTHERMAL ENERGY DEVELOPMENT,
Los Alamos Scientific Lab., N. Mex.
J. C. Rowley.
Physics Today, Vol. 30, No. 1, p 36-45, January, 1977. 7 fig, 1 tab, 24 ref.

Descriptors: *Thermal power, *Drilling, *Geologic investigations, Research and development, *Geothermal studies, Thermal water, Geophysics, Corrosion, Drilling equipment, Logging(Recording), Energy.
Identifiers: Geopressurized systems, Dry hot rock systems, Magma systems, Rock melting drilling, Electric spark disintegration drilling.

Although the heat reservoir of the earth's interior is a promising source of energy for the future, technology will need to be developed to more readily access geothermal resources. In addition to steam and hot water geothermal systems, geopressurized systems (high-pressure brine and methane), dry hot rock systems, and magma systems could theoretically be exploited for energy production. The limiting factors preventing more widespread use of these resources today are the need for more efficient and cost-effective techniques of geothermal exploration and concomitant advances in geophysial modeling, problems with drilling into harsh environments, and corrosion of generating equipment due to high saline content of geothermal fluids. Regarding the drilling process, corrosion resistant drill string and bit materials are needed to eliminate the costly problem of drill string twist-off so common when drilling into geothermal reservoirs by conventional means. Advanced techniques such as rock melting and electric spark disintegration may prove to be excellent approaches for hot rock drilling in years to come. (Eberle-NWWA)
W77-08661

FAULT CONTROL OF SUBSIDENCE, HOUSTON, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
C. W. Kreitler.
Ground Water, Vol. 15, No. 3, p 203-214, May-June, 1977. 13 fig, 18 ref.

Descriptors: *Land subsidence, *Faults(Geology), *Water table, *Texas, Pumping, Flood damage, Groundwater basins, Groundwater barriers.
Identifiers: *Houston-Galveston area(Texas), Differential compaction.

The Houston-Galveston area of Texas which already has sustained millions of dollars in damage due to land subsidence is threatened with greater loss as this subsidence continues. The conclusions of this paper suggest that the surface faults that interlace the area and control drainage patterns are primarily activated by differential compaction of the underlying aquifer; these faults also appear to be hydrological barriers. The faults compartmentalize land subsidence into several individual basins, thus, pumpage from one fault-bound basin may not adversely affect another. It is urged that such evidence be well considered before future releveling surveys are undertaken. (Eberle-NWWA)
W77-08662

GROUND WATER BUDGET OF THE MOUNTAINOUS REGIONS OF HUNGARY, (IN HUNGARIAN),
Hungarian State Geological Inst., Budapest.
For primary bibliographic entry see Field 2F.
W77-08663

MULTI-SHOT CAMERA SYSTEM FOR BOREHOLE SURVEYING.
For primary bibliographic entry see Field 8G.
W77-08668

CARBON ISOTOPIC STUDY OF THE FATE OF LANDFILL LEACHATE IN GROUNDWATER,
Indiana Univ., Bloomington. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-08670

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
For primary bibliographic entry see Field 2K.
W77-08677

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, (LES PROBLEMES THERMIQUES ET CHIMIQUES DES EAUX THERMALES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
For primary bibliographic entry see Field 5B.
W77-08678

SOME FEATURES OF THE GEOCHEMISTRY OF THERMAL WATER IN PLATFORM AREAS FROM EXPERIMENTAL DATA,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 5B.
W77-08679

THE HELIUM ISOTOPES IN THERMAL FLUIDS,
Akademiya Nauk SSR, Moscow. Geologicheskii Institut.

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For primary bibliographic entry see Field 5B.
W77-08680

GEOCHEMISTRY OF THERMAL WATERS FROM VARIOUS GEOTHERMAL PROVINCES OF INDIA,
National Geophysical Research Inst., Hyderabad(India).
For primary bibliographic entry see Field 2K.
W77-08682

TEMPERATURE AND CHEMISM OF GROUND WATERS IN THE WESTERN AREAS OF THE EAST EUROPEAN PLATFORM,
Akademiya Nauk SSSR, Moscow. Interagency Geophysical Committee.
For primary bibliographic entry see Field 2K.
W77-08683

GEOCHEMISTRY AND ORIGIN OF THERMAL WATERS IN POLAND,
Polish Academy of Sciences, Warsaw. Inst. of Geological Science.
For primary bibliographic entry see Field 2K.
W77-08684

THERMAL WATERS IN TAIWAN, A PRELIMINARY STUDY,
Mining Research and Service Organization, Taipei (Taiwan).
C. Chen.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 79-88, 3 fig, 1 tab, 13 ref.

Descriptors: *Geothermal studies, *Geochemistry, Heated water, Hydrothermal studies, Hydrogen ion concentration, *Thermal water.
Identifiers: *Taiwan.

Approximately 80 hot-spring and fumarolic areas in Taiwan are reported with most of them being located in the Miocene, Paleogene, and pre-Tertiary metamorphic terranes. The two explored geothermal fields are Tatun and Tuchang. The Tatun belt is apparently of volcanic origin and the geothermal power potential is estimated to be at least 80-200 MW. Large scale exploitation has been hampered by the corrosion problem rendered by the acid fluid. It is suggested that the Tuchang belt could be another important belt capable of immediate exploitation. The Tuchang field produces sodium bicarbonate water with a pH around 8.5 and temperatures up to 173C. The Tatun field contains acid sulphate chloride water with a pH of about 2 and temperature up to 193C. (See also W77-08677) (Chilton-ORNL)
W77-08685

THE CONTENT OF SILICA IN HOT MINERAL WATERS OF FRANCE IN RELATION TO TEMPERATURE, SODIUM CONTENT AND BICARBONATES (LA TENEUR EN SILICE DES EAUX THERMOMINERALES DE FRANCE EN RELATION AVEC LA TEMPERATURE, LA TENEUR EN SODIUM ET EN BICARBONATES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
For primary bibliographic entry see Field 2K.
W77-08686

SOME GEOCHEMICAL PROBLEMS IN THE UTILIZATION OF GEOTHERMAL WATERS,
Department of Scientific and Industrial Research, Wellington (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 5B.
W77-08687

STUDY OF THE CHEMICAL AND GASEOUS COMPOSITION OF THERMAL WATERS OF THE EASTERN PART OF THE PANNONIAN DEPRESSION (CONSIDERATIONS SUR LA COMPOSITION CHIMIQUE ET GAZEUSE DES EAUX THERMALES DE LA PARTIE ORIENTALE DE LA DEPRESSION PANNONIQUE (ROUMANIE)),
Institutul de Geologie si Geofizica, Bucharest (Rumania).
For primary bibliographic entry see Field 2K.
W77-08688

STUDIES BY THE DYNAMIC METHOD ON THE REACTION OF ROCK WITH HOT SPRING WATER OF THE TAMAGAWA HOT SPRINGS IN JAPAN,
Toho Univ., Tokyo (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W77-08689

IMPORTANT GEOTHERMAL SITES IN GREECE, ON THE BASE OF THERMOMINERAL SPRING LAYINGS, AND THE POSSIBILITIES OF THEIR EXPLOITATION AND UTILISATION,
National Technical Univ., Athens (Greece). Institute of Mineral Layings, Science and Applied Geology.
C. Garagouins, and C. Dimitroulias.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 128-134, 20 ref.

Descriptors: *Geothermal studies, *Thermal water, *Heated water, Hydrology, Energy, *Hot springs.
Identifiers: *Greece(Neovolcanic regions).

The neovolcanic regions of Greece are identified. Some thermal springs are found to mix with other waters before reaching the surface and there by lose part of their heat. The study suggests that it would be possible to capt warm water at depth and to obtain high temperatures. The possibilities of energy production from waters ranging from 60-100 C is discussed. (See also W77-08677) (Chilton-ORNL)
W77-08690

TOTAL ENERGY USE IN AN URBAN-AGRICULTURAL POWER PLANT COMPLEX,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W77-08691

AN ECOLOGICAL MODEL FOR HEAVY METAL CONTAMINATION OF CROPS AND GROUND WATER,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5B.
W77-08706

UTILITY ANALYSIS FOR THE URBAN GROWTH INSIDE THE RECHARGE ZONES OF THE GROUNDWATER RESOURCES OF SAN ANTONIO, TEXAS,
Texas Univ. at San Antonio. Dept. of Environmental Studies.
For primary bibliographic entry see Field 6B.
W77-08713

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1975 TO SPRING 1976,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08732

AVAILABILITY OF GROUND WATER IN THE MIDDLE MERRIMACK RIVER BASIN, CENTRAL AND SOUTHERN NEW HAMPSHIRE,
Geological Survey, Concord, N. H. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08733

RECORDS OF WELLS, WATER-LEVEL MEASUREMENTS, AND DRILLERS' LOGS, RED RIVER VALLEY, LOUISIANA,
Geological Survey, Little Rock, Ark. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08734

GUIDE FOR DATA COLLECTION TO CALIBRATE A PREDICTIVE DIGITAL GROUND-WATER MODEL OF THE UNCONFINED AQUIFER IN AND NEAR THE CITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-08735

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1975.
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08737

WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1975.
Geological Survey, Helena, Mont. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08738

SIMULATIONS OF WATER-LEVEL DRAWDOWNS IN PROPOSED WELL-FIELD AREAS, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
H. Klein.
Open-file report 76-651, September 1976. 14 p, 9 fig, 1 ref.

Descriptors: *Model studies, *Drawdown, *Aquiers, *Pumping, *Florida, Water wells, Networks, Feasibility studies, Analog models, Evaluation, Projections.
Identifiers: Dade County(Fla), *Biscayne aquifer(Fla).

Electrical analog model simulations of hydraulic conditions in the Biscayne aquifer were made at proposed inland well-field sites in Dade County, Florida. Simulated drawdowns of water levels after 7 months of continuous pumping at 50, 100, and 150 million gallons per day were obtained at each site. Simultaneous pumping of each of the sites at 50 million gallons per day showed that after 7 months pumping there would be interference between proposed well fields. (Woodard-USGS)
W77-08739

OUTLINE OF THE WATER RESOURCES OF THE SATUS CREEK BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
D. Molenaar.
Open-file report 76-808, 1977. 34 p, 20 fig, 23 ref.

Descriptors: *Available water, *Streamflow, *Groundwater resources, *Aquifer characteristics, *Irrigation, *Indian reservations, *Washington, Hydrogeology, Surface-groundwater relationships, Saturated soils, Hydrologic budget, Evaluation, Watershed management.

Identifiers: *Yakima Indian Reservation(Wash), *Satus Creek basin(Wash).

On the Yakima Indian Reservation, Washington, only about 5 percent of the Satus Creek basin--in the relatively flat eastern lowland adjacent to and including part of the Yakima River lowland--is agriculturally developed, mostly through irrigation. Because the basin's streams do not contain adequate water for irrigation, most irrigation is by canal diversion from the adjoining Toppenish Creek basin. Irrigation application of as much as 9.25 acre-feet per acre per year, combined with the presence of poorly drained silt and clay layers in this area, and the natural upward discharge of ground water from deeper aquifers (water-bearing layers), has contributed to a waterlogging problem, which has affected about 10,500 acres, or about 25 percent of the irrigated area. In the upland of the basin, a large average annual base flow of about 30 cubic feet per second in Logy Creek indicates the presence of a potentially highly productive aquifer in young (shallow) basalt lavas underlying the higher western parts of the upland. This aquifer may provide a reservoir from which streamflow may be augmented by groundwater pumping or, alternatively, it may be used as a source of ground water for irrigation of upland areas directly. (Woodard-USGS)
W77-08740

WATER-LEVEL CHANGES IN NORTHWESTERN KANSAS, 1950-76,
Geological Survey, Lawrence, Kans. Water Resources Div.
M. E. Pabst, and E. D. Jenkins.
Kansas Geological Survey Journal, Lawrence, December 1976. 20 p, 2 fig, 2 plates, 2 tab, 14 ref.

Descriptors: *Groundwater resources, *Withdrawal, *Water utilization, *Water level fluctuations, *Kansas, Irrigation, Drawdown, Hydrologic data, Well data, Aquifers, Data collections.
Identifiers: Northwestern Kansas.

The water level in wells has declined as much as 44 feet (13 meters) since 1950 in areas of greatest development in northwestern Kansas, primarily as a result of groundwater withdrawals for irrigation. During 1950-76, the number of irrigation wells increased from about 100 to 3,050, and annual withdrawals are estimated to have increased from 15,000 to 600,000 acre-feet (18 to 740 cubic hectometers). Most of the water used in northwestern Kansas is withdrawn by wells screened in the Ogallala Formation of Pliocene age. The Ogallala consists primarily of sand and gravel that contains lenses of clay and silt. (Woodard-USGS)
W77-08742

ARTIFICIAL RECHARGE FOR SUBSIDENCE ABATEMENT AT THE NASA-JOHNSON SPACE CENTER, PHASE I,
Geological Survey, Austin, Tex. Water Resources Div.
S. Garza.
Open-file report 77-219, 1977. 82 p, 23 fig, 7 tab, 21 ref.

Descriptors: *Land subsidence, *Groundwater, *Withdrawal, *Artificial recharge, *Injection wells, Model studies, Aquifers, Hurricanes, Floods, Feasibility studies, Methodology, Evaluation, *Texas.
Identifiers: *NASA-Johnson Space Center(Tex), Houston area(Tex).

Regional decline of aquifer head due to groundwater withdrawal in the Houston area has caused extensive land-surface subsidence. The NASA-Johnson Space Center (NASA-JSC) in southeastern Harris County, Texas, was about 13 to 19 feet above mean sea level in 1974 and sinking at a rate of more than 0.2 foot per year. NASA-JSC officials, concerned about the hurricane flooding hazard, requested the U.S. Geological Survey to study the feasibility of artificially recharging the aquifers for subsidence abatement. Hydrologic digital models were developed for theoretical determinations of quantities of water needed, under various well-array plans, for artificial recharge of the Chicot and Evangeline aquifers in order to halt the local subsidence at NASA-JSC. The programs for the models were developed for analysis of three-dimensional ground-water flow. Total injection rates of between 2,000 and 14,000 gallons per minute under three general well-array plans were determined for a range of residual clay pore pressures of 10 to 70 feet of hydraulic head. The space distributions of the resultant hydraulic heads, illustrated for injection rates of 3,600 and 8,400 gallons per minute, indicated that, for the same rate, increasing the number and spread of the injection locations reduces the head gradients within NASA-JSC. (Woodard-USGS)
W77-08744

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN ATTALA, HOLMES, HUMPHREYS, ISSAQUENA, SHARKEY, AND YAZOO COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
J. M. Bettandroff, and S. A. Leake.
Mississippi Research and Development Center, Jackson, 1976. 68 p, 24 fig, 10 tab, 38 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Water utilization, *Mississippi, Hydrologic data, Streamflow, Sediments, Water wells, Aquifer characteristics, Water yield, Water pollution sources, Chemical analysis, Water supply, Water demand.
Identifiers: West-central Mississippi.

Ground water is the major source of industrial and agricultural water supplies in Attala, Holmes, Humphreys, Issaquena, Sharkey, and Yazoo Counties, Miss. A total of 5,416 million gallons per day were used for public and industrial supply in 1975; agricultural use for the year was 45,000 acre-feet. Average runoff contributed by the study area to the river basins is 3,000 million gallons per day. The average flow of the Mississippi River past the area is 360 billion gallons per day. The surface water is chemically suitable for most uses; however, some streams contain relatively high concentrations of iron, large amounts of sediment, or high color. Agricultural chemicals have impaired the quality of the stream and lake system. The fresh-ground-water section is 500 to 3,000 feet thick. The lower Wilcox aquifer, the Meridian-upper Wilcox aquifer, the Sparta aquifer system, and the Cockfield Formation are the major sources of ground-water supplies and are capable of supplying one million gallons per day or more to well fields in most areas. Water is highly mineralized in downdip areas of these aquifers. Iron and low pH cause problems locally in water supplies. The Mississippi River valley alluvial aquifer can supply several million gallons per day to well fields; however, the water is hard and contains excessive iron. (Woodard-USGS)
W77-08748

GROUND-WATER DATA FOR MICHIGAN, 1975,
Geological Survey, Lansing, Mich. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08753

SIMULATION OF POLLUTANT MOVEMENT IN GROUNDWATER AQUIFERS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-08807

SURFACE-GROUNDWATER INTERACTIONS AND THE CONJUNCTIVE USE OF THE WATER RESOURCES OF THE MULLICA RIVER BASIN, NEW JERSEY,
Rutgers - The State Univ. New Brunswick N. J. Dept. of Civil and Environmental Engineering.
R. Ahmed.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 908. Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Thesis, January 1973. 210 p, 19 figs, 28 tabs, 3 app. 88 ref. OWRT A-025-NJ(8) B-014-NJ(6) and A-025-NJ(8).

Descriptors: *River flow, Subsurface flow, Inflow, *Surface-groundwater relationships, *Aquifers, *Conjunctive use, Streamflow, *New Jersey, Groundwater movement, *Darcys law, *Continuity equation, Computer models.
Identifiers: *Mullica River Basin(NJ).

A fundamental equation describing transient two-dimensional flow through an aquifer was developed using Darcy's law, and the continuity equation. The resulting equation was a nonlinear parabolic partial differential equation. The resulting equation was solved numerically on the digital computer. An Alternating Direction Explicit Technique was employed to solve the flow equation for the head at any point in the basin under consideration and the amount of water exchange between stream and aquifer. The efficiency and accuracy of the digital model were checked by comparing the calculated values against analytical solutions for a homogeneous isotropic aquifer of simple geometry. Results of the comparison were satisfactory. Trend surface analysis was performed on available hydro-geologic data for the groundwater aquifer in the Mullica River Basin, New Jersey. A general linear model was utilized to extrapolate the values of the parameters to any point in the basin. Natural recharge values were obtained from calculated potential recharge values for the Batsto and the Oswego sub-basin. The digital computer model for the groundwater aquifer-stream system was specifically verified for the Batsto and the Oswego sub-basins by comparing the computed and historical return flow to the streams.
W77-08810

EXPERIMENTAL STUDY OF MULTI-CATION DIFFUSION IN AN ARTIFICAL QUARTZ SANDSTONE,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-08811

SOIL AND ROCK STRATA TO TRAP, FILTER AND STORE WATER FOR RURAL DOMESTIC USE,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 3B.
W77-08821

A MATHEMATICAL MODEL STUDY OF FRESH-WATER LENSES,
Aston Univ., Birmingham (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-08837

DIGITAL MODEL STUDIES OF STEADY STATE RADIAL FLOW TO PARTIALLY PENETRATING WELLS IN ALLUVIAL PLAINS,
Indian Inst. of Tech. Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-08838

SEISMIC DESIGN OF LIQUID-STORAGE TANKS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-08859

MOLYBDENUM CONTENT IN THE SUBSURFACE WATERS OF THE VINNITSA OBLAST, (IN RUSSIAN),
Vinnitskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 2K.
W77-08882

OBSERVATION RECORDS OF GROUND WATER LEVEL, (IN JAPANESE),
Geological Survey of Japan, Kawasaki.
T. Ozaki.
Geol Surv Jpn Rep. 249, p 1-54, 1973.

Descriptors: *Groundwater, *Data collection, Water levels, *Water supply, *Pumping, Industrial water, *Water level fluctuations, Artesian wells, Precipitation(Atmospheric).
Identifiers: *Japan.

Records of ground water levels in Japan are presented, and comments are given on the relation between annual fluctuation of ground water level and parameters such as history of development of ground water supply and the annual increase of pumping for industrial activities. A number of types of long-term fluctuations are distinguished. The fluctuation of ground water level is related to natural precipitation and supply from river water to the ground water basin. Ground water levels were found to be gradually lowering due to increased pumping from artesian wells in some areas. When pumping activities were controlled the ground water level was found to rise. Overall ground water levels were found to be slightly lower, suggesting that the problem will increase in the future.--Copyright 1975, Biological Abstracts, Inc.
W77-08904

UNITED STATES V. GAF CORPORATION: A LEAK IN THE FWPCA,
For primary bibliographic entry see Field 5G.
W77-08979

A 'ROUGH CUT' MODEL OF A SOUTH FLORIDA WATER SUPPLY PLAN,
Central and Southern Florida Flood Control District, West Palm Beach.
W. V. Storch.
In Depth Report, Vol 1, No 9, p 1-12, December-January 1973. 3 fig.

Descriptors: *Florida, *Groundwater, *Aquifers, *Groundwater resources, *Water resources, Water table, Water table aquifers, Drought, Water storage, Groundwater movement, Groundwater potential, Groundwater availability, Subsurface waters, Surface waters.

South Florida water plans of the past and present are compared in this study of what a model plan should contain. The Corps of Engineers federal water supply plan of 1968, which sought long-term carryover storage facilities in and around Lake Okeechobee, is explained in detail. For the future, the study recommends greater withdrawal from the Biscayne aquifer, as well as backpumping from the lower east coast into the conservation areas. Storm runoff from the east coast should be directed deep underground. A series of studies examine the feasibility of matching water needs with population growth and environmental factors. The key recommendation is that the storage capability of Lake Okeechobee be raised to 17.5 feet, so as to match the expected increase in the state's population. (Frank-Florida)
W77-08980

WATER RESOURCES AND WATER UTILIZATION IN ISRAEL,
Office of Naval Research, London (England).
For primary bibliographic entry see Field 6E.
W77-09011

SOLUTE TRAVEL TIMES TO WELLS,
Iowa State Univ., Ames. Dept. of Agronomy; and Iowa State Univ., Ames. Dept. of Physics.
For primary bibliographic entry see Field 5B.
W77-09042

CHARACTER OF SEEPAGE OF PRECIPITATION TO THE WATER TABLE IN THE CENTRAL FOREST STEPPE,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
A. M. Grin, S. I. Yevlakhina, and Yu. V. Kuk.
Soviet Hydrology, Selected Papers No 4, p 267-270, 1975. 4 fig, 2 tab, 6 ref. Translated from Izvestiya Akademii Nauk USSR, Seria Geograficheskaia, No 5, p 70-76, 1975.

Descriptors: *Seepage, *Water table, *Groundwater recharge, Infiltration, Leaching, Forests, Grasslands, Precipitation(Atmospheric), Soil water, Groundwater, Moisture content, Water levels, Wells, Foreign countries, Foreign research, Water wells, Zone of aeration, Soil water movement, Snowmelt, Melt water.
Identifiers: *USSR.

Groundwater recharge by precipitation is of great interest because of its practical significance and great scientific complexity. The nature of water seepage from the soil surface through the aeration zone and to aquifers is insufficiently known in many natural areas. Yet it is known that the solution of many theoretical and practical problems in hydrology and water management depends on how, at what time, and in what way the groundwaters are recharged by precipitation seeping from above. Study of the water regime of soils in the central forest-steppe has been initiated as early as the 1920's. It was found that the soil water reserves are replenished mainly during the snow melt period and partly in autumn. The largest increment in soil moisture occurs during snowmelt, especially when conditions are favorable for meltwater seepage. Such conditions are observed when the soil is frozen to a small depth and there is no ice crust and also when the melting of snow is slow and its water equivalent is high. In such periods, the soil is wetted to a maximum depth. However, even under the most favorable conditions, continuous wetting over an area rarely reaches a depth of 3-5 m, whereas the depth to the water table here is 10 m or more, as a rule. (Sims-ISWS)
W77-09043

SELECTED PROBLEMS IN IDAHO GROUND WATER LAW,
Idaho Univ., Moscow. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-09049

ARTIFICIAL RECHARGE TO A FRESH-WATER-SENSITIVE BRACKISH-WATER SAND AQUIFER, NORFOLK, VIRGINIA,
Geological Survey, Reston, Va. Water Resources Div.
D. L. Brown, and W. D. Silvey.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $1.70. Professional Paper 939, 1977. 53 p, 39 fig, 10 tab, 16 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Injection wells, *Brackish water, *Aquifers, Water quality control, Water storage, Test wells, Aquifer characteristics.
Identifiers: *Norfolk(Va), Test drilling.

Fresh water was injected into a brackish-water sand for storage and retrieval. The initial injection rate of 400 gpm decreased to 70 gpm during test 3. The specific capacity of the well decreased also, from 15.4 to 0.93 gpm. Current-meter surveys indicated uniform reduction in hydraulic conductivity of all contributing zones in the aquifer. Hydraulic and chemical data indicate this was caused by dispersion of the interstitial clay upon introduction of the calcium bicarbonate water into the sodium chloride bearing sand aquifer. The clay dispersion also caused particulate rearrangement and clogging of well screen. A pre-flush of 0.2 N calcium chloride solution injected in front of the fresh water at the start of test 4 stabilized the clay. However, it did not reverse the particulate clogging that permanently reduced permeability and caused sanding during redevelopment. Clogging can be prevented by stabilization of the clay using commercially available trivalent aluminum compounds. Test 1 and test 2 showed that 85 percent of the water injected can be recovered, and the water meets U.S. Public Health Standards. Storage of fresh water in a brackish-water aquifer appears feasible provided proper control measures are used. (Woodard-USGS)
W77-09066

ANALOG SIMULATION OF THE GROUND-WATER SYSTEM, YUMA, ARIZONA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-09067

HYDROLOGIC RECONNAISSANCE OF THE GEOTHERMAL AREA NEAR KLAMATH FALLS, OREGON, WITH A SECTION ON PRELIMINARY INTERPRETATION OF GEOPHYSICAL DATA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
E. A. Sammel, and D. L. Peterson.
Water-Resources Investigations 76-127 (open-file report), 1976. 137 p, 20 fig, 11 tab.

Descriptors: *Geothermal studies, *Oregon, *Aquifer characteristics, *Water chemistry, *Groundwater, Geochemistry, Geophysics, Heat flow, Hot springs, Basalts, Faults(Geologic).
Identifiers: *Klamath Falls area(Oreg).

Geothermal phenomena in the vicinity of Klamath Falls, Oregon, include hot springs, steam and water wells with temperatures exceeding 100 deg C, and several hundred warmwater wells with temperatures ranging from 20 deg C to 35 deg C. Hot water is confined to three relatively restricted areas located near major fault and fracture zones of the Basin and Range type. The water is produced mostly from Tertiary basalt and volcanic sediments. The hot waters contain less than 1000 mg/liter of dissolved solids and have compositions dominated by sodium and sulfate. Silica concentrations are less than 100 mg/liter, and the minimum estimated reservoir temperature based on silica content is 130 deg C. Cation ratios suggest that actual reservoir temperatures are not much greater than the estimated minimum. The temperature regime in the upper 500-600 meters of rock is dominated by convective transport, and gradients exceed 150 deg C per kilometer at places. Heat flow in the area, however, may be no more than 1.5 - 2 heat-flow units. In the absence of evidence for a shallow intrusive body of hot rock, the geothermal phenomena are attributed to deep circulation of meteoric water. The reservoir may be one of the largest hot-water geothermal systems in the United States. (Woodard-USGS)
W77-09070

REPORT ON PRELIMINARY DATA FOR MADISON LIMESTONE TEST WELL NO. 1, NE1/4SE1/4 SEC. 15, T. 57 N., R. 65 W., CROOK COUNTY, WYOMING,
Geological Survey, Lakewood, Colo. Water Resources Div.

R. K. Blankennagel, W. R. Miller, D. L. Brown, and E. M. Cushing.
Open-file report 77-164, February 1977. 97 p, 8 fig, 3 plates, 5 tab, 1 ref.

Descriptors: *Groundwater resources, *Test wells, *Aquifer characteristics, *Water quality, *Wyoming, Groundwater potential, Borehole geophysics, Stratigraphy, Hydrogeology, Chemical analysis, Regional analysis, Montana, North Dakota, South Dakota, Projections.
Identifiers: *Madison Limestone, *Core analyses.

This report provides the preliminary data for the Madison Limestone test well no. 1 in Crook County, Wyoming, including test-well history, geology of the test well, hydrologic testing, and geochemistry. The test well was drilled to a depth of 4,341 feet to determine the water-resource potential of the Madison Limestone and associated rocks to meet future water needs in a 188,000 sq mi region that includes the coal-rich area of the Northern Great Plains. Drilling and testing were designed to yield a maximum of stratigraphic, structural, geophysical, and hydrologic information. All significant water-bearing units contain relatively freshwater (less than 2,000 mg/liter dissolved solids). Three water-bearing units, which are now cased off, may be potential sources of ground water in the area of the test well. These are the Hulett Sandstone Member of the Sundance Formation, the Minnekahta Limestone, and the upper sandy part of the Minnelusa Formation. (Woodard-USGS)
W77-09072

GEOLOGIC DATA FROM TEST DRILLING IN PALM BEACH COUNTY, FLORIDA SINCE 1970,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09073

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1975.
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09074

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1975.
Geological Survey, Bismarck, N. Dak. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09075

WATER-RESOURCES INVESTIGATIONS IN KENTUCKY, 1976.
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09078

WATER-RESOURCES INVESTIGATIONS IN WISCONSIN, 1976.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09079

GROUND-WATER RESOURCES AND GEOLOGY OF WALWORTH COUNTY, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-09081

CHEMICAL AND ISOTOPIC INVESTIGATIONS OF GROUNDWATER IN POTENTIAL GEOTHERMAL AREAS IN HAWAII,
Hawaii Inst. of Geophysics, Honolulu; and Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-09082

GROUND-WATER HYDROLOGY OF BERKELEY COUNTY, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va. Water Resources Div.
W. A. Hobba, Jr.
West Virginia Geological and Economic Survey, Morgantown, and the Berkeley County Court, 1976. 21 p, 1 plate, 5 ref.

Descriptors: *Hydrogeology, *Groundwater resources, *Water quality, *Surface-groundwater relationships, Hydrologic data, Water table, Water levels, Aquifer characteristics, Chemical analysis, *West Virginia, Potomac River.
Identifiers: *Berkeley County(W Va), Potomac River basin.

Berkeley County, W. Va., is largely underlain by limestone aquifers in which water levels may fluctuate annually as much as 32 feet. In order to prepare maps of the water table and ground-water quality that represent one instant in time, data were collected during a two-week period of dry weather in July and August 1973. The water levels in 350 wells and springs and the discharge of 24 streams were measured. Water-quality analysis showed that specific conductance ranged from 10 to 1400 micromhos. Carbonate hardness ranged from 3 to 700 mg/liter. Nitrate concentration ranged from 0 to 143 mg/liter and chloride concentrations ranged from 3 to 255 mg/liter. As much as 85 percent of streamflfow may be derived from ground water in parts of the county underlain by limestone aquifers. This discharge may be as much as 600,000 gallons per day per square mile. Fifteen wells and springs were sampled after a period of recharge in January 1974. Fecal coliform and fecal streptococci concentrations were as much as 600 and 355 colonies per 100 ml, respectively. Nitrate concentrations in these samples were as much as 10 times higher than the concentrations found in samples collected in July and August. (Woodard-USGS)
W77-09083

STORAGE OF LOW-LEVEL RADIOACTIVE WASTES IN THE GROUND: HYDROGEOLOGIC AND HYDROCHEMICAL FACTORS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5E.
W77-09086

PRELIMINARY STUDY OF WASTEWATER MOVEMENT IN AND NEAR GRAND TETON NATIONAL PARK, WYOMING, THROUGH OCTOBER 1976,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-09087

WATER-LEVEL RECORDS FOR THE SAN LUIS VALLEY OF COLORADO, 1973-77,
Geological survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09088

INTEGRAL EQUATION FOR THE DESCRIPTION OF STREAM-AQUIFER INTERACTION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-09092

4C. Effects On Water Of Man's Non-Water Activities

CLEARCUTTING IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. School of Forest Resources.
J. A. Lynch, E. S. Corbett, and R. J. Hutnik.
In: Clearcutting in Pennsylvania, the Pennsylvania State University, University Park, Pa., 1975. (Chapter 5: Water Resources p 51-63. 37 ref.

Descriptors: *Clear-cutting, *Water quality, *Water yield, Turbidity, Water temperature, Storm runoff, Peak discharge, Cycling nutrients, Leaching, Water pollution sources, Pennsylvania, Northeast US.

The factors influencing the quality and quantity of water yielded from forested lands are outlined. The effects of clearcutting on stream nutrient concentrations, water temperature, turbidity, water yield, and stormflows are evaluated. Recommendations are made for protecting water resources when using clearcutting as a forestry practice. (Forest Service)
W77-08712

HYDROLOGIC CHANGES AFTER LOGGING IN TWO SMALL OREGON COASTAL WATERSHEDS,
Geological Survey, Portland, Oreg. Water Resources Div.
D. D. Harris.
Available from Branch of Distribution, USGS, 1200 S.Eads St., Arlington, VA 22202, price $0.75. Water-Supply Paper 2037, 1977. 31 p, 16 fig, 11 tab, 36 ref.

Descriptors: *Lumbering, *Clear-cutting, *Environmental effects, *Sediment yield, *Streamflow, *Oregon, Small watersheds, Hydrologic data, Water yield, Flow rates, Sediment transport, Water temperature, Evaluation.
Identifiers: Hydrologic changes, Small coastal watersheds.

Effect of clearcut, cable logging on the hydrologic characteristics of a small coastal stream in Oregon indicate an average 181-percent increase in sediment yield over a 7-year postlogging period. Annual runoff and high-flow volumes increased 19 and 1.1 inches, respectively, after logging in the watershed. Clearcutting in small, spaced patches in another watershed resulted in some increase in water and sediment yields, but the increase was not statistically significant. Average monthly April-October maximum water temperatures increased significantly in the principal stream of both the clearcut and 'patch-cut' watersheds. Hydrologic characteristics of both streams generally appear to be returning to prelogging conditions (1973). (Woodard-USGS)
W77-08746

NETWORK CHARACTERISTICS IN SUBURBANIZING STREAMS,
Iowa Univ., Iowa City. Dept. of Geography.
W. L. Graf.
Water Resources Research, Vol. 13, No. 2, p 459-463, April 1977. 4 fig, 4 tab, 10 ref.

Descriptors: *Drainage, *Networks, *Urbanization, *Iowa, Drainage systems, Drainage effects, Watersheds(Basins), Hydrographs, Channels, Data processing, Analytical techniques, Streamflow, Flash floods, Runoff, Geomorphology, Cities, Hydrology.
Identifiers: *Suburban drainage.

Analysis of hydrologic, geomorphic, and suburbanization data from a small instrumented drainage basin near Iowa City, Iowa, indicated that channel networks are radically altered when

nburban development overtakes a drainage basin. hanges in channel networks are such that the net- ork becomes much more efficient in collecting ater quickly, so that lag time and kurtosis of orm hydrographs are altered to produce the miliar flash floods of urban areas. The data owed that network changes are closely as- ociated with lag time, and kurtosis of storm ydrographs and suggested that corrective mea- ures should be concentrated on the internal links f the network. Changes in characteristics of chan- el networks should be considered in addtion to hanges in areas of impervious surfaces when the ydrologic impact of suburbanization is assessed. Sims-ISWS)
/77-08830

EASONAL VARIATIONS IN THE IMPACT OF UBURBAN DEVELOPMENT ON RUNOFF ESPONSE: PETERBOROUGH, ONTARIO,
rent Univ., Peterborough (Ontario). Dept. of eography.
. H. Taylor.
/ater Resources Research, Vol. 13, No. 2, p 464-58, April 1977. 1 fig, 1 tab, 11 ref.

escriptors: *Runoff, Precipitation(Atmospheric), *Urbanization, Drainage effects, *Canada, *Seasonal, Rainfall-unoff relationships, Snow, Snowmelt, Cities, Ef- ects, Streamflow, Watersheds(Basins), Stream ages, Rain gages, On-site investigations, Hydro- raphs, Hydrology, Urban hydrology.
dentifiers: *Peterborough(Ontario).

small basin in Peterborough, Ontario, was in- rumented to investigate the contrasts in runoff esponse between rural and suburbanized sections f the basin. Data were collected over three easons (summer, fall, and spring) to evaluate easonal variations in the rural-urban contrast. esults indicated that the effect of the urban evelopment is felt most strongly in the spring nder snowmelt conditions and least strongly in ie summer. Urban direct runoff volumes exceed ural volumes by factors of 1.2 for summer rain- torms, 2.3 for fall rainstorms, and 7.5 for spring nowmelt and rain-on-snow events. Urban peak ischarges exceed rural peaks for the same easons by factors of 4.5, 2.4, and 7.1. Direct ru- off-rainfall ratios (rainfall and snowmelt in the pring case) are consistent in the rural basin, being .05 for the summer, 0.07 for the fall, and 0.06 for ie spring. The corresponding ratios in the urban asin are 0.06, 0.16, and 0.76. It is believed that easonal variations in the rural-urban response atios are caused mainly by seasonal fluctuations i the extent of the runoff contributing area in the rban basin. (Sims-ISWS)
/77-08831

FFECT OF AGRICULTURAL AND SILVICUL- URAL PRACTICES ON THE RUNOFF FROM RAINAGE BASINS OF THE NIZHNEDEVIT- KAYA HYDROLOGIC STATION,
. G. Bozhenko.
oviet Hydrology, Selected Papers, No 4, p 296-99, 1975. 1 fig, 4 tab. Translated from Trudy osudarstvennogo Gidrologicheskogo Instituta, o 229, p 162-168, 1975.

escriptors: *Runoff, *Agriculture, *Forestry, Effects, Farm management, Forests, Precipita- on(Atmospheric), Subsurface flow, Surface ru- off, Infiltration, Soil water, Watersheds(Basins), ivers, Foreign countries, Foreign research, ydrology.
dentifiers: *USSR.

he Nizhnedevitsk Hydrologic Station is in the entral part of the Central Chernozem Region of ie European USSR. A combination of agricul- ural and silvicultural reclamation practices has een carried out systematically in the Central hernozem Region in the past 20-30 years. As a esult, the productivity of agricultural lands has in- creased. For example, the grain crop yield in the Nizhnedevitsk station area has increased from 11 to 30 centners/hectare. The increase was promoted by a change in the structure of crop rotations and tillage practices. The present level of agricultural and silvicultural reclamation practices, which led to a sharp increase in the productivity of agricultural lands, did not change the annual runoff of rivers in the central part of the Central Chernozem Region, but resulted in a redistribution of the volumes of surface and subsurface flow into rivers. Surface runoff decreased by a factor of nearly 2, while subsurface flow increased by the same value. The change occurred mainly as a result of the conversion of summer-autumn surface runoff to subsurface flow and also because of a slight reduction in the proportion of surface runoff in spring. In the last 10 years, subsurface flow accounted for 70-75% of the annual river runoff volume, i.e., river runoff became more regulated by the subsurface storage of the basins, which must have a beneficial effect on the utilization of river runoff. The water erosion of soils decreases with a reduction of summer-autumn floods. (Sims-ISWS)
W77-08835

MAN'S EFFECT ON THE FISHES OF THE UPPER SHETUCKET RIVER SYSTEM,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5C.
W77-09061

FLOOD-PLAIN DELINEATION FOR DIFFICULT RUN BASIN, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Reston, Va. Water Resources Div.
P. L. Soule.
Open-file report 76-459, 1976. 184 p, 112 fig, 16 tab, 4 ref.

Descriptors: *Flood plains, *Boundaries(Surfaces), *Urbanization, *Flood control, *Flood profiles, Maps, Flood frequency, Flood recurrence interval, Land management, Planning, Construction.
Identifiers: *Fairfax County(Va), Difficult Run basin.

Water-surface profiles of the 25-year and 100-year floods and maps on which the 25-, 50-, and 100-year flood boundaries are delineated for streams in the Difficult Run basin in Fairfax County, Virginia. The techniques used in the computation of the flood profiles and delineation of flood boundaries are presented. Difficult Run heads at about 500 ft. elevation near the city of Fairfax and discharges into the Potomac River at about 70 feet above mean sea level. Stream channel slopes are fairly steep, the main channel of Difficult Run has an average fall of about 25 feet per mile. Stream channels are well defined with established flood plains covered in most cases with trees and dense brush. Development within the basin has been gradual and mostly residential. In 1965 most of the development was in the area of Fairfax City and the town of Vienna and imperviousness for the basin at that time was computed to be less than 1 percent. Since 1965 considerable additional residential development has taken place within the basin in the Vienna and Reston areas and ultimate development with an overall imperviousness of 30 percent is anticipated with higher percentages of imperviousness near centers of anticipated development. (Woodard-USGS)
W77-09071

GEOLOGIC DATA FROM TEST DRILLING IN PALM BEACH COUNTY, FLORIDA SINCE 1970,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09073

4D. Watershed Protection

THE HYDROLOGY OF A SMALL CATCHMENT BASIN AT SAMARU, NIGERIA: IV: ASSESSMENT OF SOIL EROSION UNDER VARIED LAND MANAGEMENT AND VEGETATION COVER;
Institute for Agricultural Research, Zaria (Nigeria).
J. Kowal.
Samaru Res Bull. 149, p 134-147, 1972.

Descriptors: *Soil erosion, *Land management, *Watershed management, *Surface runoff, *Runoff, Watersheds(Basins), Vegetation effects, Abrasion, Dispersion, Cultivation, Cultivated lands, Terracing.
Identifiers: Nigeria, Samaru, Plant nutrient loss, Nutrient loss.

The results of a field experiment designed to measure surface erosion under various systems of land management and vegetation cover are presented for the period 1965-8. No correlation was found between the amount of annual run-off and the amount of annual soil erosion or plant nutrient loss. This is attributed to a difference in the hydraulic characteristics of run-off flow, to a differential contribution to total erosion by splash and abrasion and to differences in the degree of dispersion brought about by various treatments tested. The average amount of soil lost in erosion from cultivated plots, 200 yards long and laid out at constant gradient of 1:320, ranged from 3.370 + 360 lb to 18,690 + or - 630 lb/acre (3,780 + or - 400 to 20,950 + or - 700 kg ha-1)/yr. Under natural vegetation no loss of soil occurred. The lowest erosion occurred from non-ridged land, averaging between 3,370 + 360 and 3,600 + 380 lb/acre (3,780 + or - 400 and 4,000 + or - 420 kg ha-1)/yr irrespective of treatment cover. Terraces with 3-ft (0.9-m) ridges gave 5.3 times as much soil loss than flat land, while that with alternate ridges tied was 1.5 times greater. The largest soil loss occurred from broadlands with alternately-tied ridges amounting to 1890 + or - 630 lb/acre (20,960 + or - 700 kg ha-1)/yr. The total amount of exchangeable and soluble bases lost annually in run-off and eroded soil range from about 14 + or - 1.9 lb/acre (15.7 + or - 2.1 kg ha-1)/yr on cropped flat land and alternately-tied ridges to 29.7 + or - 3.2 lb and 26.3 + or - 2.5 lb/acre (33.3 + or - 3.6 and 29.5 + or - 2.8 kg ha-1) on ridged land and broadlands with alternately-tied ridges, respectively. Annual loss of N ranged from about 7--19 lb/acre (7.8-21.3 kg ha-1) and was approximately proportional to the bases lost in each treatment. Under climate and soil conditions at Samaru growing crops on ridges along terraces still allows a significant amount of soil erosion and nutrient loss. Cultivation on flat terraced land is less damaging.--Copyright 1974, Biological Abstracts, Inc.
W77-08698

WATER AS AN ENVIRONMENTAL CONSTRAINT IN LAND USE PLANNING,
North Carolina State Univ., Raleigh. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 6G.
W77-08721

TRAP-EFFICIENCY INVESTIGATION BERNALILLO FLOODWATER RETARDING RESERVOIR NO. 1 (PIEDRA LISA ARROYO) NEAR BERNALILLO, NEW MEXICO, WATER YEARS 1956-1974,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
D. E. Funderburg.
Open-file report 77-261, March 1977. 43 p, 23 fig, 4 tab, 7 ref.

Descriptors: *Sediment control, *Reservoirs, *Trap efficiency, *New Mexico, *Thunderstorms, Runoff, Inflow, Retention, Outflow, Sediment

yield, Flash floods, Storm structure, Flood control.
Identifiers: *Bernalillo area(N Mex).

The U.S. Geological Survey, in cooperation with the U.S. Soil Conservation Service, began an investigation of sedimentation of Bernalillo Floodwater Retarding Reservoir No. 1 (Piedra Lisa Arroyo) near Bernalillo, New Mexico in 1956. This investigation was part of a nationwide investigation of the trap efficiency of detention reservoirs. Reservoirs No. 1 is normally a dry reservoir and runoff from the 10.6 sq km drainage area generally occurs from high-intensity summer thundershowers. The mesa area of the drainage basin was treated to prevent erosion and gullying and to retard rapid runoff of rainfall. The land treatment consisted of pits, terraces, seeding, and restricted grazing. The total outflow recorded for the period of record (July 19, 1956 to June 30, 1974) was 133 acre-feet, yielding 1,439 tons of sediment. Over 99 percent of the coarse sediments and a high percentage of the silts and clays were deposited in the reservoir before reaching the outflow pipe. The determined trap efficiency of Reservoir No. 1 was 96 percent for the period of record. (Woordard-USGS)
W77-08741

DESIGN EFFICIENCY OF STORMWATER DETENTION BASINS,
National Weather Service, Silver Spring, Md., Hydrologic Research Lab.
D. C. Curtis, and R. H. McCuen.
Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings Paper 12938, p 125-140, May 1977. 5 fig, 6 tab, 15 ref, 1 append.

Descriptors: *Urban runoff, *Detention reservoirs, *Model studies, Mathematical models, Erosion, Sedimentation, Sediments, Particle size, Sediment control, Runoff, Storm runoff, Flood routing, Water management(Applied), Urban drainage, Urbanization, Hydrology.
Identifiers: *Detention basins.

In addition to increased flood runoff, urban development has caused a significant increase in sediment loads in streams. While many means of sediment and runoff control have been proposed, stormwater detention has been shown to be one of the more cost efficient means. Because detention has been shown to be one of the more cost efficient means. Because detention facilities have not been used extensively in the past, a data base is not available for determining the effect of design factors on sediment trap efficiency and runoff control characteristics. A mathematical model, which includes erosion, sedimentation, and detention facility components, was developed from principles of hydraulics and classical settling mechanic. The model was used to examine the effecrt of : (1) detention basin location; (2) soil particle size distribution; (3) basin depth; (4) initial storage, and (5) orifice diameter. An understanding of the relative importance of these factors may lead to better design of stormwater detention facilities. (Sims-ISWS)
W77-08841

PERFORMANCE CHARACTERISTICS OF A GRASSED-WATERWAY TRANSITION,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
W. O. Ree.
ARS-S-158, February 1977. 11 p, 14 fig, 3 tab, 1 ref.

Descriptors: *Channel flow, *Erosion control, *Grassed waterways, *Transition flow, Hydraulic jump, Flow, Equations, Profiles, Vegetation, Vegetation effects.
Identifiers: *Bermuda grass.

The report described the performance of a channel transition at the end of a grassed waterway during 11 test flows ranging from 0.83 to 145 cu ft/s to determine the ability of the transition to reduce velocity from supercritical to subcritical without erosion. The transition performed satisfactorily and suffered no erosion or cover loss from the flows. The good performance was attributed to a design that incorporates a gradual convergence of the conjugate depths, thus limiting hydraulic jump to a nondestructive minimum. Maintaining a dense, uniform bermudagrass cover also contributed to the success of the transition. (Bhowmik-ISWS)
W77-08849

PRESENT-DAY SLUMPING AND EROSION PHENOMENA ON IRRIGATED LANDS (EXEMPLIFIED BY SOUTHEASTERN CISCAUCASIA), (IN RUSSIAN),
Industrial Research Inst. of Engineering, Survey and Construction, Stavropol (USSR).
For primary bibliographic entry see Field 2J.
W77-08885

AN ASSESSMENT OF SNOWPACK DEPLETION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 3B.
W77-08933

TRAP RESPONSES OF THE GRAY SQUIRREL (SCIURUS CAROLINENSIS CAROLINENSIS), RACCOON (PROCYON LOTOR LOTOR), AND OPOSSUM (DIDELPHIS VIRGINIANA VIRGINIANA) TO ENVIRONMENTAL FACTORS IN TWO SWAMP WATERSHEDS OF NORTHEASTERN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 6G.
W77-08936

DESIGNING FOR SEDIMENT TRANSPORT,
Army Engineer District, Kansas City, Mo.
W. M. Linder.
Water Spectrum, Vol 8, No 1, p 36-43 (Spring-Summer 1976). 3 map, 10 photo.

Descriptors: *Sediment transport, *Design criteria, *Flood control, *Channel erosion, Sediment control, Streams, Rivers, Decision making, Meanders, Berms, Drawdown, Levees, Alluvial faus, Damage, Environmental effects, Equilibrium, Suspended loads, Slopes, Projects.

Stream channelization is frequently employed without consideration of sediment transport characteristics of the stream, or of the extent to which the stream's natural balance will be disturbed. In the past, many problems associated with flood control, drainage, and navigation have been solved by modification of the river channels without giving equal thought to the sediment being transported by the water flowing in those channels. This has led to errors in the planning and design of channel modification projects. In many instances the objectives of the projects have been adequately met, but in others there have been adverse effects. Many acres of fertile land have been lost as the streams widened and deepened. Bridges have been damaged or destroyed during major runoffs. Erosion and sedimentation damage are the critical adverse effects. Techniques should be employed which consider sediment transport characteristics and stream equilibrium. In this way, the reactions of a stream to manmade changes can be minimized. Some of the techniques that should be considered are: (1) composite channel designs; (2) extensive use of levees; (3) grade control structures. The ultimate cost resulting from adverse effects of traditional channel modification is greater than the cost of a design that recognizes the influence of sediment transport. (Martin-Florida)
W77-08962

NATURAL STREAM TEMPERATURE VARIATIONS IN A CATCHMENT,
Environment Protection Authority, Victoria (Australia).
For primary bibliographic entry see Field 5B.
W77-09039

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

BITUMINOID FORMATION IN THE MUD SEDIMENTS OF DOMESTIC SEWAGE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. E. Sinel'Nikov.
Gidrobiol Zh. 9(5), p 12-20, 1973.

Descriptors: *Pollutant identification, *Spectroscopy, Infrared radiation, *Bottom sediments, *Sewage, Domestic wastes, Organic compounds, Fats, Oil, Muds, Luminescence.
Identifiers: *Bituminoids.

By using IR-spectroscopy and studying the luminescent characteristics of substances isolated from the chloroform fraction of domestic sewage bottom sediments, a possible transformation of fats and oils into high molecular weight compounds (bituminoids) is shown. The content of chloroform-soluble substances in the mud was 10% of the whole organic substance determined from losses during calcination. Bituminoids constituted from 25-50% of the whole chloroform-soluble substance. The bituminoid content in the exprimental was 2-10% of the fat applied.--Copyright 1975, Biological Abstracts, Inc.
W77-08618

HIGH SPEED LIQUID CHROMATOGRAPHIC ANALYSIS OF COBALAMIN PRODUCTIVITY AND DISTRIBUTION IN ACTIVATED SEWAGE SLUDGE TREATMENT,
Clark Univ., Worcester, Mass.
R. A. Beck.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 77-6014. Ph.D. Thesis, 1976. 107 p.

Descriptors: *Pollutant identification, *Chromatography, *Activated sludge, Analysis, Filtration, Separation techniques, Analytical techniques, *Sludge treatment, *Waste water treatment, Chemical analysis.
Identifiers: Cobalamins, Benzyl alcohol extraction.

A high speed liquid chromatographic technique was developed for the determination of 1-10 micrograms of total extractable cobalamins from activated sludge. Cobalamins are extracted by benzyl alcohol; spectrophotometrically interfering substances are removed by combined gel filtration and chromatography; trace extracts are concentrated by lyophilization; and total extractable cobalamins are quantified by high speed liquid chromatography. The annual productivity of cobalamins was found to average 1,87-27.08 micrograms/gram of dry sludge weight. Increases of this substance paralled increased environmental temperatures and diminished dissolved oxygen levels. Cobalamin levels were found to be 9.75 micrograms/gram in secondary stage activated sludge, 3.79 micrograms/gram in primary sludge and 4.75 micrograms.gram in tertiary sludge. (Collins-FIRL)
W77-08621

SSELS (MYTILUS SP.) AS AN INDICATOR LEAD POLLUTION,
pps Institution of Oceanography, La Jolla, f.
primary bibliographic entry see Field 5C.
7-08693

EVALUATION OF THE NATIONAL TROPHICATION SURVEY DATA,
ional Eutrophication Survey, Corvallis, Oreg.
primary bibliographic entry see Field 5C.
7-08710

AILABILITY OF GROUND WATER IN THE DDLE MERRIMACK RIVER BASIN, CEN-AL AND SOUTHERN NEW HAMPSHIRE,
ological Survey, Concord, N. H. Water sources Div.
primary bibliographic entry see Field 7C.
7-08733

ATER RESOURCES DATA FOR WASHING-N, WATER YEAR 1975.
ological Survey, Tacoma, Wash. Water sources Div.
r primary bibliographic entry see Field 7C.
7-08737

ATER RESOURCES DATA FOR MONTANA, ATER YEAR 1975.
ological Survey, Helena, Mont. Water sources Div.
r primary bibliographic entry see Field 7C.
7-08738

ATER FOR INDUSTRIAL AND AGRICUL-RAL DEVELOPMENT IN ATTALA, OLMES, HUMPHREYS, ISSAQUENA, SHAR-EY, AND YAZOO COUNTIES, MISSISSIPPI,
ological Survey, Jackson, Miss. Water sources Div.
r primary bibliographic entry see Field 4B.
7-08748

ROUND-WATER DATA FOR MICHIGAN, 75,
ological Survey, Lansing, Mich. Water sources Div.
r primary bibliographic entry see Field 7C.
7-08753

HE DEVELOPMENT OF A TEST FOR THE OTABILITY OF WATER TREATED BY A IRECT REUSE SYSTEM,
ncinnati Univ., Ohio. Coll. of Medicine.
T. Christian, C. S. Clark, T. E. Cody, S. itherup, and P. S. Gartside.
vailable from the National Technical Informa-on Service, Springfield, VA 22161 as ADA-025 3, Price codes: A09 in paper copy, A01 in icrofiche. Report to Army Medical Research and evelopment Command, Washington, D.C. Re-ort No. 8, June 1976. 181 p, 72 tab, 25 fig.

escriptors: *Public health, *Domestic water, Potable water, Domestic wastes, Pathogenic bac-ria, Waste disposal, Waste treatment, Waste ater treatment, Waste water disposal, Hospitals, oxins, Human disease methodology, Physiology, iochemistry, Laboratory tests, *Bioassay, Toxicity, *Water reuse, Pollutant identification.
dentifiers: *Toxic substances, *Hospital waste-ater reuse, Human health problems, Mammalian cell culture, Hydroquinone, 2 4-initrophenylhydrazine, 1 3-dinitrobenzene, Behavioral toxicology.

he objective of this contract is to develop an ssay system to determine th presence of toxic ubstances in drinking water produced from a irect hospital wastewater reuse system (MUST). A biologically-based test system was chosen because it was potentially a non-specific indicator of the presence of toxins and it is relevant to identification of human health problems. Mammalian cells are cultured in vitro in a growth medium that employs the water under investigation as the solvent. The effect of the drinking water sample on the cell culture is evaluated by comparing cell growth in the test media with growth in control medium made with distilled water as the solvent. The primary aim of this contract in the second year is validation of the toxicity assay through comparison of the response of the assay system to graduated concentrations of known compounds with animal toxicological responses to the same compounds. Hydroquinone, 2,4-dinitrophenylhydrazine, and 1,3-dinitrobenzene dose-response data for animals and mammalian cells are presented. Although emphasis in the animal studies has been on classical toxicological methods, a limited amount of behavioral toxicology has also been carried out. (Katz)
W77-08758

A PNEUMATIC DOSING APPARATUS FOR FLOW-THROUGH BIOASSAYS,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Biology.
A. D. Smith, J. R. Butler, and G. W. Ozburn.
Water Research, Vol 11, p 347-349, 1977. 3 fig, 3 ref.

Descriptors: *Bioassays, *Methodology, *Equipment, *Laboratory equipment, *Toxins, *Design, *Lethal limit, Laboratory tests, Technology.
Identifiers: *Pneumatic dosing apparatus, *Flow-through systems.

A multichannel pneumatic injector, when used with an equal-volume dilutor, possesses several advantages over the mechanical approach to toxicant dosing. The system is reliable and highly versatile, capable of maintaining an unlimited range of toxicant levels in flow-through bioassays. Use of a single toxicant concentration eliminates the necessity of preparing several stock solutions. Automatic reloading of the injector syringes reduces maintenance. (Katz)
W77-08763

TOXICITY TO FISH OF FLAME RETARDANT FABRICS IMMERSED IN THEIR WATER. PART I,
Cornell Univ., Ithaca, N.Y., Dept. of Veterinary Pathology.
For primary bibliographic entry see Field 5C.
W77-08765

THE RESIDUAL OXYGEN BIOASSAY: A RAPID PROCEDURE TO PREDICT EFFLUENT TOXICITY TO RAINBOW TROUT,
E. V. S. Consultants Ltd., Coquitlam, (British Columbia).
G. A. Vigers, and A. W. Maynard.
Water Research, Vol 11, p 343-346, 1977. 1 tab, 3 fig, 12 ref.

Descriptors: *Bioassay, *Testing, *Analytical techniques, *Forecasting, *Rainbow trout, *Toxicity, *Oxygen, *Lethal limit, *Respiration, *Toxicity, *Water quality, *Bioindicators, Laboratory tests, Fish physiology, Oxygen demand, Industrial wastes, Pulp wastes.
Identifiers: *Residual oxygen bioassay, Sodium pentachlorophenate, Kraft pulp mill bleach effluent, Chloralkali plant waste.

A rapid bioassay procedure is described which for the toxic effluents tested, is sensitive to concentration in the 96-h LC50 range. The procedure requires less than eight hours to complete and is based on the consumption of available oxygen by fish in sealed containers. The procedure is evaluated using sodium pentachlorophenate, 3 kraft pulp mill bleach plant effluents and a chloralkali plant waste. The threshold concentrations obtained from the rapid procedure were directly comparable to 96-h LC50 values obtained by standard methods. For replicate tests with sodium pentachlorophenate, no significant difference between means of data obtained by the two bioassay procedures could be demonstrated. (Katz)
W77-08766

COMPILATION OF TEMPERATURE PREFERENCE DATA,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 7C.
W77-08767

THERMAL ACCLIMATION, UPPER TEMPERATURE TOLERANCE, AND PREFERRED TEMPERATURE OF JUVENILE YELLOWTAIL SNAPPERS, OCVURUS CHRVSURUS (BLOCH) (PISCES: LUTJANIDAE),
Auburn Univ., Ala., Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5C.
W77-08769

LABORATORY METHODS FOR DETERMINING TEMPERATURE PREFERENCE,
Wilfrid Laurier Univ., Waterloo(Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08770

METHOD FOR DETERMINING ACUTE TOXICITY OF AN ACID WASTE AND LIMITING PERMISSIBLE CONCENTRATION AT BOUNDARIES OF AN OCEANIC MIXING ZONE,
EG and G Environmental Consultants, Waltham, Mass.
For primary bibliographic entry see Field 5C.
W77-08771

A STUDY OF HEAVY METALS IN LAKE ABBAYA, ETHIOPIA, AND THE INCIDENCE OF NON-PARASITIC ELEPHANTIASIS,
London Univ. (England). Dept. of Pharmaceutics.
A. E. Klein.
Water Research, Vol. 11, p. 323-325, 1977. 2 tab., 1 fig., 12 ref.

Descriptors: *Heavy metals, *Mercury, Africa, *Arsenic compounds, *Public health, Hotsprings, *Diseases, *Parasitism, On-site investigations, Water quality, *Human diseases, Human pathology, Pollutant identification.
Identifiers: *Non-parasitic elephantiasis, *Lake Abbaya(Ethiopia), *Mercury poisoning chronic symptoms.

Samples of surface water from Lake Abbaya, Ethiopia, and from nearby hot springs, have been analysed for heavy metals and other constituents. Significant levels of mercury and arsenic were observed. These findings may be relevant to the high incidence of non-parasitic elephantiasis in the immediate vicinity of the lake. (Katz)
W77-08774

STUDY ON THE POST-MORTEM IDENTIFICATION OF POLLUTANTS IN THE FISH KILLED BY WATER POLLUTION: DETECTION OF ARSENIC,
South Carolina State Coll., Orangeburg. Water Lab.
S. S. Sandhu.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 3, p. 373-378, 1977. 1 tab., 11 ref.

Descriptors: *Defoliants, *Absorption, *Path of pollutants, *Fishkill, *Herbicides, *Catfish, *Pesticide residues, *Pollutant identification,

*Arsenicals(Pesticides), Toxicity, Pesticides, Water pollution, Agricultural chemicals, Arsenic compounds, Water pollution sources, Agriculture weed control, Public health, Arsenic compounds.
Identifiers: *Bioaccumulation, *Arsenic.

Careless aerial spraying of a cotton field for weed control and defoliation caused the contamination of an adjacent reservoir with the herbicide. Dead catfish, resulting from exposure to the herbicide were found to contain high levels of arsenic (5.09 ppm in fish muscle tissue) suggesting this to be the cause of death. Seven weeks after the exposure, catfish from the reservoir were found to contain 12.38 ppm arsenic in muscle tissue, indicating bioaccumulation of the substance by surviving fish. Water arsenic levels fell from 2.50 ppm to 1.91 ppm after seven weeks. (Katz)
W77-08775

DEVELOPMENT OF A BLOOD SUGAR BIOASSAY FOR RAPIDLY MEASURING STRESSFUL LEVELS OF PULPMILL EFFLUENT TO SALMONID FISH,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
D. J. McLeay.
Journal of the Fisheries Research Board of Canada, Vol 34, p 477-485, 1977. 2 tab, 4 fig, 29 ref.

Descriptors: *Bioassay, *Water pollution effects, FIsh physiology, Biochemistry, Laboratory tests, Rainbow trout, Salmon, Juvenile fish, *Industrial wastes, *Pulp wastes, *Pulp and paper industries, Methodology, Aquaria, Lethal limit.
Identifiers: *Coho salmon, *Blood sugar levels, *Glucose, *Pulpmill effluent, *Blood sugar bioassay, *Bleached kraft mill effluent, Glucose levels, Liver glycogen reserves.

The hyperglycemic stress response of fish was evaluated for use as a rapid test for assessing stressful levels of pulpmill effluents (BKME). Plasma glucose levels in juvenile coho salmon (Oncorhynchus kisutch) were elevated within 0.5 h following transfer from the holding tank to aquaria containing either fresh water or BKME, peaking at 3-6 h and returning to near-basal levels at 24 h. Acclimation of coho to aquaria for 24, 48, 72, or 96 h prior to addition of effluent resulted in marked increases in glucose levels attributable to BKME. Significant responses to effluent were found with exposures of 3-10 h, whereas levels were not increased with exposures of 2 h or less. Plasma glucose levels increased progressively with increasing effluent concentrations. Threshold effect (EC50) values varied from 0.04 to 0.16 of the 96-h LC50 values. The response to BKME treated previously by the activated sludge process or by foam separation was diminished or absent altogether. Juvenile rainbow trout (Salmo gairdneri) and coho displayed a hyperglycemic response with 4-, 6-, or 8-h exposure to an identical effluent concentration, although the magnitude of response of rainbow was less in each instance. (Katz)
W77-08779

ACID MINE DRAINAGE (AMD) AND ITS IMPACT ON A SMALL VIRGINIA STREAM,
Virginia Polytechnic Inst. State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W77-08784

EFFECTS OF SUBLETHAL CONCENTRATIONS OF THE HERBICIDE ATRAZIN ON GROWTH AND REPRODUCTION OF DAPHNIA PULEX,
Freiburg Univ. (West Germany). Limnologisches Institut.
For primary bibliographic entry see Field 5C.
W77-08786

THE USE OF ION EXCHANGE METHODS TO DETERMINE TRACE ELEMENTS IN NATURAL WATERS: IV. URANIUM, COBALT AND CADMIUM, (IN GERMAN),
Vienna Univ. (Austria). Analytisches Institut.
J. Korkisch, and L. Goedl.
Talanta. 21(10), p 1035-1046, 1974.

Descriptors: *Ion exchange, *Trace elements, *Surface waters, *Anion exchange, *Separation techniques, *Cobalt, *Cadmium, Spectrophotometry, Analytical techniques, Water chemistry, Resins, Fluorometry, *Pollutant identification.
Identifiers: Austria, *Uranium.

A method is described for separating and determining by spectrofluorimetric or spectrophotometric measurement, traces of U, Co and Cd at ppm levels in natural waters. The sample is acidified with HCl, filtered, and after addition of ascorbic acid and potassium thiocyanate, passed through a column of Dowex 1- x 8 anion-ex-change resin in the thiocyanate form. The 3 ions are concentrated on the resin as thiocyanate complexes, being at the same time separated from most of the other ions present in the sample. Elution with a tetrahydrofuran-methylglycol-HCl mixture removes other interfering ions, then 6M HCl strips the Co, 1M HCl the U, and 2M HNO3 the Cd. Data are presented for concentrations of U (0.01-5 ppm), Co(0.04-1.9 ppm) and Cd (0.04-0.06 ppm) in a large number of water sources in Austria. (See also W76-07410, W76-07409 and W76-07408)--Copyright (c) 1975, Biological Abstracts, Inc.
W77-08787

A COMPARISON OF METHODS OF HYDROCARBON ANALYSIS OF MARINE BIOTA,
Alaska Univ., College. Inst. of Marine Science.
R. L. Gritz, and D. G. Shaw.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 4, p. 408-415, April 1977. 4 tab., 8 ref.

Descriptors: *Methodology, *Analytical techniques, *Pollutant identification, *Chemical analysis, *Organic compounds, *Biota, Chromatography, Laboratory tests, Testing procedures, Marine life.
Identifiers: *Soxhlet extraction, *Saponification.

The efficiency of currently used methods of hydrocarbon analysis are compared. Butter calm (Saxidomus gigantea) was used for the analysis in its natural state and spiked with a mixture of aliphatic and aromatic hydrocarbons. The methods that were compared were Soxhlet Extraction followed by saponification and extraction by alkaline digestion (direct saponification). For the latter extraction procedure, the effectiveness of two and 24 hour reaction times was compared. Each of the extracts was subjected to column chromatography using fully activated and partially deactivated sorbents. The best test procedures was found to be 24 hour saponification and column chromatography on partially deactivated columns. Soxhlet extraction and direct two hour saponification failed to remove all of the esters. The partially deactivated column was preferred because it prevented the possibility of alkene isomerization. (Katz)
W77-08789

A CERTAIN MARINE CATENATE DINOFLAGELLATE TENTATIVELY APPLIED FOR DETECTING CARCINOGENS,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
S. Ishio, J. C. Chen, and T. YAno.
Bulletin of the Japanese Society Scientific Fisheries Vol. 43, No. 3, p. 277-288, 1977 9 fig., 26 ref.

Descriptors: *Algae, Phytoplankton, *Marine algae, Marine plants, *Biochemistry, Bioassay, Laboratory tests, Methodology, *Algicides, Nutrients, Pathology, Public health, Bioindicators, Pollutant identification.
Identifiers: *Carcinogens, Marine catenate dinoflagellates, *Polykrikos, Carcinogen detector, *Gyrodinium.

A marine catenate dinoflagellate having been tentatively applied for detecting carcinogens has been regarded to be Polykrikos schwartzi Butschli. However, this species does not belong to the genus Polykrikos for reasons that is devoid of both syncytium cell structure and nematocysts, but possesses both chloroplasts and phagocytes. This dinoflagellate is now concluded to belong to the genus Gyrodinium from the theca having both blisters and cortical vesicles, plastids very similar to those of Gyrodinium cohnii and the girdle displacement of 0.23 clearly exceeding the upper limit of that of Gymnodinium. (Katz)
W77-08795

METHOXYCHLOR RESIDUE STUDIES IN CAGED AND WILD FISH FROM THE ATHABASCA RIVER, ALBERTA, FOLLOWING A SINGLE APPLICATION OF BLACKFLY LARVICIDE,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W77-08797

EXPERIMENTAL STUDY OF MULTI-CATION DIFFUSION IN AN ARTIFICAL QUARTZ SANDSTONE,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-08811

ELECTROCHEMICAL DETERMINATIONS OF TRACE QUANTITIES OF PHOSPHATE AND NITRATE,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
Gary L. Lundquist.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 898, Price codes: A07 in paper copy, A01 in microfiche. PhD Thesis, July 1975. 112 p, 27 fig, 7 tab, 78 ref. OWRT A-041-ILL(4). 14-31-0001-3213.

Descriptors: *Phosphates, *Nitrates, Trace elements, *Electrodes, Electrochemistry, *Volumetric analysis, *Membranes, *Pollutant identification, Cation exchange, Analytical techniques.
Identifiers: *Electrochemistrical stripping.

A method for the determination of phosphate based upon the cathodic chronopotentiometric stripping of an electrochemically deposited cupric phosphate salt film from a copper electrode has been developed. The oxidation state of copper in the salt film was determined by constant current coulometry at a copper-coated platinum electrode. The relative solubilities of the HPO42- and H2PO4- salts were investigated by short-time scale cyclic chronopotentiometry at pH 6.0. Linear working curves over single orders-of-magnitude down to 20 ppb phosphate have been obtained. The cathodic stripping determination of phosphate at a mercury electrode was also evaluated. A method for the determination of trace quantities of nitrate was successfully developed. The determination is based upon the voltammetric reduction of nitrate in the presence of excess lanthanum at a stationary mercury drop electrode. Working curves are linear over two orders-of-magnitude with a detection limit of 60 ppb nitrate. When the method is used in conjunction with a small volume anion exchange membrane isolated cell, the detection limit is lowered to 6.2 ppb. The effect of contact time and volume of a 1.0 x 10-6M NO3- solution was also determined. The effect of sample ionic strength on the rate of transfer of NO3-

through the membrane was studied by adding various concentrations of KCl to the samples. (Cox-Illinois)
W77-08817

THE USE AND MISUSE OF PURE WATER PVT PROPERTIES FOR LAKE WATERS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2H.
W77-08840

SOURCES OF TAR POLLUTION ON ISRAELI MEDITERRANEAN COAST,
Israel Petroleum Inst., Tel-Aviv.
For primary bibliographic entry see Field 5B.
W77-08852

SYSTEMATIC IDENTIFICATION OF DO-BOD MODEL STRUCTURE,
Cambridge Univ. (England). Control Div.
For primary bibliographic entry see Field 5B.
W77-08866

EFFECTS OF TEMPERATURE AND KELTHANE ON GRASS SHRIMP,
California Univ., Davis. Water Science and Engineering Section.
For primary bibliographic entry see Field 5C.
W77-08874

MOLYBDENUM CONTENT IN THE SUBSURFACE WATERS OF THE VINNITSA OBLAST, (IN RUSSIAN),
Vinnitskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 2K.
W77-08882

IDENTIFICATION OF WEATHERED OIL FILMS FOUND IN THE MARINE ENVIRONMENT,
Exxon Research and Engineering Co., Linden, N. J. Governmental Research Lab.
J. W. Frankenfeld, and W. Schulz.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 883, Price codes: A10 in paper copy, A01 in microfiche. U.S. Coast Guard Research and Development Report No. CG-D-107-75, June 1974. 206 p, 107 fig, 23 tab, 37 ref, 5 append. DOT-CG-23035.

Descriptors: *Oil pollution, *Oil spills, *Water pollution sources, *Pollutant identification, Environmental effects, Analytical techniques, Chromatography.
Identifiers: *Outer Continental Shelf.

A study was undertaken to develop a rapid, efficient method for identifying the source of spilled oil. Fifty-seven different petroleum products were weathered under controlled conditions in laboratory simulators. Samples were taken periodically and examined by a variety of analytical techniques. The analytical methods were graded on their abilities to classify petroleum products as to generic type and to identify the actural source of the spilled oil. Four types of analyses were identified as being especially useful: thin-layer chromatography, infrared fingerprinting, gas chromatographic fingerprinting and liquid-liquid chromatography. The application of these techniques is discussed in detail and examples are given. By use of a combination of these four techniques all oils studied in this project could be uniquely identified. (Sinha-OEIS)
W77-08901

TESTING OF A TECHNIQUE FOR REMOTELY MEASURING WATER SALINITY IN AN ESTUARINE ENVIRONMENT,
National Aeronautics and Space Administration, Bay Saint Louis, Mo. Earth Resources Lab.
For primary bibliographic entry see Field 2L.
W77-08903

N2 : AR, NITRIFICATION AND DENITRIFICATION IN SOUTHERN CALIFORNIA BORDERLAND BASIN SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
R. O. Barnes, K. K. Bertine, and E. D. Goldberg.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-023 364, Price codes: A02 in paper copy, A01 in microfiche. Reprint, April 1976. Reprinted from: Limnology and Oceanography, Vol 20, No 6, p 962-970, November 1975. 2 fig, 3 tab, 23 ref. N00014-69-A-200-6049.

Descriptors: *Nitrogen compounds, *Argon, *Sediment-water interfaces, *Resources development, *Baseline studies, *Environmental effects, *Nitrification, *Denitrification, Geochemistry, *California.
Identifiers: *Outer Continental Shelf, Molecular nitrogen, Sulfate reduction, Interstitial water, Southern California.

The first quantitative observations of dissolved molecular nitrogen (N2) in deep-sea sedimentary pore waters show increases of up to 17% above adjacent bottom water values. The N2 : Ar concentration ratio similarly increases. This increase is greater than expected from reduction of seawater nitrate in the sediment. A mechanism is suggested in which ammonia, derived from nitrogen-containing organic matter is converted to N2 through a nitrite intermediate under conditions of low oxygen tension. Ammonia is not converted to N2 in anoxic sediments that are undergoing sulfate reduction even though N2 is the thermodynamically stable species. (Sinha-OEIS)
W77-08907

AGENTS, METHODS AND DEVICES FOR AMELIORATION OF DISCHARGES OF HAZARDOUS CHEMICALS ON WATER,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5G.
W77-08910

BENTHIC MACROINVERTEBRATES AS INDEXES OF WATER QUALITY IN THE SCIOTO RIVER BASIN, OHIO,
Akron University, Akron, Ohio, Department of Biology.
J. H. Olive, and K. R. Smith.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-269 013, Price codes: A07 in paper copy, A01 in microfiche. Bulletin of the Ohio Biological Survey, New Series, Vol 5, No. 2, 1975. 124 p, 20 fig, 23 tab, 53 ref. OWRT B-008-OHIO(2).

Descriptors: *Benthos, *Invertebrates, *Bioindicators, *Ohio, Water quality, Water pollution, *Pollutant identification, Biological communities, Chlorides, Water temperature, Dissolved oxygen, Phosphates, Sulfates, Hardness(Water), Hydrogen ion concentration, *Organic wastes, Sediments.
Identifiers: *Scioto River basin(Ohio).

The results are presented of an evaluation of water quality in the Scioto River system based on the composition and structure of benthic macroinvertebrates communities. Benthic macroinvertebrates from natural substrates were analyzed at 76 locations on the main river channel and on major tributaries during 1967, 1968, and 1969. Water temperature and the concentration of total alkalinity, chloride, total hardness, dissolved oxygen, total inorganic phosphate, sulfate, and hydrogen ions (pH) were determined at each location. Inadequately treated and untreated organic wastes from municipal sewage treatment facilities and sediments from eroding soils were the most common pollutants in the Scioto River Basin. Benthic invertebrate communities were indicative of relatively high quality water at 26 locations; of moderately polluted water at 38 locations; and of heavily polluted water at 12 locations. In heavily polluted areas benthic invertebrate communities usually consisted of more than 80 percent organic pollution-tolerant organisms and had H' values less than 1.0. At least one high-quality area was observed on each stream investigated, usually in the headwater region. The most heavily polluted areas in the Scioto River basin were located below Marion on the Little Scioto River, throughout most of Little Walnut Creek, in mostsections of the Scioto River between Columbus and Portsmouth, and in the north Scioto River just below the mouth of the Little Scioto River.
W77-08925

MINIMUM OXYGEN LEVELS SURVIVED BY STREAM INVERTEBRATES,
Virginia Commission of Game and Inland Fisheries, (Richmond).
For primary bibliographic entry see Field 5C.
W77-08926

CHARACTERIZATION OF URBAN RUNOFF IN GREENFIELD, MASSACHUSETTS--PHASE I,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08939

FREQUENCY OF ORGANIC COMPOUNDS IDENTIFIED IN WATER,
Environmental Research Lab., Athens, Ga.
W. M. Shackelford, and L. H. Keith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 470, Price codes: A99 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Monitoring Series, EPA-600/4-76-062, Dec. 1976. 617 p, 6 tab, 5 ref.

Descriptors: *Organic compounds, *Organic wastes, Organic pesticides, *Industrial wastes, Industrial water, *Water pollution sources, Path of pollutants, Analytical methods, Laboratory tests, Methodology, Frequency analysis, *Water quality, Geographical regions, Chemical wastes, *Data collections, *Data storage and retrieval, *Pollutant identification.
Identifiers: Contaminants, *Chemical compounds, Geographical distribution, Computerized list, *Frequency of occurrence(Wastes).

This study was initiated for the purpose of compiling a list of all organic compounds that have been found in water. This report contains the names of compounds found, their location or a reference to a published study, the type of water in which they are found, and the date of sampling or report generation. About 5700 entries are in this list at present. Among them are 1259 different compounds that have been found in one or more of 33 different water types. Tables in the text include lists of the data file sorted by compound name, location or reference, and water type. Also included are tables that summarize the frequency of occurrence of each compound, location or reference, and water type. No attempt has been made to include data from studies that include only analysis for specific compounds. The list is meant to include, however, all survey-type analyses of water samples. (Katz)
W77-08944

Group 5A—Identification Of Pollutants

A FLUORESCENCE IMMUNOASSAY TECHNIQUE FOR DETECTING ORGANIC ENVIRONMENTAL CONTAMINANTS,
IRT Corp., San Diego, Calif.
H. R. Lukens, C. B. Williams, S. A. Levison, W. B. Dandliker, and D. Muryama.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 397, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Health Effects Research Series, Report EPA 650/1-75/004, May 1975. 61 p, 1 tab, 8 fig, 13 ref.

Descriptors: *Methodology, Laboratory techniques, *Laboratory analysis, *Organic compounds, *Public health environmental control, *Pollutant identification, Fungicides, Bioassay, Organic wastes, *Fluorescence.
Identifiers: Polarization, *Immunoassay, *Organic contaminants, 2-aminobenzimidazole, *Benzimidazole, Fluorescein.

This report describes the development and successful demonstration of an immunological assay for the detection of low molecular weight organic contaminants of environmental concern. The specific technique described is a fluorescence polarization immunoassay, the theory of which is presented. The preparation of the two required reagents, namely a fluorescent conjugate of the contaminant of interest, together with an antibody to the contaminant, is described in detail. The specific contaminant chosen for this study was 2-aminobenzimidazole (MW = 133), a metabolite of certain fungicide agents used in agriculture. The particular fluorescent mostly chosen to form the conjugate with the 2-aminobenzimidazole was fluorescein. A successful demonstration of the assay has been accomplished, and a detection sensitivity in the sub-nanogram/ml range obtained. A high degree of specificity of the antibody for the hapten has been demonstrated, and a successful quantitative recovery from an unknown solution has been obtained. (Katz)
W77-08947

TOXICITY OF FOUR PESTICIDES TO WATER FLEAS AND FATHEAD MINNOWS,
EG and G, Bionomics, Wareham, Mass.
For primary bibliographic entry see Field 5C.
W77-08948

NPDES PERMITS AND WATER ANALYSES.
QLM Labs., Inc., Nyack, N. Y.
For primary bibliographic entry see Field 5G.
W77-08953

CHEMICAL CHARACTER OF HEADWATER STREAMS IN VERMONT AND NEW HAMPSHIRE,
Dartmouth Coll., Hanover, N.H.
For primary bibliographic entry see Field 2K.
W77-09027

TRANSJOEN, A GROUNDWATER INFLUENCED LAKE WITH SPECIAL REDOX AND SULPHATE CONDITIONS,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 2H.
W77-09031

A COMPARATIVE STUDY OF ORGANIC CARBON AND NUTRIENTS IN LAKE SEDIMENT,
Washington State Univ., Pullman. Dept. of Environmental Science.
D. E. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 108, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 61 p, 16 fig, 7 tab, 28 ref, 2 append. OWRT C-4145-(No. 9060)(2).

Descriptors: *Washington, *Idaho, Sediments, *Lakes, *Lake sediments, Carbon, Phosphorus, Manganese, Nitrogen, Pollutant identification, Water pollution.
Identifiers: Total organic carbon, Nitrate nitrogen, Silver Lake, Coeur d'Alene Lake, Liberty Lake, Williams Lake, Capital Lake.

Sediment cores were obtained from Coeur d'Alene, Liberty, Williams, Silver and Capital Lakes in the Washington-Idaho region. A procedure was developed to analyze the total organic carbon (TOC) of sediment using the Oceanographic International Corporation (OIC) carbon analyzer. Suitable computer techniques were employed to determine the non-linear standard curves and interpolation of TOC values. Experiments involving changes in reagent amounts, purging times, and oxidation times showed the newly developed procedure for determining TOC in sediment to be valid. Total phosphorus (T-P), manganese (Mn), and nitrate nitrogen (NO3-N) concentrations of these same sediments were analyzed and compared. No clear cut distribution patterns in chemical data were found among the lakes' sediments. Total organic carbon values were highest in Liberty Lake sediments. Total phosphorus, Mn, and NO3-N values were highest in Coeur d'Alene Lake sediments. In fact, TOC and T-P measurements in this investigation do not appear to be a precise indicator of a lake's tropic status. Manganese has been found to be a controlling factor in phosphorus sedimentation in other studies. However, this did not appear to be the case in this investigation.
W77-09065

LIMNOLOGICAL INVESTIGATION OF SIX LAKES IN SOUTHEAST ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.; and Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 7C.
W77-09069

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1975.
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09074

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1975.
Geological Survey, Bismarck, N. Dak. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09075

GROUND-WATER HYDROLOGY OF BERKELEY COUNTY, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09083

ANALYSES OF NATIVE WATER, BED MATERIAL, AND ELUTRIATE SAMPLES OF MAJOR LOUISIANA WATER WATERWAYS, 1975,
Geological Survey, Baton Rouge, La. Water Resources Div.
C. R. Demas.
Open-file report 76-853, December 1976. 304 p, 15 plates, 15 tab, 6 ref.

Descriptors: *Environmental effects, *Dredging, *Navigable waters, *Louisiana, Sampling, Water analysis, Bottom sediments, Chemical analysis, Metals, Pesticides, Nutrients, Organic compounds, Evaluation, Path of pollutants.
Identifiers: *Elutriate.

The U.S. Geological Survey, in cooperation with the U.S. Army Corps of Engineers, conducted a series of elutriate studies in selected reaches of major navigable waterways of Louisiana. As defined by the U.S. Environmental Protection Agency, an elutriate is the supernatant resulting from the vigorous 30-minute shaking of one part bottom sediment from the dredging site with four parts water (vol/vol) collected from the dredging site followed by one hour settling time and appropriate centrifugation and a 0.45-micron filtration. The elutriate studies were initiated to evaluate possible environmental effects of proposed dredging activities in selected reaches of Louisiana waterways. The waterways investigated were the Mississippi River-Gulf Outlet, Breton Sound, Mississippi River downstream from Baton Rouge, Bayou Long, Intracoastal Waterway (east and west of the Harvey Canal), Three Rivers area, Ouachita River, Barataria Bay, Houma Navigation Canal, Atchafalaya Bay (Ship Channel), Berwick Bay, Intracoastal Waterway (Port Allen to Morgan City), Petite Anse area, and Calcasieu River and Ship Channel. The Geological Survey collected 227 samples of native water and bed (bottom) material from 130 different sites. These samples (as well as elutriates prepared from mixtures of native water and bed material) were analyzed for selected metal, pesticide, nutrient, and organic constituents. An additional 116 bed samples collected at 58 sites were analyzed for selected pesticides; and 4 additional native-water samples from 2 sites were analyzed for selected metal pesticide, nutrient, and organic constituents. (Woodard-USGS)
W77-09084

PRELIMINARY STUDY OF WASTEWATER MOVEMENT IN AND NEAR GRAND TETON NATIONAL PARK, WYOMING, THROUGH OCTOBER 1976,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-09087

WILLIMANTIC RIVER ORGANISMS GROWN IN MEDIA WITH NATURAL SUBSTRATE LEVELS AS INOCULA FOR ALGAL ASSAYS,
Connecticut Univ., Storrs, Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W77-09091

EFFECTS OF PRIMARY SEWAGE EFFLUENT FROM THE CITY OF WILLIMANTIC ON THE BENTHIC INVERTEBRATE FAUNA OF THE WILLIMANTIC/SHETUCKET RIVERS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5C.
W77-09093

REAL-TIME MEASUREMENTS OF AQUATIC NITROGEN,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5D.
W77-09095

THE EFFECT OF SECONDARILY TREATED SEWAGE ON THE ALGAL POPULATIONS OF THE WILLIMANTIC/SHETUCKET RIVERS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5C.
W77-09096

5B. Sources Of Pollution

QUANTITATIVE AND QUALITATIVE IMPLICATIONS OF URBAN STORM RUNOFF ABATEMENT MEASURES,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.

or primary bibliographic entry see Field 5G.
/77-08602

ITROGEN REMOVAL FROM SECONDARY FFLUENT BY A LABORATORY SOIL OLUMN,
lawaii Univ., Honolulu. Water Resources esearch Center.
. L. Dugan, P. C. Ekern, and R. T. Tsutsui.
vailable from the National Technical Informaon Service, Springfield, VA 22161 as PB-268 773, rice codes: A03 in paper copy, A01 in microfiche. echnical Report No 102, August 1976. 25 p, 7 fig, tab, 30 ref, 3 append. OWRT A-048-HI(1). 14-31-001-5011.

escriptors: *Nitrogen, Denitrification, Percolation, Effluents, *Hawaii, Waste disposal, oils, Path of pollutants, Water pollution sources. dentifiers: *Land disposal, Latosol, *Oxisol.

he objective was the investigation of the percote rate and the disposition of nitrogen from a aboratory soil column when chlorinated secondary sewage effluent was applied under both connuous and intermittent loading. A 1.7-m (5.5-in.) iameter column was packed to a depth of 1.5 m (5) with a well-aggregated Oxisol soil (Lahaina seies). A constant head was maintained by a odified Mariotte bottle during the application of ffluent. Percolate was sampled through ports at 7 epths as well as from a bottom drain. When effluent was continuously ponded on the surface: (1) ercolate rate decreased with time, (2) ammonium ons were adsorbed, (3) nitrification was supressed, (4) denitrification occurred, and (5) the enitrification biological community required nore than 2 days to develop. When effluent applcation was stopped after 2 days and aerobic condiions developed, nitrification was very active vithin 5 days. The solute breakthrough curve apeared well in advance of 1 pore volume and was ighly skewed with an extended tail.
/77-08607

HYDROLOGY OF THREE RECREATIONAL LAKES IN EASTERN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Civil nd Environmental Engineering.
H. D. Copp.
Available from the National Technical Informaion Service, Springfield, VA 22161 as PB-268 799, Price codes: A03 in paper copy, A01 in microfiche. Progress Report, July 1, 1975. 22 p, 10 fig, 8 tab. OWRT A-067-WASH(1). 14-31-0001-5048.

Descriptors: *Evaporation, Nutrients, *Water balance, Eutrophication, Hydrology, *Lakes, *Washington, Recreation, *Water pollution sources, Lake basins, Watersheds(Basins).
Identifiers: *Non-point source pollution, *Newman Lake Basin(Wash), *Liberty Lake Basin(Wash), *Williams Lake Basin(Wash).

Data were collected over a complete water year (October 1 to September 30). The objective was to assess the water resources of three rather small, freshwater lake basins in eastern Washington State. Each lake provides a source of water-oriented recreation, particularly during the summer season. Land occupation consists of forest cover, range lands, ranching, and resident living. Most of the latter occurs as summer homes on and near the lake shores. Most of the occupation generates water-borne waste which could find its way into the lakes either directly or via surface and subsurface streamflow. Assessment of the water resources may lead to the identification of water pollution sources. (McHenzie-Wash State)
W77-08608

BITUMINOID FORMATION IN THE MUD SEDIMENTS OF DOMESTIC SEWAGE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.

For primary bibliographic entry see Field 5A.
W77-08618

CARBON ISOTOPIC STUDY OF THE FATE OF LANDFILL LEACHATE IN GROUNDWATER,
Indiana Univ., Bloomington. Dept. of Chemistry.
L. M. Games, and J. M. Hayes.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 668-677, April, 1977. 7 fig, 6 tab, 22 ref.

Descriptors: *Water pollution sources, *Carbon, *Landfills, Municipal wastes, Waste disposal, Groundwater movement, Organic compounds, Leachate, Inorganic compounds, Water analysis, Path of pollutants, Indiana, *Isotope studies.
Identifiers: Isotope ratio measurements, Columbus(Ind).

Carbon is present in ground water in various forms and amounts, and sanitary landfills represent an important unnatural input of carbon to nearby aquifers. Little is known, however, about the movement of carbon in ground water or the extent of its interactions of a biological or physical nature over time. In this study, comparisons of carbon isotope ratios were used to analyze ground water entering the Columbus, Indiana landfill site, the landfill leachate, and ground water leaving the landfill area. Water taken from six wells was analyzed for concentrations of volatile organic carbon, nonvolatile organic carbon, and inorganic carbon. The findings emphasized the need to study more than one type of carbon compound when assessing the chemical effects of unnatural carbon inputs, and that a long period of observation is necessary to fully picture reactions taking place between natural and contaminant ground water carbon. It was concluded that the Columbus landfill did not significantly affect the bulk carbon content of the underlying aquifer, although contamination by trace amounts of highly toxic materials is still a theoretical possibility. The isotopic investigation method in and of itself was judged very useful for this and similar studies. (Eberle-NWWA)
W77-08670

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
For primary bibliographic entry see Field 2K.
W77-08677

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, (LES PROBLEMES THERMIQUES ET CHIMIQUES DES EAUX THERMALES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
H. J. Schoeller.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 1-5, 5 ref.

Descriptors: *Reviews, *Thermal pollution, Heated water, Chemistry, Temperature, Research and development, Thermal water, Water pollution, Water chemistry.

This paper presents an overview of the existing problems of thermal waters. Aspects considered include the source of temperature and chemical composition; geological factors; status of present knowledge and methods of research. (See also W77-08677) (Chilton-ORNL)
W77-08678

SOME FEATURES OF THE GEOCHEMISTRY OF THERMAL WATER IN PLATFORM AREAS FROM EXPERIMENTAL DATA,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
I. G. Kissin, and S. I. Pakhomov.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 7-15, 3 fig, 1 tab, 4 ref.

Descriptors: *Geochemistry, Hydrology, *Thermal pollution, Heated water, Sea water, Temperature, Chemical activity, Thermodynamics, *Thermal water, Water pollution.

Rocks classified as clayey, sandy, carbonate and cristalline were leached with distilled water, sea water, sodium and calcium NaCl solutions at temperatures ranging from 20-250C. At high temperatures, data showed a decrease in pH values and potassium content and an increase in silic-acid and boric-acid contents. Calcium sulfate and carbonate content and the composition of rocks affected temperature metamorphization of water with gypsum bearing rocks causing sharpest variations. At high temperatures, metamorphization of sea water in contact with carbonate rocks resulted in a sharp decrease in sulfate and Mg ion concentration. Free CO2, liberated by hydrolysis, caused an increase in chemical activity of thermal water. (See also W77-08677) (Chilton-ORNL)
W77-08679

THE HELIUM ISOTOPES IN THERMAL FLUIDS,
Akademiya Nauk SSR, Moscow. Geologicheskii Institut.
B. G. Polak, V. I. Kononov, I. N. Tolstikhin, B. Mamyrin, and L. V. Khabarin.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 17-33, 5 fig, 3 tab, 12 ref.

Descriptors: *Geochemistry, Hydrology, Heated water, *Helium, *Isotope studies, *Thermal water, Tracers.

The study compares the isotopic composition of helium from thermal fluids discharged in tectonically mobile belts of the earth where there are favorable conditions for the outflow of abyssal matter and energy from the interior onto the earth's surface. It was concluded that there is no direct connection between He3/He4 values and the general gas composition of thermal fluids. It appeared that helium with the mantle isotopic composition and the main components of hydrothermae gas are formed at different levels, helium being supplied from the deepest interiors. (See also W77-08677) (Chilton-ORNL)
W77-08680

HYDROTHERMAL PROCESSES IN THE ATLANTIC OCEAN CRUST, 26 DEGREES N,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-08681

THE CONTENT OF SILICA IN HOT MINERAL WATERS OF FRANCE IN RELATION TO TEMPERATURE, SODIUM CONTENT AND BICARBONATES (LA TENEUR EN SILICE DES EAUX THERMOMINERALES DE FRANCE EN RELATION AVEC LA TEMPERATURE, LA TENEUR EN SODIUM ET EN BICARBONATES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
For primary bibliographic entry see Field 2K.
W77-08686

SOME GEOCHEMICAL PROBLEMS IN THE UTILIZATION OF GEOTHERMAL WATERS,
Department of Scientific and Industrial Research, Wellington (New Zealand). Chemistry Div.
A. J. Ellis.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium August/September, 1975. p 100-109, 5 tab, 2 fig, 15 ref.

Descriptors: *Geothermal studies, Environmental effects, Salinity, *Heated water, Temperature, Silica, Chemistry, Water utilization, Thermal water, Reviews.

Recent research on the disposal of geothermal waters is reviewed. The environmental effects of geothermal discharges as they relate to vegetation damage or contamination of local waterways is emphasizes. The particular problems encountered by the chemistry of silica in solution, its polymerization and precipitation processes are discussed, including the development of a pilot-scale process to remove silica from geothermal waters. (See also W77-08677) (Chilton-ORNL)
W77-08687

STUDY OF THE CHEMICAL AND GASEOUS COMPOSITION OF THERMAL WATERS OF THE EASTERN PART OF THE PANNONIAN DEPRESSION (CONSIDERATIONS SUR LA COMPOSITION CHIMIQUE ET GAZEUSE DES EAUX THERMALES DE LA PARTIE ORIENTALE DE LA DEPRESSION PANNONIQUE (ROUMANIE)),
Institutul de Geologie si Geofizica, Bucharest (Rumania).
For primary bibliographic entry see Field 2K.
W77-08688

RESULTS OF A MICROBIOLOGICAL INVESTIGATION OF THE DANUBE RIVER BY ONE POINT PROFILE (1969-1971), (IN GERMAN),
I. Daubner, and B. Trzilova.
Biologia (Bratisl). 28(9), p 775-781, 1973.

Descriptors: *Rivers, *Aquatic bacteria, *E coli, *Aquatic microorganisms, *Water pollution sources, Microorganisms, Plankton, River flow, Sugar crops, Organic wastes.
Identifiers: *Austria, *Czechoslovakia, *Danube River, Heterotrophic bacteria, Fecal pollution.

In comparison with previous years, no substantial changes were noticed either in the number or in the dynamics of microbical plankton taken as a whole or in the individual components. The number of bacteria is inversely proportional to the flow/s, which points to the mountainous character of the river (diluted pollution). The increase in the number of heterotrophic bacteria is considerably influenced by the sugar-production season in Austria and Moravia (Czechoslovakia) (Sept.-Dec.), but the microbial plankton, taken as a whole, is not affected. During the whole period of investigation (1961-1971) there was a gradual decrease of Escherichia coli (principal fecal pollution indicator species) from 46.5% to 29.7%; atypical strains gradually increased in the same period from 4.6% to 38.2%. This phenomenon probably reflects the increased pollution, particularly with specific toxic substances.--Copyright 1974, Biological Abstracts, Inc.
W77-08694

ESTIMATION AND EVALUATION OF RADIOACTIVE CONTAMINATION THROUGH A FOOD WEB IN AN AQUATIC ECOSYSTEM: I. AN APPLICATION OF THE COMPARTMENT MODEL TO TRANSFER OF RADIOACTIVE SUBSTANCES THROUGH A FOOD CHAIN,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5C.
W77-08695

THE EFFECT OF SOIL MOISTURE ON THE DEVELOPMENT OF SOIL MICROFLORA IN CONDITIONS OF FIELD EXPERIMENTS, (IN SLOVAK),
Vyskumny Ustav Rastlinnej Vyroby, Piestany (Czechoslovakia).
L. Haban.
Ved Pr Vysk Ustavu Rastlinne J Vyroby Pi-estanoch. 11, p 27-34, 1973.

Descriptors: *Soil moisture, *Soil microorganisms, *Soil bacteria, Topsoil, Loam, Clay loam, Cultures.
Identifiers: Ammonifying bacteria, Amylolytic bacteria, Cellulose-decomposing, Bacteria, Pectinolytic bacteria, Amino acid-decomposing bacteria, Correlations, Czernosem.

Correlations between the soil moisture and the development of 6 cultured groups of microorganisms were investigated in field trial using different methods of increasing of topsoil on a degraded czernosem and loamy to clayey soils. A high significant correlation dependence was found between the number of bacteria and the soil moisture. A higher correlation dependence between the development of the cultured groups and the soil moisture was found, except for the cellulose decomposing bacteria, in the subsoil layer. The response of the individual cultured groups of bacteria varied with soil moisture conditions. Most susceptible were the cellulose decomposing microorganisms, pectinolytic bacteria and amino acid decomposing bacteria. Less susceptible were protein decomposing (ammonifying) bacteria and amylolytic bacteria. The correlation between humin matter decomposing bacteria and the soil moisture was insignificant.--Copyright 1974, Biological Abstracts, Inc.
W77-08696

THE ROLE OF METHYLMERCURY PRODUCTION IN THE TRANSFER OF MERCURY IN A SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W77-08697

THE BEHAVIOUR OF DISSOLVED IRON, MANGANESE AND ZINC IN THE BEAULIEU ESTUARY, S. ENGLAND,
University of East Anglia, Norwich (England). School of Environmental Sciences.
L. M. Holliday, and P. S. Liss.
Estuarine and Coastal Marine Science, Vol. 4, 1976, p 349-353, 3 fig, 10 ref.

Descriptors: Chemistry, Sea water, *Salinity, *Iron, *Manganese, *Zinc, Hydrogen ion concentration, Estuaries, *Dissolved solids, Water pollution sources.
Identifiers: Beaulieu Estuary(England).

The relationship between salinity and the concentration of dissolved iron, manganese, and zinc are reported. Rapid removal of iron as salinity increased was apparent. This removal is almost complete by the time the salinity of the estuarine water has reached 15%. A possible hypothesis to explain the removal mechanism is homogeneous precipitation of hydrous iron oxides formed as a result of change in pH associated with the mixing process. In contrast to the large scale removal observed for iron, any deviation from conservative behaviour for manganese and zinc were either small or non-existent. (Chilton-ORNL)
W77-08701

THE DISTRIBUTION OF TRACE METALS IN THE WESTERN NORTH ATLANTIC OFF NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
J. M. Bewers, B. Sundry, and P. A. Yeats.
Geochimica et Cosmochimica Acta, Vol. 40, No. 6, 1976, p 687-696, 9 fig, 5 tab, 26 ref.

Descriptors: *Water pollution sources, Pollutants, *Trace elements, Manganese, Iron, *North Atlantic, Sediments, Runoff, *Path of pollutants, *Distribution, *Canada, Metals.
Identifiers: Trace metals.

Significant differences between water mass trace element concentrations were found with the most striking feature of the distributions being that, with the exception of manganese, the Atlantic Slope water contained lower trace metal concentrations than the underlying Central Atlantic water. Concentrations of Fe and Mn extracted from suspended matter on the Scotian Shelf were higher than those in the non-detrital fraction of the underlying sediments. Mn showed major nearshore increases in concentration related to continental runoff but Fe concentrations are controlled by particulate matter distribution. For other trace elements, the effects of both continental runoff and anthropogenic activity appeared to be minor even a few miles from the coast. (Chilton-ORNL)
W77-08703

TRACE ELEMENT INVENTORY FOR THE NORTHERN CHESAPEAKE BAY WITH EMPHASIS ON THE INFLUENCE OF MAN,
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-08704

TRANSPORT OF MOLYBDENUM IN MOUNTAINOUS STREAMS, COLORADO,
Colorado Univ., Boulder. Dept. of Geological Sciences.
D. S. Kaback.
Geochimica et Cosmochimica Acta, Vol. 40, 1976, p 581-582, 2 tab, 1 ref.

Descriptors: *Water pollution effects, *Water pollution sources, Mine wastes, Metals, *Molybdenum, Streams, *Colorado, *Path of pollutants.

The study investigated the transport of Mo in river sediments and waters of Colorado with the principal area of interest being in the drainage below a large mining and milling operation. In most cases the molybdenum carried in water was largely in true solution but at certain times of the year the suspended load in samples taken near the mill showed 300-325 ppm (19% of the total load in the water at that time). (Chilton-ORNL)
W77-08705

AN ECOLOGICAL MODEL FOR HEAVY METAL CONTAMINATION OF CROPS AND GROUND WATER,
Royal Danish School of Pharmacy, Copenhagen.
S. E. Jorgensen.
Ecological Modelling, Vol. 2, 1976, p 59-67, 2 fig, 5 tab, 6 ref.

Descriptors: *Model studies, Ecology, Sludge, *Soil contamination, Pollutants, *Lead, *Groundwater, Crops, *Heavy metals, *Path of pollutants, Water pollution sources.

The model reported is able to predict the concentration of heavy metals in ground water and crops when sludge is added to the soil. Model prediction indicates that Pb is limiting the use of sludge as a soil conditioner and that crop contamination appears to be a greater danger than ground water contamination. It is indicated that municipal sludge can be used in considerable quantities without danger if soil has a high humus or clay content and the pH is maintained close to 7.00. It was concluded that, while the model has given acceptably good results, the number of case studies are limited and that the model should therefore be used cautiously. (Chilton-ORNL)
W77-08706

CLEARCUTTING IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 4C.
W77-08712

TIME-OF-TRAVEL STUDY, BLACK RIVER FROM LYONS FALLS TO DEXTER, NEW YORK,
Geological Survey, Albany, N. Y. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-08747

REACTIONS IN THE AQUEOUS ENVIRONMENT OF LOW MOLECULAR WEIGHT ORGANIC MOLECULES,
Geological Survey, Lakewood, Colo. Water Resources Div.
M. C. Goldberg.
The Science of the Total Environment, Vol 5, p 277-294, 1976: Elsevier Scientific Publishing Company, Amsterdam, Netherlands, 1976. 11 fig, 2 tab, 17 ref.

Descriptors: *Organic pesticides, *Aqueous solutions, *Bottom sediments, *Chlorinated hydrocarbon pesticides, *Herbicides, Sampling, Chemical analysis, Analytical techniques, Water pollution, Agricultural chemicals.
Identifiers: *Total organic concentrations.

The origin of small organic molecules in surface waters of the United States, for the most part, stems from industrial, urban and agricultural sources. Agricultural materials were examined, particularly the chlorinated pesticides and herbicides, to determine concentration ranges within which the characteristic interactions of these solutes could be defined. Chlorinated hydrocarbon concentrations of bottom sediments at selected locations ranged from 5 ng/kg (nanograms per kilograms) to 3.5 micrograms per kilograms, and in water from 5 ng/liter to 0.06 micrograms per liter. Herbicide concentrations in water ranged from 5 ng/liter to 1.5 micrograms per liter for the same samples. Total organic carbon concentrations at these locations ranged from less than 0.1 to 42 milligrams per liter. (Woodard-USGS)
W77-08754

FATE AND BIOLOGICAL EFFECTS OF MERCURY INTRODUCED INTO ARTIFICIAL STREAMS,
Savannash River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5C.
W77-08757

THE MICROBIAL DEGRADATION OF AROMATIC PETROLEUM PRODUCTS,
Texas Univ. at Austin. Dept. of Microbiology.
D. T. Gibson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 128, Price codes: A04 in paper copy, A01 in microfiche. Office of Naval Research, Washington, D.C., June, 1976. 51 p, 2 fig, 26 ref.

Descriptors: Bacteria, Biochemistry, *Biodegradation, *Oil, *Oil spills, Oily water, Laboratory tests, *Phenols, Enzymes, Hydrogen ion concentration, Organic compounds, *Aromatic compounds, Physiology, *Oil wastes, *Oil pollution, *Microbial degradation.
Identifiers: *Ortho-xylene, *Nocardia, Enzymatic fission, Hydrolytic reaction, *Chlorobiphenyl, *Monochlorinated biphenyl isomers.

The biodegradation of ortho-xylene by a species of Nocardia is initiated by nuclear oxidation to form 3,4-dimethylcatechol. The latter compound is apparently formed from cis-3,4-dimethyl-3,5-cyclohexadien-1,2-diol (cis-o-xylene dihydrodiol). Enzymatic fission of 3,4-dimethylcatechol produces an acid, 2-hydroxy-5-methyl-6-oxohepta-2,4-dienoic acid, that undergoes spectral changes at acid and alkaline pH. Further metabolism of the ring-fission product occurs by a hydrolytic reaction that forms acetic and 2-oxohex-4-enoic acids. Enzymatic hydration of the latter compound to give 4-hydroxy-2-oxohexanoate is followed by an aldolase reaction that produces pyruvate and propionaldehyde. The pathway proposed for the biodegradation of o-xylene is analogous to those reported for the degradation of a number of aromatic compounds. Commercial samples of 2-, 3-, and 4-chlorobiphenyl contain impurities that cause lag periods in the growth of Beijerinckia on succinate. Purified preparations of these compounds also inhibited the initiation of growth of this organism but not to the same extent. Preliminary observations suggest that inhibition may be associated with the ease of oxidation of the monochlorinated biphenyl isomers. (Katz)
W77-08759

PHYTOPLANKTON STANDING CROP AND SEWAGE NUTRIENT ENRICHMENT ALONG THE CENTRAL COAST OF LEBANON,
American Univ., Beirut (Lebanon). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08762

FATE OF LABELED N-ALKANES IN THE BLUE CRAB AND STRIPPED MULLET,
University of Southern Mississippi, Hattiesburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08764

THE EFFECT OF THE IMPOUNDMENT OF LAKE KAINJI, NIGERIA, ON THE INDIGENOUS SPECIES OF MORMYRID FISHES,
Reading Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-08772

TOXICITY, ACCUMULATION, AND RELEASE OF THREE POLYCHLORINATED NAPHTHALENES (HALOWAX 1000, 1013, AND 1099) IN POSTLARVAL AND ADULT GRASS SHRIMP, PALAEMONETES PUGIO,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08773

STUDY ON THE POST-MORTEM IDENTIFICATION OF POLLUTANTS IN THE FISH KILLED BY WATER POLLUTION: DETECTION OF ARSENIC,
South Carolina State Coll., Orangeburg. Water Lab.
For primary bibliographic entry see Field 5A.
W77-08775

STUDIES ON MERCURY CONTENT IN SELECTED FISH SPECIES FROM POMERANIAN GULF AND SZCZECIN FIRTH (BADANIA NAD ZAWARTOSCIA RTECI OGOLNEJ W WYBRANYCH GATUNKACH RYB ZATOKI POMORSKIEJ I),
Institute of Marine Food Technology, Szczecin (Poland).
For primary bibliographic entry see Field 5C.
W77-08781

POLYCHLORINATED BIPHENYLS IN ADULT MAYFLIES (HEXAGENIA BILINEATA) FROM THE UPPER MISSISSIPPI RIVER,
Fish and Wildlife Service La. Crosse, Wis. Fish Pesticide Research Unit.
For primary bibliographic entry see Field 5C.
W77-08783

CONCENTRATIONS OF PCBS, DIELDRIN AND DDT RESIDUES IN MARINE ANIMALS FROM LIVERPOOL BAY,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08788

INCORPORATION OF BENZATHRONE INTO THE NUCLEI OF GYRODINIUM SP. AND THE HEREDITY OF CONSEQUENT MITOTIC DELAYS,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
For primary bibliographic entry see Field 5C.
W77-08796

SIMULATION OF POLLUTANT MOVEMENT IN GROUNDWATER AQUIFERS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
R. Khaleel, and D. L. Reddell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 835, Price codes: A12 in paper copy, A01 in microfiche. Texas Water Resources Institute, College Station, Technical Report No 81, September 1976. 248 p, 47 fig, 87 ref, 6 append. OWRT A-030-TEX(1). 14-31-0001-5044, 14-31-0001-6045.

Descriptors: Groundwater, *Groundwater movement, *Dispersion, *FLow, *Aquifers, *Path of pollutants, *Simulation analysis, *Model studies, Infiltration, Porous media, Equations.
Identifiers: Computer simulators, Numerical simulators.

A three-dimensional model describing the two-phase (air-water) fluid flow equations in an integrated saturated-unsaturated porous medium was developed. Also, a three-dimensional convective-dispersion equation describing the movement of a conservative, noninteracting tracer in a nonhomogeneous, anisotropic porous medium was developed. Finite difference forms of these two equations were solved using an implicit scheme to solve for water or air pressures, an explicit scheme to solve for water and air saturations, and the method of characteristics with a numerical tensor transofmration to solve the convective-dispersion equations. The inclusion of air as a second fluid phase caused the infiltration rate to decrease rapidly to a value well below the saturated hydraulic conductivity when the air became compressed. This is in contrast to one-phase fluid flow problems in which the saturated hydraulic conductivity is considered to be the lower bound for the infiltration rate. A typical two-dimensional drainage problem in agriculture was solved in a nonhomogeneous, integrated saturated-unsaturated medium using the total simulator of fluid flow and convective-dispersion equations. A variety of outputs, such as an equipotential map or a solute concentration map, were obtained at selected time steps. A field-size problem describing the migration of septic-tank wastes around the perimeter of a lake was also considered and solved using the total simulator. The unique features of this model are (1) infiltration was treated as a two-phase fluid (air-water) flow process, (2) the complete subsurface regime (saturated and unsaturated) was considered as a unified whole, (3) the nonhomogeneous nature of a porous media and a variety of realistic boundary conditions are considered and (4) the tensorial nature of the dispersion coefficients was recognized.
W77-08807

EVALUATION OF NITRIFICATION IN THE WATER COLUMN OF THE PASSAIC RIVER,
Rutgers - The State Univ., New Brunswick N. J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5C.
W77-08813

PRODUCTION AND HEAVY METAL CONCENTRATION OF VASCULAR AQUATIC MACROPHYTES IN THREE EASTERN CONNECTITUCT RIVERS,
Connecticut Univ., Storrs.

R. M. Heisey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 834, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 97 p, 11 fig, 20 tab, 124 ref. append. OWRT A-502-CONN(9), 4-31-0001-3507.

Descriptors: *Water pollution sources, Water pollution treatment, *Bioindicators, *Heavy metals, *Aquatic plants, *Productivity, Rivers, *Lead, *Copper, Industrial wastes, Municipal wastes, *Connecticut, *Absorption.
Identifiers: *Gasoline combustion fallout, *Human influence, Pontederia, Potamogeton, Connecticut rivers.

The purpose was to determine the extent of heavy metal uptake by aquatic angiosperms and to ascertain whether concentrations in plant tissues are useful indicators of the amounts of these metals present in the environment. Significant differences were found in the concentration of lead and copper in plants (Pontederia and Potamogeton) growing in three Connecticut rivers which are subject to differing degrees of human influence. In general, concentrations of copper and lead were higher in below-ground Pontederia section than in the shoots. Lead concentrations of Pontederia tops were roughly comparable to these of whole Potamogeton plants. Copper concentrations of submersed and floating-leaved plants were much higher than those in Pontederia tops. Copper concentrations reflected the presence of a printed circuit factory in one area; variation in lead concentrations indicated differences in the amount of aerial fallout from the combustion of leaded gasoline, the major source of lead in the study area. Metal concentrations of Potamogeton appear to more nearly reflect the occurrence of copper and lead in river water, as the bottom substrate probably mediates the effects of river water on Pontederia. (deLara - Conn)
W77-08814

MINERAL DISTRIBUTION WITHIN THE SEDIMENTS OF PEARL HARBOR,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2L.
W77-08815

MOVEMENT OF MANURIAL NITROGEN IN COOL, HUMID CLIMATES,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
M. F. Walter, G. D. Bubenzer, and J. C. Converse.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 832, Price codes: A02 in paper copy, A01 in microfiche. Reprint, Paper No 74-2018, Presented at 1974 Annual Meeting of American Society of Agricultural Engineers, Stillwater, Oklahoma, June 26-26, 1974. 21 p, 10 fig, 4 tab, 14 ref. OWRT B-076-WIS(4). 14-31-0001-3946.

Descriptors: Unsaturated flow, Liquid waste, Waste disposal, *Farm wastes, *Agricultural runoff, *Soil contamination, *Ammonia, *Nitrogen, Water pollution, Water quality, Model studies, *Wisconsin, *Nitrates, Distribution, Dairy industry, Soil water movement, Temperature, *Path of pollutants, Dispersion.

A model to predict vertical nitrate distribution in soil resulting from heavy land applications of anaerobic liquid dairy waste was developed. The model predicts net nitrogen transformations to nitrate as a function of temperature. Nitrate movement is based on predicted one-dimensional unsaturated flow and solute dispersion.
W77-08819

THE DESIGN OF A SYSTEM FOR COLLECTING LEACHATE FROM A LINED LANDFILL SITE,
Toronto Univ. (Ontario). Dept. of Geophysics.
For primary bibliographic entry see Field 5G.
W77-08827

SIMULATION OF TWO-DIMENSIONAL CONTAMINANT TRANSPORT WITH ISOPARAMETRIC HERMITIAN FINITE ELEMENTS,
Princeton Univ., N.J. Dept. of Civil Engineering.
M. T. van Genuchten, G. F. Pinder, and E. O. Frind.
Water Resources Research, Vol. 13, No. 2, p 451-458, April 1977. 10 fig, 11 ref. EPA R803827-01.

Descriptors: *Pollutants, *Soil contamination, *Model studies, *Mathematical models, Mathematical studies, Mathematics, Finite element analysis, *Path of pollutants, Dispersion, Infiltration, Analytical techniques, Data processing, Groundwater movement.

A deformed isoparametric Hermitian element can be used in the simulation of two-dimensional contaminant transport. The degree of freedom arising from the cross derivative may be eliminated in the Galerkin-type finite element formulation, reducing the computational effort per node. Two example problems demonstrated that the Hermitian element gives results which are comparable to those obtained with the zero-order continuous cubic element but requires 25-40% fewer degrees of freedom, depending on the geometrical description of the problem. (Sims-ISWS)
W77-08829

EFFECT OF THE BOUNDARY SURFACE BETWEEN SEA AND FRESH WATERS ON THE DISTRIBUTION OF DISSOLVED OXYGEN IN THE MOUTH REGION OF THE DNIEPER RIVER,
Ye. P. Kirillova.
Soviet Hydrology, Selected Papers, No. 4, p 227-228, 1975. 1 fig, 3 ref. Translated from Trudy Gosudarstvennogo Okeanograficheskogo Instituta, No. 118, p 31-34, 1974.

Descriptors: *Estuaries, *Dissolved oxygen, *Rivers, Lagoons, On-site investigations, Saline water-freshwater interfaces, Sea water, Freshwater, Spatial distribution, Runoff, Foreign countries, Foreign research, Sediments, Turbidity, Oxygen, Water quality, Water chemistry.
Identifiers: *Dnieper River, *USSR.

Dissolved oxygen is one of the most important hydrochemical elements for the existence of aquatic organisms and for the decomposition of organic substances in a body of water. Oxygen distribution in the mouth area of the Dnieper is determined mainly by hydrologic-hydrochemical conditions that depend on the Dniepter runoff. The spatial distribution of oxygen in the mouth area of the Dnieper River was determined by the position of the boundary surface and water transparency, which are directly related to the freshwater runoff of the river. The largest zones with a high oxygen deficit form most frequently in summer, when the slopes of the boundary between fresh and salt waters are small. (Sims-ISWS)
W77-08832

DENSITY CURRENTS AND THEIR APPLICATIONS,
Catholic Univ. of America, Washington, D. C. Dept. of Civil Engineering.
T. W. Kao.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings paper 12947, p 543-555, May 1977. 4 fig, 8 ref, 2 append. NSF ENG75-09347.

Descriptors: *Density currents, *Water spreading, *Model studies, Mathematical models, Sludge disposal, Oil spills, Discharge(Water), Heated water, Sewage, Sewage sludge, Sewage disposal, Lakes, Reservoirs, Stratification, Density stratification, Water pollution.

The velocity of propagation of a variety of gravity motivated density currents was given. Several stratification configurations of the ambient fluid environment were considered. Applications were given to surface warm discharge in lakes or reservoirs, the spreading of a slug of sewage sludge at the thermocline level of the sea or lake, and the spreading of oil slick on water surface. Extension of the result to axisymmetric spreading also was given. (Sims-ISWS)
W77-08844

OCEANOGRAPHIC FEATURES, CURRENTS, AND TRANSPORT IN CABOT STRAIT,
Quebec Univ., Rimouski. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-08851

SOURCES OF TAR POLLUTION ON ISRAELI MEDITERRANEAN COAST,
Israel Petroleum Inst., Tel-Aviv.
Y. Shekel, and R. Ravid.
Environmental Science and Technology, Vol 11, No 5, p 502-505, May 1977. 6 fig, 1 tab, 16 ref.

Descriptors: *Oil pollution, *Oil industry, Pollutants, *Oil wastes, *Oily water, Analytical techniques, Organic compounds, Solvent extractions, Oil, Fuels, International waters, Water pollution, Oil spills, Chemical analysis, Organic wastes, Gas chromatography.
Identifiers: Tar pollution, *Israeli Mediterranean Coast, *Curde oil, *Tar ball pollutants, *Israel, *Mediterranean Sea, Sulfur content, Vanadium/nickel ratio.

A survey was made to find the sources of tar balls polluting the Mediterranean coast of Israel. Samples were collected fortnightly from eight stations along the shore from September 1973 to January 1975. According to chromatographic analysis, 76% of the tar balls were formed from weathered crude oil (GC-1) + crude oil sludge (GC-2), 18% from weathered fuel oil (GC-3), 4% were greatly weathered, and 2% of the samples were unidentified. According to the vanadium/nickel ratio and sulfur contents, 96% of the tar balls formed from GC-1 + GC-2 were from Middle Eastern sources. The degree weathering of the samples showed that 46% of the tar balls formed from GC-1 + GC-2 were exposed at sea for about a fortnight, 41% for more than two months, and 13% probably for one to two years. (Henley-ISWS)
W77-08852

COMPREHENSIVE OCEANOGRAPHIC BASELINE STUDY AT BARCELONETA, PUERTO RICO.
Black and Veatch, Kansas City, Mo.
M. J. Graham, G. R. Miller, and P. E. Schafer.
Journal of the Water Pollution Control Federation, Vol 49, No 4, p 558-567, April 1977. 5 fig, 3 tab, 6 ref.

Descriptors: *Baseline studies, *Waste water disposal, *Benthos, *Diurnal distribution, *Oceanography, Diurnal, Aquatic productivity, Ecological distribution, Ocean currents, Outfall sewers, Sewerage, Sediments, Sediment distribution, Water pollution sources, Tidal waters, Waste water(Pollution), Water quality, *Puerto Rico.
Identifiers: *Oceanographic baseline study, Predischarge investigation, *Barceloneta(Puerto Rico), *Manati River(Puerto Rico).

An interdisciplinary baseline study was conducted at an open ocean site on the north coast of Puerto

Rico. A sampling network of 27 water chemistry stations and 15 benthos/plankton stations was used to characterize the ocean water and sediment and to define the influence of the nearby Manati River. It was found that the Manati River, which presently receives the discharge of essentially raw domestic and industrial wastewater, was probably the source of most of the coliforms, turbidity, nitrates, nitrites, phosphorus, and silica in the study area waters. The river also may be the origin of arsenic, beryllium, chromium, and zinc. (Henley-ISWS)
W77-08853

HYDROTHERMAL FLUIDS OF SEAWATER SALINITY IN OPHIOLITIC SULPHIDE ORE DEPOSITS IN CYPRUS,
Oxford Univ. (England). Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 2L.
W77-08854

SYSTEMATIC IDENTIFICATION OF DO-BOD MODEL STRUCTURE,
Cambridge Univ. (England). Control Div.
B. Beck, and P. Young.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE5, Proceedings paper No. 12461, p 909-927, October 1976. 9 fig, 38 ref.

Descriptors: *Water quality, *Statistical methods, *Rivers, *Dynamics, *Dissolved oxygen, *Biochemical oxygen demand, Algal control, Estimating, Algorithms, Equations, Model studies.
Identifiers: Extended Kalman Filter, Human factors, Model tests, Recursive routines, Identification, Solar energy, Time factors.

The Extended Kalman Filter (EKF) provides a logical statistically-based extension to those existing approaches to model fitting based on deterministic model response error (surface) minimization. Its crucial feature as a basis for identification, however, is the recursive nature of the algorithm which permits the estimation of possible variations in the model parameters. Depending upon whether or not such estimated variations are realistic, bearing in mind the physical nature of the dynamic system, it is possible to formulate criteria for model adequacy. This approach to model identification was applied to the problem of modeling DO-BOD interaction in a freshwater river system based on daily field data. It was found that the basic model structure, as defined by a dynamic version of the Streeter-Phelps equations, was inadequate and, in the case of the river considered, it was necessary to introduce additional 'sustained sunlight' terms to account for the effects of floating algal populations. (Bell-Cornell)
W77-08866

REAERATION AND VELOCITY PREDICTION FOR SMALL STREAMS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
E. G. Foree.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE5, Proceedings paper No. 12448, p 937-952, October 1976. 6 fig, 3 tab, 9 ref.

Descriptors: *Water quality, *Computer models, *Reaeration, *Velocity, *Oxygenation, *Dissolved oxygen, Tracers, Streams, Low flow, Systems analysis, Equations, Dams, Height, *Kentucky, Waterfalls, Forecasting.
Identifiers: Dissolved oxygen analyzers.

The radioactive tracer technique employing dye, krypton-85 and tritium was utilized for the determination of reaeration and velocity characteristics of small streams. Based on work conducted over a 3-year period, models are developed to predict reaeration coefficient and velocity associated with a particular stream reach as a function of its slope and specific discharge (stream discharge per unit drainage basin area). Reaeration at dams is predicted as a function of the height of fall over the dam. These concepts have been incorporated into a general computer model for prediction of stream dissolved oxygen profiles and an example application is presented. (Bell-Cornell)
W77-08867

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
D. McLaughlin, J. A. Elder, G. T. Orlob, D. F. Kibler, and D. E. Evenson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 543, Price codes: A16 in paper copy, A01 in microfiche. NOAA Technical Memorandum ERL MESA-4, December 1975. 68 fig, 33 tab. Contract 3-35423.

Descriptors: New York, *Ecosystems, *Baseline studies, *Environmental effects, Estuaries, Water pollution, Fisheries.
Identifiers: *Outer Continental Shelf, *New York Bight, Resources management.

A comprehensive, conceptual representation of the physical, geological, chemical and biological processes that affect the New York Bight ecosystem is presented as well as some specific recommendations suggesting where field and laboratory research efforts should be undertaken to support a satisfactory evaluation of management alternatives. The important problems in the New York Bight are identified in order to develop effective strategies and research efforts towards solving them. They are: the movement of undesirable materials onto beaches, shellfish contamination, and a decline and instability in migratory fisheries. As each problem is described, the critical subsystems are identified, reviewed in the light of present knowledge, and a set of recommendations or research tasks for future implementation is proposed. (Sinha-OEIS)
W77-08900

IDENTIFICATION OF WEATHERED OIL FILMS FOUND IN THE MARINE ENVIRONMENT,
Exxon Research and Engineering Co., Linden, N. J. Governmental Research Lab.
For primary bibliographic entry see Field 5A.
W77-08901

ANALYSIS OF POLLUTION FROM MARINE ENGINES AND EFFECTS ON THE ENVIRONMENT.
Environmental Control Technology Corp., Ann Arbor, Mich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 175, Price codes: A15 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Protection Technology Series No. EPA-670/2-75-062, June 1975. 333 p, 38 fig, 51 tab, 101 ref. R-801799.

Descriptors: *Water pollution effects, *Environmental effects, Water pollution sources, Boating, Lakes, Aquatic life, Lead, Organic compounds, Oil pollution.
Identifiers: Outboard marine engines.

The objective of the study was to obtain sufficient laboratory and field data to be able to predict the number of outboard engines which can be operated on any particular body of water without causing adverse effects on the aquatic environment. Four small natural bodies of water were subjected to outboard engine emissions three times greater than saturation (maximum) levels occurring under normal boating conditions. These natural water bodies were stressed at these high levels with outboard engine exhaust emission for a period of three years. The study showed that there were no acute changes in the physical, chemical or biological characteristics of the water or sediments of the test lakes. No major adverse effects were found on water quality or the biological communities (periphyton, phytoplankton, zooplankton, benthos and fish) indigenous to the test lakes. No adverse accumulation of lead or hydrocarbons in the water column was observed. Also, no statistically significant accumulation of lead or hydrocarbons was noticed to be taking place in the lake sediments. (Sinha-OEIS)
W77-08902

A TRANSIENT, TWO-DIMENSIONAL, DISCRETE-ELEMENT, FAR-FIELD MODEL FOR THERMAL IMPACT ANALYSIS OF POWER PLANT DISCHARGES IN COASTAL AND OFFSHORE REGIONS. PART I: GENERAL DESCRIPTION OF THE MATHEMATICAL MODEL AND RESULTS OF AN APPLICATION,
Oak Ridge National Lab., Tenn.
A. H. Eraslan.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-4940, Price codes: A08 in paper copy, A01 in microfiche. Report to Nuclear Regulatory Commission, Washington, D.C., February 1975. 164 p, 79 fig, 1 tab, 62 ref. W-7405-eng-26.

Descriptors: *Thermal pollution, *Powerplants, *Environmental effects, *Resources development, Nuclear powerplants, *Mathematical models, Cooling water, Tides, Coasts, Ocean circulation, Model studies.
Identifiers: *Outer continental shelf.

A far-field mathematical model is presented for numerical simulation of short-time (within tidal cycle) transient, two-dimensional temperature distributions in large coastal and offshore regions resulting from the condenser cooling water discharges of power plants. The general mathematical formulation considers completely arbitrary, transient oceanic flow conditions, which include periodic tidal, geostrophic and wind-induced currents, as locally specified inputs to the model. The fundamental differences, both from physical and mathematical considerations, between mesoscale and micro-scale eddy turbulence, shear flow dispersion, and stratification are discussed in detail to establish a realistic formulation of depth-averaged, nonconvective thermal energy fluxes associated with the general turbulent transport phenomenon. The general mathematical model is applied to the assessment of the thermal impact of a hypothetical multiunit generating station in a coastal region where the oceanic flow conditions are assumed to be strictly periodic tidal currents without any appreciable net drift of sufficient duration to remove the heated effluent out of the far-field region. It is concluded that steady-state near-field studies of the individual discharges are definitely inadequate, and a transient far-field analysis which considers the variations in oceanic flow conditions is essential for the realistic assessment of the thermal impact of a large nuclear power plant in a coastal or offshore region. (Sinha-OEIS)
W77-08905

N2 : AR, NITRIFICATION AND DENITRIFICATION IN SOUTHERN CALIFORNIA BORDERLAND BASIN SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5A.
W77-08907

A BIODEGRADATION OF OIL ON WATER SURFACES,
Office of Naval Research, Arlington, Va.
For primary bibliographic entry see Field 5G.
W77-08909

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY--TEXAS: AREA DESCRIPTION,
National Marine Fisheries Service, Galveston, Tex. Gulf Coastal Fisheries Center.
For primary bibliographic entry see Field 2L.
W77-08916

ANALYTICAL MODELS FOR THE EVALUATION OF SUPPLEMENTAL AERATION IN TEXAS ESTUARIES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
C. A. Benson, R. W. Hann, Jr., and T. W. Reynolds.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 544, Price codes: A07 in paper copy, A01 in microfiche. Sea Grant Report No. TAMU-SG-75-213, January 1976. 142 p, 22 fig, 15 tab, 4 append.

Descriptors: *Estuaries, *Aeration, *Mathematical models, *Water pollution control, *Texas, Dispersion, Waste disposal, Computer programs.

A one-dimensional dynamic mathematical model was developed for computer solution of estuarine dispersion problems. The math model was based on the one-dimensional mass transfer equation for the longtudinal distribution of a substance in a variable area stuary. Finite-difference approximations of the mass transfer equation were used to develop the numerical model. Model results showed that wastes are adequately degraded in the channel and do not accumulate to excessive levels. These results were compared with field data obtained from sampling runs in the Harbor Channel. This work showed that dispersion and dilution would greatly affect the oxygen transfer effeciency of a surface aeration system. Dissolved oxygen levels in the Houston Ship Channel, however, were determined to be the controlling factor affecting efficiency of aeration. Model results showed that inchannel aeration would not only improve oxygen levels in the channel, but greatly reduced the organic load discharged into Galveston Bay. Another conclusion was that tidal flows would have little influence on the efficiency of a surface aeration system operating on the Houston Ship Channel.
W77-08917

OCEAN DUMPING IN THE UNITED STATES - 1975, THIRD ANNUAL REPORT OF THE ENVIRONMENTAL PROTECTION AGENCY ON THE ADMINISTRATION OF TITLE I OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972, AS AMENDED.
Environmental Protection Agency, Washington, D. C. Office of Water and Hazardous Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 694, Price codes: A04 in paper copy, A01 in microfiche. Third Annual Report of the Environmental Protection Agency on Administration of Title I of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended, June 1975. 66 p, 2 fig, 8 tab.

Descriptors: *Waste disposal, *Water pollution control, *Baseline studies, *Environmental effects.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Dredged material disposal, Outfalls, *Resource management.

The Act became effective April 23, 1973, and since that time all ocean dumping of waste materials transported for the purpose of dumping has been done under permit from EPA except for dredged material, which is regulated by the Corps of Engineers. This annual report covers the second full year of regulation of ocean dumping by EPA under Title I of the Act, and it offers the first opportunity to make quantitative comparison of how ocean dumping has changed since the Act became effective. Eleven ocean dumping sites in the Atlantic Ocean and the Gulf of Mexico are now in active use for municipal and industrial wastes. There is no dumping of these wastes in the Pacific, although municipal sewage sludge is discharged to the ocean through outfalls. These discharges are regulated under the permit system. Ocean dumping site surveys are due to begin this year. A detailed baseline survey is currently being conducted in the New York Bight for an alternate site for sewage sludge disposal. EPA is also studying and evaluating two dump sites, one industrial and one municipal, off Delaware Bay, and is cooperating with NOAA in studies of a deepwater site off the continental shelf east of Cape Henlopen, Delaware. (Sinha - OEIS)
W77-08919

INDUCED VERTICAL MIXING IN A STRATIFIED IMPOUNDMENT BY A SUBSURFACE WARM WATER DISCHARGE,
Wisconsin University, Madison. Department of Civil and Environmental Engineering.
K. V. R. Henkel, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 025, Price codes: A15 in paper copy, A01 in microfiche. Ph.D. Thesis, 1973. 314 p, 58 fig, 7 tab, 73 ref, 6 append. OWRT B-080-WIS(5). 14-31-0001-3948.

Descriptors: *Water quality, *Stratification, *Heat exchangers, *Model studies, *Vertical migration, Mixing, Heated water, Impoundments, Thermal pollution, Cooling water.

This theoretical and experimental study investigated vertical mixing, induxed in a thermally stratified impoundment, by the introduction of a warm water discharge near the impoundment bottom. Laboratory tests, conducted in an 18 inch diameter, circular tank and a 4 foot square tank, varied the following variables systematically: (1) inlet velocity; (2) temperature difference between discharge and tank bottom water; (3) location of discharge; (4) surface layer thickness; and (5) initial temperature difference between tank surface and bottom layers. From the tests, correlations were found relating the time to mix each tank to various dimensional and non-dimensional combinations of the above variables. Coupling the conservation laws for volume and heat in the impoundment, including surface heat exchange, with those for volume, heat and momentum of a warm water discharge, a model was developed for the transient vertical thermal structure of an impoundment. The model, when applied to the laboratory tanks, agreed very well with the measured profiles. The model (without a warm water discharge), when applied to Lakes Mendota and Monona, showed reasonable agreement with observed temperature profiles. Comparisons were made between the simulated temperature profiles with and without a warm water discharge for Lake Monona. Consequences, potential problems and applications of condenser cooling water discharges for inducing vertical mixing in thermally stratified impoundments are discussed. (See also W74-12370) (Hooper-Wisc)
W77-08929

A PREDICTIVE PHOSPHORUS MODEL FOR LAKES - DEVELOPMENT AND TESTING,
North Carolina University, Chapel Hill, Department of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W77-08930

SEASONAL PATTERNS OF DISSOLVED OXYGEN, NUTRIENTS, AND METALS IN NATURAL AND CHANNELIZED SWAMP STREAMS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
E. J. Kuenzler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 979, Price codes: A02 in paper copy, A01 in microfiche. Paper presented at Workshop on Freshwater Forested Wetland Research, Dept. of Env. Engr Scs., Univ. of Florida, Gainesville, Jan 15-16, 1976. 21 p, 8 fig, 2 tab, 25 ref. OWRT B-084-NC(1) 14-31-0001-5100.

Descriptors: *Channel improvement, Water quality, *Nutrients, *Metals, *Dissolved oxygen, Wetlands, Flood plains, Channelized, *Seasonal, *Swamps, *North Carolina, Distribution patterns, Water pollution sources, *Path of pollutants.
Identifiers: *Channelized streams, Flood plain swamps, Eastern North Carolina, Swamp streams.

In 1974 the Water Resources Research Institute of The University of North Carolina funded this research project to investigate certain aspects of water quality in natural flood-plain swamps, and the perturbations in these water quality parameters resulting from stream channelization. Six streams were selected in the Atlantic Coastal Plain province of North Carolina just above the tidewater region. This area has a subtropical, moist climate with warm summers and cool winters. The mean annual rainfall is about 120 cm. Conclusions at thise point are - small Coastal Plain streams, natural or channelized, are dynamic. They exhibit marked seasonal changes in flow and in water quality. The waters of natural streams are soft, moderately acid, stained with brown color, and very low in nutrients, especially NO+3 and soluble reactive phosphorous. Oxxygen may nearly disappear in summer. The low-D.O. period coincided with the period of maximum NH+4, Kjeldahl-N, particulate-P, Fe, Mn, Ca, and Mg. The factors determining these seasonal patterns are not yet established but the redox potential and the relative importance of base flow vs. runoff seem likely. (Stewart-NC State)
W77-08932

COMPUTER MODELING FOR THE PREDICTION OF WATER QUALITY FROM AGRICULTURAL DRAINAGE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
T. J. Stolinski, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 976, Price codes: A09 in paper copy, A01 in microfiche. M.S. Thesis, May 1975. 186 p, 15 fig, 15 tab, 51 ref, 5 append. OWRT A-036-NEB(1). 14-31-0001-5027.

Descriptors: *Agricultural runoff, *Water quality, Runoff, *Computer models, Forecasting, *Drainage, Simulation analysis, Watersheds(Basins), *Agricultural watersheds, Water pollution sources.
Identifiers: Agricultural pollution.

This project was designed to obtain additional needed information relative to agricultural pollution and to aid in the verification and development of computer models for simulation of this runoff. An agriculturally oriented watershed was instrumented to obtain information relative to rainfall and resulting runoff. In addition, data were obtained relative to cropping practices including chemical application, crop yields, etc. Data obtained are to be used in verifying and modifying available modeling techniques. Due to unusually dry weather during the summer of 1974, storm runoff was essentially non-existent after completion of instrumentation on July 1. As a result, data were not available for use. Therefore, information relative to the reliability of existing computer models is not included, but instead, a discussion is presented of various available modeling techniques and the basis for their use. The discussion also includes the sources and nature of various agricultural pollutants.
W77-08934

CHARACTERIZATION OF URBAN RUNOFF IN GREENFIELD, MASSACHUSETTS--PHASE I,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
F. A. DiGiano, M. P. Donahue, and P. L. Heirtzler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 984, Price codes: A06 in paper copy, A01 in microfiche. Publication No. 50, July 1975. 102 p, 17 tab, 20 fig, 27 ref, 2 append. OWRT C-5341(No.4239)(1).

Descriptors: *Waste identification, *Water pollution sources, *Urban runoff, *Massachusetts, Sampling, *Monitoring, Measurement, Water quality, Phosphorus, Chlorides, Biochemical oxygen demand, Carbon, Sewers, Coliforms.
Identifiers: *Non-point pollution sources, Greenfield(Mass), *Green River(Mass), *Total organic carbon.

The primary interest of this research focuses on the importance of both the short term impacts on water quality requirements and the longer term disruptions to normal stream ecology that may be caused by urban runoff. This report includes water quality data obtained from April 1974 to June 1975. Sample points in the Green River were selected such that the contribution of urban runoff from various sources and land use patterns could be measured. Water quality data consist mainly of weekly measurement of specific parameters at 6 sampling stations in the river's urban reach and measured impacts of several storm events. Parameters of most interest are B.O.D., T.O.C., total P, Cl, turbidity, total and fecal coliforms, oil and grease. Increases in concentrations of most pollutat parameters were noted during wet weather. Mean loading rates were 269, 26, 15, and 717 lb/sq mile/day for B.O.D., T.O.C, total P, and chloride, respectively. However, combined sewer overflows increased loadings on several days and prevented accurate assessment of the urban runoff contribution.
W77-08939

FREQUENCY OF ORGANIC COMPOUNDS IDENTIFIED IN WATER,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5A.
W77-08944

QUALITATIVE AND QUANTITATIVE CHANGES IN THE BENTHIC FAUNA OF A TROUT STREAM, THE COUZE PAVIN PUY-DE-DOME, CAUSED BY AGRICULTURAL AND URBAN POLLUTION, (IN FRENCH),
Institut National de la Recherche Agronomique, Paris (France).
For primary bibliographic entry see Field 5C.
W77-08955

EFFECT OF TEMPERATURE AND HYDROXY ALUMINUM INTERLAYERS ON THE ADSORPTION OF TRACE RADIOACTIVE CESIUM BY SEDIMENTS NEAR WATER-COOLED NUCLEAR REACTORS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Soils and Water.
A. M. Elprince, C. I. Rich, and D. C. Martens.
Water Resources Research, Vol 13, No 2, p 375-380, April 1977. 3 fig, 1 tab, 38 ref. ERDA E(40-1)-4851.

Descriptors: *Cesium, *South Carolina, *Radioactive wastes, *Nuclear reactors, *Thermal pollutions, *Radioisotopes, Nuclear wastes, Water pollution sources, Radiochemical analysis, Water quality, Water pollution, Adsorption, Chemical properties, Expansive clays, Heat pollution, Water temperature, Physical properties, Sediments.
Identifiers: *Water-cooled nuclear reactors, *Heated water pollution, *Savannah River Plant(SC), Bottom sediment adsorption, Hydroxy aluminum interlayers.

The adsorption of Cs137 by sediments from the Savannah River Plant follows a theoretically expected linear relationship between 1n Kd and 1/T where Kd and T are the equilibrium distribution coefficient (Cs adsorbed, meg/g/Cs(+) in solution, meq/m1) and the temperature in kelvins, respectively. The slope of the plots decreases after removal of hydroxy Al interlayers with citrate pretreatment. Hydroxy Al interlayers thus make Cs(+) adsorption more temperature dependent. The thermal effect of hydroxy Al interlayers becomes more significant in sediments containing a nonswelling 2:1-2:2 intergrade clay mineral than in those sediments containing a swelling 2:1-2:2 intergrade clay mineral. The phenomenon was explained by considering hydroxy Al interlayers as a source of hydronium ions H30(-) which compete with Cs(+) for exchange positions in wedge zones. An increase in temperature favors an increase in H30(-) ions, which in turn favors less adsorption of Cs(+). Aside from the thermal effect, the positively charged hydroxy aluminum polymeric groups drastically decrease the cation exchange capacity and, consequently, the adsorption of cesium. (Henley-ISWS)
W77-09024

HYPEROXYGEN CONCENTRATIONS IN THE HYPOLIMNION PRODUCED BY INJECTION OF LIQUID OXYGEN,
Limnological Associates, Ojai, Calif.
For primary bibliographic entry see Field 5G.
W77-09028

NATURAL STREAM TEMPERATURE VARIATIONS IN A CATCHMENT,
Environment Protection Authority, Victoria (Australia).
J. H. Walker, and J. D. Lawson.
Water Research, Vol 11, No 4, p 373-377, 1977. 1 fig, 7 tab, 10 ref.

Descriptors: *Watersheds(Basins), *Water temperature, *Model studies, *Australia, Streams, Rivers, Temperature, Thermal water, Air temperature, On-site data collections, Cooling, Water cooling, Heat transfer, Water pollution, *Thermal pollution.

In order to establish water temperature criteria or limits for reaches of streams downstream from thermal discharges, a knowledge of the natural water temperature is necessary. To overcome the situation where no historical records are available, a simple method of predicting natural water temperatures in a catchment was presented. The only data required for computation are the site altitude and the air temperature at a station in the catchment, or the natural water temperature in an upstream reach or other tributary in the catchment. The time scale of the predicted water temperature is a function of the frequency of measurement of the independent variables. (Sims-ISWS)
W77-09039

DISPERSION MEASUREMENT ON THE DANUBE,
Research Inst. for Water Resources Development, Budapest (Hungary).
L. Somlyody.
Water Research, Vol 11, No 4, p 411-417, 1977. 7 fig, 2 tab, 16 ref.

Descriptors: *Dispersion, *Rivers, *Dye releases, *Model studies, Mathematical models, Dye concentration, Dye dispersion, Fluorescent dye, Tracers, Mixing, On-site investigations, Water quality, Foreign countries, Water pollution, Foreign research, Path of pollutants, Streamflow.
Identifiers: *Danube River, *Hungary, Dispersion coefficients.

In formulating the two-dimensional mixing model for a 52 km long section of the River Danube, the dispersion conditions were studied. Three tracer experiments were performed at two different streamflow rates (1900 and 1050 cu m/s) and at constant feed. For determining the transverse dispersion coefficient, a new method based on the equations of the mass flux constant line was developed. Examination of the observation data showed the dispersion coefficient pertaining to the greater streamflow to be more than twice as high as the one at the smaller streamflow (0.033 and 0.013 sq m/s). The variation with streamflow is approximated well by a formula. (Sims-ISWS)
W77-09040

WETTABILITY OF COAL-MINE SPOILS IN NORTHWESTERN NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W77-09041

SOLUTE TRAVEL TIMES TO WELLS,
Iowa State Univ., Ames. Dept. of Agronomy; and Iowa State Univ., Ames. Dept. of Physics.
D. Kirkham, and S. B. Affleck.
Ground Water, Vol 15, No 3, p 231-242, May - June 1977. 7 fig, 15 ref. NSF ENG75-19394.

Descriptors: *Groundwater, *Solutes, *Groundwater movement, *Travel time, *Model studies, Mathematical models, Aqueous solutions, Nitrates, Wells, Water wells, Water pollution, *Water pollution sources, Hydraulic conductivity, Aquifers, Rivers, Permeability.
Identifiers: Solute concentration.

Theoretical travel times were given for a solute to reach a well from an injection point for wells that fully penetrate confined aquifers of constant thickness and mainly constant conductivity and porosity. Solute is assumed to move along streamlines with the water in piston flow under steady flow conditions. Three cases were considered. (1) For a 'standard' well of external radius of influence r sub e and well radius r sub w, the travel time varies approximately directly as the square of the distance r of the injection point from the well, as the ratio f/K of porosity to conductivity, and as 1n r sub e/r sub w. (2) For a well in which the flow region is divided by radius r sub c into two regions, with the region next to the well clogged and of very low conductivity, K sub I, the travel time varies approximately directly as r squared, as f/K sub I, and as 1n r sub c/r sub w. (3) For a well being fed from a line drive (river) at a distance d from the well, the travel time from a point on the line drive to the well varies as the distance d squared, as f/K, as 1n 2d/r sub w, and as a function of the position of the point along the line drive. In each case, the travel time is inversely proportional to h sub e - h sub w, where h sub e is the head at the radius of influence r sub e (or at the line drive) and h sub w is the head at the well. In the three cases, doubling the pumping rate halves the travel time. Travel times can affect the extent of chemical changes of the solute (contaminant) during its flow to the well. (Sims-ISWS)
W77-09042

URBAN STORMWATER POLLUTANT LOADINGS: A STATISTICAL SUMMARY THROUGH 1972,
URS Co., San Mateo, Calif.
W. L. Bradford.
Journal Water Pollution Control Federation, Vol 49, No 4, p 613-622, April 1977. 5 tab, 18 ref. EPA 68-01-1846.

Descriptors: *Storm runoff, *Urban runoff, *Pollutants, *Mathematical studies, *Load distribution, Mathematics, Statistical methods, Statistics, Runoff, Surface runoff, Sampling, Data collections, Storm water, Watersheds(Divides), Drainage systems, Water pollution sources, Water quality, Water pollution, Suspended solids, Trace elements.

Identifiers: *Pollutant loadings, *Storm water composition, Coliform organisms, Total solids, Loading rates.

The data on urban storm water pollutant loading rates and composition available from the literature published through 1972 were used to find differences related to differing regions of the nation, gross land use types, average daily traffic, type of landscaping, and type of street surface. From 153 records, the mean and standard deviation of dust and dirt loading rates and composition were calculated for each of the independent variables listed and compared to those of the entire data set. Although apparent differences exist between subsets and the whole set of data, with some important exceptions, the null hypothesis was accepted at the 95% confidence level in most cases. To improve future analyses, study methods need to be more standardized than at present. (Henley-ISWS)
W77-09046

NONLINEAR ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
P. K. Misra, and E. S. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 079, Price codes: A05 in paper copy, A01 in microfiche. Kansas State Bulletin, KWRRI Contribution No 105. Kansas Engineering Experiment Station, Special Report Number 109, July 19, 1972. 89 p, 19 fig, 20 tab, 29 ref. OWRT A-048-KAN(3). 14-31-0001-3516.

Descriptors: *Water quality, *Model studies, *Estimating, *Algorithms, Statistical methods, Dynamic programming, Streams.
Identifiers: *Ninlinear estimation, *Stream modeling.

The various approximate nonlinear estimation algorithms are summarized and applied to the estimation of parameters in stream quality based on the Camp and Dibbins model. The advantages and drawbacks of the various estimation algorithms are compared by using the numerical results. The nonlinear algorithms studied are linearized Kalman filter, invariant imbedding least squares filter, the first order and second order minimal variance filters, the Gaussian minimal variance filter, maximum a posteriori filter, and dynamic programming least squares filter. (See also W75-04614 and W75-01111)
W77-09047

OPTIMAL ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan, Dept. of Industrial Engineering.
P. K. Misra, and E. S. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 099, Price codes: A04 in paper copy, A01 in microfiche. Kansas State Univ., Bulletin, KWRRI Contribution No. 104. Kansas Engineering Experiment Station, Special Report Number 110, July 19, 1972. 58 p, 14 fig, 2 tab, 13 ref. OWRT A-048-KAN(4), 14-31-0001-3516.

Descriptors: *Water quality, *Estimating, *Model studies, Optimization, Statistical methods.
Identifiers: Linear estimation, Stream modeling.

The various linear estimation schemes are discussed and summarized. The Kalman filter and the invariant imbedding filter are applied to the estimation of the parameters in stream quality modeling. The results are discussed in terms of convergence rate and the influence of noisy data. Statistical mismatch is also discussed. (See also W75-04614 and W75-01111)
W77-09052

ADSORPTION AND VERTICAL MOVEMENT OF THE ZINC AND MANGANESE IONS IN THREE TYPES OF SOIL,
Tuskegee Inst., Ala. Dept. of Plant and Soil Science.
R. J. Patel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 191, Price codes: A05 in paper copy, A01 in microfiche. M. S. Thesis, August 1974, 76 p, 13 fig, 15 tab, 87 ref, append. OWRT B-028-ALA(5), 14-31-0001-3053.

Descriptors: *Adsorption, *Zinc, *Ions, Retention, *Manganese, *Soil types, Vertical migration, *Soil chemistry, Leaching, Chelation, Ion exchange, Path of pollutants, Water pollution, Metals.

The adsorption pattern of zinc and manganese ion was studied in three different types of soil: Hoytville, Nebraska and Troup. The soil samples were first leached with 1N ammonium acetate solution and were then equilibrated with the metal solutions of different concentrations ranging from 0.1 to 0.8 me, per gram of soil. The retention of these metals by the soils was evaluated in three different forms: exchangeable, chelated, and non-displaceable. To displace zinc and manganese held in the exchangeable and chelated forms, 1N KCl and 0.1 N Cu-(0Ac)2 solutions respectively were used. Adsorption data of the metals more used to compute the relative amount of soil material complexed with one mole of the cation and the stability constant of the resulting soil-metal complex. The data indicated that relatively more of zinc and manganese was adsorbed by the Hoytville soil than by the Nebraska or Troup soil. In general, the stability constant for the total adsorption of either zinc or manganese in any soil was comparatively greater than that for the other two fractions (chelated and non-displaceable) that were held in the soil. The concentration of zinc or manganese retained by the soils was more in the surface of the column and decreased progressively with depth.
W77-09054

SPECIES DIFFERENCES IN BREAKDOWN OF TREE LEAVES IN STREAMS--SIGNIFICANCE FOR COMPOSITION OF STREAM COMMUNITIES,
California Univ., Santa Barbara, Marine Science Inst.
A. M. Wenner, A. L. Busath, and R. P. Howmiller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 194, Price codes: A03 in paper copy, A01 in microfiche. California Water Resources Center, Davis, Report No. 39, May, 1977. 29 p, 7 fig, 4 tab, 17 ref. (California Water Resources Center Project UCAL-WRC-W-492). OWRT-A-055-CAL(3).

Descriptors: *Riparian plants, *Invertebrates, Streams, *Leaves, *Decomposing organic matter, *Productivity, Detritus, Aquatic plants.

This report focuses on the possible influence of riparian vegetation on the composition and productivity of stream invertebrate fauna by concentrating on the role of decomposing matter in streams. Experiments were performed to determine decomposition rates of various leaf types, as well as on comparative survival and growth of selected stream invertebrates raised on single leaf types in artificial streams. A field survey was made of leaf types and invertebrates in local streams to discover any relationship between detrital and faunal composition. This study was unable to confirm any direct correlation between leaf litter composition and faunal composition. Data from some riffle samples and qualitative observations at the time of collection revealed no obvious absences in any stream. Riffle samples tended to have more insect predators than did litter samples were detected. (Snyder-California, Davis)
W77-09056

ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W77-09059

A COMPARATIVE STUDY OF ORGANIC CARBON AND NUTRIENTS IN LAKE SEDIMENT,
Washington State Univ., Pullman. Dept. of Environmental Science.
For primary bibliographic entry see Field 5A.
W77-09065

THERMAL LOADING OF NATURAL STREAMS,
Geological Survey, Menlo Park, Calif. Water Resources Div.; and Geological Survey, Reston, Va. Water Resources Div.
A. P. Jackman, and N. Yotsukura.
Available from Supt. of Documents, GPO, Washington, DC, 20402, Price 70c. Professional Paper 991, 1977. 39 p, 42 fig, 2 tab, 45 ref.

Descriptors: *Model studies, *Thermal pollution, *Natural streams, *Heat transfer, *Diffusion, Water temperature, Mathematical models, Analytical techniques, Evaluation, Path of pollutants.
Identifiers: *Surface heat dissipation, Thermal transport models.

The impact of thermal loading on the temperature regime of natural streams is investigated by mathematical models, which describe both transport (convection-diffusion) and decay (surface dissipation) of waste heat over 1-hour or shorter time intervals. The models are derived from the principle of conservation of thermal energy for application to one- and two-dimensional spaces. The basic concept in these models is to separate water temperature into two parts, (1) excess temperature due to thermal loading and (2) natural (ambient) temperature. This separation allows excess temperature to be calculated from the models without incoming radiation data. Natural temperature may either be measured in prototypes or calculated from the model. If use is made of the model, however, incoming radiation is required as input data. Comparison of observed and calculated temperatures in seven natural streams shows that the models are capable of predicting transient temperature regimes satisfactorily in most cases. (Woodard-USGS)
W77-09068

A RECONNAISSANCE OF THE HYDROLOGY OF THE EDISTO AND ASHEPOO ESTUARIES, SOUTH CAROLINA,
Geological Survey, Columbia, S.C. Water Resources Div.
For primary bibliographic entry see Field 2L.
W77-09076

A RECONNAISSANCE OF THE HYDROLOGY OF THE INTRACOASTAL WATERWAY FROM BUCKSPORT TO LITTLE RIVER INLET, SOUTH CAROLINA,
Geological Survey, Columbia, S.C. Water Resources Div.
For primary bibliographic entry see Field 2L.
W77-09077

ANALYSES OF NATIVE WATER, BED MATERIAL, AND ELUTRIATE SAMPLES OF MAJOR LOUISIANA WATER WATERWAYS, 1975,
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-09084

LIBRARY U. OF I. URBANA-CHAMPAIGN

TORAGE OF LOW-LEVEL RADIOACTIVE
VASTES IN THE GROUND: HYDROGEOLOG-
C AND HYDROCHEMICAL FACTORS,
eological Survey, Reston, Va. Water Resources
iv.
or primary bibliographic entry see Field 5E.
77-09086

RELIMINARY STUDY OF WASTEWATER
IOVEMENT IN AND NEAR GRAND TETON
ATIONAL PARK, WYOMING, THROUGH
CTOBER 1976,
eological Survey, Cheyenne, Wyo. Water
esources Div.
. R. Cox.
pen-file report 77-275, March 1977. 35 p, 5 fig, 7
b, 2 ref.

escriptors: *Path of pollutants, *Waste
ater(Pollution), *Effluents, *Sewage lagoons,
National parks, *Wyoming, Surface waters,
roundwater, Sampling, Wells, Streams, Water
nalysis, Chemical analysis, Evaluation.
lentifiers: *Grand Teton National Park(Wyo).

nvestigations were made by the U.S. Geological
urvey in cooperation with Teton County, Wyom-
g and the National Park Service to determine the
ffects on nearby lakes and streams of percolating
astewater effluent at three sites in and near
rand Teton National Park. Observation wells
ere drilled at two of the sites, and water samples
ere collected from the wells. Sites were
stablished on selected streams to collect water
amples and to measure streamflow. Sufficient
ata have not been collected at this time to deter-
ine in detail the baseline quality of water in the
elected streams or the rate, direction, and
elocity of movement of percolating effluents.
lowever, theoretical concepts and data collected
o date suggest that effluent percolating near
olter Bay Village is most likely moving westward
nd southwestward toward Swan Lake and Colter
ay. Effluent percolating near Moose is most like-
y moving southeastward and southward toward
he Snake River. Effluents near Flagg Ranch and
luckleberry Hot Springs probably discharge into
he Snake River and Polecat Creek, but the
mounts are small. (Woodard-USGS)
V77-09087

OPULATION RESPONSE AND HEAVY
IETAL CONCENTRATIONS IN COTTONTAIL
ABBITS AND SMALL MAMMALS IN WASTE-
VATER IRRIGATED HABITATS,
ennsylvania State Univ., University Park. School
f Forest Resources.
. R. Bierei.
vailable from the National Technical Informa-
ion Service, Springfield, VA 22161 as PB-269 186,
rice codes: A03 in paper copy, A01 in microfiche.
laster of Science Thesis in Wildlife Management,
ugust 1974. 42 p, 11 tab, 1 fig, 29 ref, append.
WRT B-059-PA(4), 14-31-0001-3932.

escriptors: *Heavy metals, *Small
nimals(Mammals), *Irrigation water, *Wildlife,
Effluents, Sewage effluents, Forests, Irrigation
ffects, Water pollution sources, Waste water
isposal.
dentifiers: *Cottontail rabbits, *Wastewater ir-
igation, Weight gains.

opulation characteristics and heavy metal con-
entrations of cottontail rabbits and small mam-
nals were compared on control and effluent
prayed areas during 1971, 1972, and 1973. Popula-
ion densities of rabbits in irrigated enclosures
ended to be higher for 3 consecutive years though
lensities were not significantly different. Rabbit
veights and adult weight gains were higher on ir-
igated areas. Wastewater irrigation of forested
reas in early successionary stages appears to in-
rease the carrying capacity for cottontail rabbits
ecause of increased food and cover produced by
he irrigation. Small mammal population densities were greater in the fall on irrigated areas and were probably related to increased production of herbaceous vegetation throughout the growing season. Spring densities on both irrigated and non-irrigated areas were not different, indicating no increase in carrying capacity over the winter months. Levels of most heavy metals in the tissues of cottontails and small mammals were not increased by wastewater irrigation. (Sink-Penn State)
W77-09097

5C. Effects Of Pollution

A PRIMER ON LIMNOLOGY,
Minnesota Univ., Minneapolis. Linmological Research Center.
For primary bibliographic entry see Field 2H.
W77-08605

SURVIVAL OF BACTERIA IN TURBID AND POLLUTED WATERS,
New Mexico State Univ., University Park. Dept. of Biology.
K. Y. Ahmed.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 801, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, August 1975. 39 p, 8 fig, 2 tab, 48 ref. OWRT A-052-NMEX(1).

Descriptors: *E coli, *Salmonella, Aquatic microorganisms, Bacteria, *Coliforms, Pathogenic bacteria, Sewage bacteria, *Rio Grande River, Temperature, Water temperature, Turbidity, Water pollution effects, *New Mexico.
Identifiers: *Glycogen, *Bacteria survival rate.

The survival of Escherichia coli B and Salmonella typhimurium was studied in polluted river water in situ and in controlled laboratory conditions. The die-off of both bacteria was very rapid in the river and the initial cell population was reduced by 90% in less than three days at the temperatures tested in the river (16 and 27.8 C.). In the laboratory conditions, E. Coli and S. typhimurium were reduced at 10 C. by 90% in 15 days and 13 days respectively. At 20 C. both bacteria were reduced by 90% within five days and at 25 C. a 90% reduction occurred in approximately two days. At 30 C. E. coli took ten days for a 90% reduction in viability while S. Typhimurium took less than 48 hours for the same viability loss. The role of glycogen in survival of both organisms seemed insignificant, as glycogen rich E. coli and S. typhimurium did not survive longer than cells with lower glycogen content with the exception of glycogen-rich E. coli at 25 C. (Hain-New Mex State)
W77-08606

HYDROLOGY OF THREE RECREATIONAL LAKES IN EASTERN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-08608

HEAVY METAL TOLERANCE OF MARINE PHYTOPLANKTON. III. COMBINED EFFECTS OF COPPER AND ZINC IONS ON CULTURES OF FOUR COMMON SPECIES,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
G. S. Braek, and A. Jensen.
Journal of Experimental Marine Biology and Ecology, Vol 25, 1976, p 37-50, 8 fig, 6 tab, 12 ref.

Descriptors: Environmental effects, Metals, *Water pollution effects, Resistance, Copper, Zinc, Phytoplankton, Diatoms, Algae, *Heavy metals.
Identifiers: Synergism, Combined effects.

The combined effects of copper and zinc ions were studied using three marine diatoms and one dinoflagellate. Results showed that joint effects of copper and zinc on marine phytoplankton could not be predicted on the basis of the toxicity of the individual metals. A. carteri and T. pseudonana gave clear cases of synergism, while the metals acted as antagonists towards the diatom P. tricornutum. For the two clones of S. costatum tested it was found that the effect of combinations of the metals was greater than the sum of the effects caused by the components applied separately, although the sensitivity of S. costatum to copper did limit the range of the experiments. (See also W74-11329) (Chilton-ORNL)
W77-08692

MUSSELS (MYTILUS SP.) AS AN INDICATOR OF LEAD POLLUTION,
Scripps Institution of Oceanography, La Jolla, Calif.
T. J. Chow, H. G. Snyder, and C. B. Snyder.
The Science of the Total Environmental, Vol 6, 1976, p 55-63, 3 tab, 1 fig, 16 ref.

Descriptors: Environmental effects, *Water pollution, *Lead, *Mussels, Marine animals, Shellfish, Pacific Coast, *Bioindicators, Pollutant identification, Water pollution effects.

Two species of mussels (M. californinanus and M. edulis) were collected along the Pacific Coast from Piedras Blancas to Punta Banda. The area depicts varying degrees of industrialization ranging from relatively undisturbed to heavily populated regions. On a dry weight basis, the whole soft parts of the mussels contained from 0.27 to 42 ppm of lead which could be related to their local habitats. Gill tissues contained the highest amount of lead. No difference was observed in the average isotope ratios of lead in the two species. (Chilton-ORNL)
W77-08693

RESULTS OF A MICROBIOLOGICAL INVESTIGATION OF THE DANUBE RIVER BY ONE POINT PROFILE (1969-1971), (IN GERMAN),
For primary bibliographic entry see Field 5B.
W77-08694

ESTIMATION AND EVALUATION OF RADIOACTIVE CONTAMINATION THROUGH A FOOD WEB IN AN AQUATIC ECOSYSTEM: I. AN APPLICATION OF THE COMPARTMENT MODEL TO TRANSFER OF RADIOACTIVE SUBSTANCES THROUGH A FOOD CHAIN,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
I. Aoyama, and Y. Inoue.
J Radiat Res. 14(4), p 375-381, 1973.

Descriptors: *Radioactivity effects, *Aquatic environment, *Model studies, *Food chains, *Fish, *Radioecology, Food webs, Sea water, Ecosystems, Absorption, Radioisotopes, Transfer, Pikes, Cichlids, Minnows, Cesium, Water pollution effects.
Identifiers: Cesium-137, Radioactive transfer, Compartment model.

A transfer of radioactive substance through a food chain in an aquatic ecosystem was analyzed through application of modified 3 compartment model of Aten's. The modification of the original model is an introduction of 2 processes, an excretion of radioactivity from Fish-1 (prey) to sea water and an direct uptake of radioactivity by Fish-2 (predator) from sea water. In the model, a following ration rate coefficient (k12) was defined as a mass transfer coefficient of a radioactive nuclide from prey to a predator; k sub 12 = theta M sub 1/M sub 2, where theta is an assimilation rate of a radioactive nuclide, M sub 1 is a daily average ration taken by a predator and M sub 2 is a weight of the predator. In the experimental

system, pike cichlids and minnows were used as predators and prey. 137Cs was used as a radionuclide in the system. The accumulation of a 137Cs in pike was explained by application of the above modified 3 compartment model and various parameters in the model were determined. This shows that the transfer of a radionuclide through a food chain can be estimated by knowing the uptake rate and the turnover rate of Fish-2 (predator). They in ecological term are a daily average ration and an assimilation rate respectively.--Copyright 1974, Biological Abstracts, Inc.
W77-08695

THE ROLE OF METHYLMERCURY PRODUCTION IN THE TRANSFER OF MERCURY IN A SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. Windom, W. Gardner, J. Stephens, and F. Taylor.
Estuarine and Coastal Marine Science, Vol. 4, 1976, p 579-583, 2 tab, 13 ref. NSF (GX-33615).

Descriptors: Environmental effects, *Water pollution effects, *Mercury, *Path of pollutants, *Salt marshes, Sediments, Algae, Ecosystems, Estuarine environment, Estuaries, Georgia, Industrial wastes.
Identifiers: Primary consumers, *Methylmercury, Brunswick area(Geo).

A salt marsh estuary which had received large discharges of inorganic mercury for several years was studied. The concentration of mercury in sediments from the study area are higher than those from unpolluted salt marsh estuaries of the southeastern Atlantic coast. The methyl form was not detected in either the sediments or Spartina alterniflora. The primary consumers of the ecosystem represented the first trophic level which accumulated methylmercury with Littorina irrorata and Uca sp representing over 90% of the production at this level. The data indicated an annual methylmercury production in this ecosystem of approximately 50 microg/g total Hg contained in the upper 5 cm of the sediment. (Chilton-ORNL)
W77-08697

DOSE-DEPENDENT EFFECTS OF METHYLMERCURY ON LIMB REGENERATION OF NEWTS (TRITURUS VIRIDESCENS),
Wisconsin Univ.-Madison. Dept. of Anatomy; and Wisconsin Univ.-Madison. Dept. of Pathology.
L. W. Chang, L. L. M. Mak, and A. H. Martin.
Environmental Research, Vol. 11, 1976, p 305-309, 2 fig, 33 ref.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, *Newts, Growth rates.
Identifiers: Regeneration, Cell growth, Tissue development, *Methylmercury, Dose-dependence.

Newts with amputated limbs were raised at a temperature of 25 C in solutions containing various concentrations of methyl mercuric chloride (0.01, 0.03, 0.05, 0.07, 0.1, 0.3, and 1.0 ppm). A general but significant delay in regeneration was observed in animals raised in mercury-water as compared to controls. The rate of regeneration in all the mercury-exposed animals seemed to be potentiated after the initiation of the regeneration. It was concluded that methylmercury has a dual inhibitory and stimulatory effect on cell growth and tissue development and that its effect is dose-dependent. (Chilton-ORNL)
W77-08699

METHYLMERCURY INDUCED INJURY OF SINGLE BARNACLE MUSCLE FIBERS,
Wisconsin Univ., Madison. Dept. of Physiology; and Wisconsin Univ., Madison. Dept. of Medicine.
H. Hift, and R. Schultz.
Environmental Research, Vol. 11, 1976, p 367-385, 22 fig, 20 ref.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, Toxicity, Sodium.
Identifiers: *Methylmercury, Muscle fibers, *Barnacles.

The effects of methylmercury on sodium transport, resting membrane potential, and ultrastructure of single barnacle muscle fibers were investigated. The results showed that methylmercury reduces sodium transport and that its primary site of action is the plasmalemma which deteriorates progressively. Experiments with ouabain indicated that the membrane sodium, potassium-ATPase system was affected by methylmercury. It was suggested that the observed reduction in Na efflux was the result of a reduced supply of ATP and that the terminal rise in Na efflux was the result of the destruction of the sarcolemma. Ultrastructure damage consisted of mitochondrial changes, the gradual disintegration of the sarcoplasmic reticulum, and the formation of gaps in the plasmalemma. (Chilton-ORNL)
W77-08700

EFFECTS OF MERCURY, CADMIUM, AND LEAD SALTS ON REGENERATION AND ECDYSIS IN THE FIDDLER CRAB, UCA PUGILATOR,
Rutgers - The State Univ., Newark, N.J. Dept. of Zoology and Physiology.
J. S. Weis.
Fishery Bulletin, Vol. 74, No. 2, 1976, p 464-467, 2 tab, 15 ref. N.I.H. Biomedical Grant No. RR 7059.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, *Cadmium, *Lead, *Crabs, Salts.
Identifiers: Regeneration, Ecdysis, *Accabonac Harbor(NY).

Retardation of regeneration was a specific effect of cadmium on crabs exposed to concentrations of both 0.1 and 1.0 mg/l. At 0.1 mg/l, mercury caused almost total inhibition of limb growth but also proved lethal to 60% of the crabs indicating that the inhibition of regeneration may be not be a specific effect of mercury but an indication of the toxicity of the metal. A seasonal difference in sensitivity to both dose levels of cadmium and the higher concentration of mercury was seen, with the greater retarding effects being apparent during molting. (Chilton-ORNL)
W77-08702

TRACE ELEMENT INVENTORY FOR THE NORTHERN CHESAPEAKE BAY WITH EMPHASIS ON THE INFLUENCE OF MAN,
Maryland Univ., College Park. Dept. of Chemistry.
G. R. Helz.
Geochimica et Cosmochimica Acta, Vol. 40, No. 6, 1976, p 573- 580, 4 tab, 2 fig, 51 ref.

Descriptors: *Water pollution effects, *Water pollution sources, Pollutants, *Trace elements, *Chesapeake Bay, Sediments, Aqueous solutions, Industrial wastes, Municipal wastes, Fallout, *Maryland.
Identifiers: *Baltimore Harbor(Md).

An estimate of input from various sources of nine trace elements to the northern Chesapeake Bay revealed that human sources supply at least half of the Cr, Cu, Cd, and Pb. Human input is somewhat less for Mn, Fe, Co, Ni, and Zn. Atmospheric sources were the most important for Pb; municipal wastewater was the dominant source for Cd and heavy industry of Cu and Cr. Generally less than 1/3 of the present input could be accounted for in the sediments, with the exception of Cr and Fe. Sediments in areas of high human input (Baltimore Harbor) become enriched in an amount roughly proportional to the increased input so that the fraction retained in the sediments is similar to that in less heavily loaded area. (Chilton-ORNL)
W77-08704

AN EVALUATION OF THE NATIONAL EUTROPHICATION SURVEY DATA,
National Eutrophication Survey, Corvallis, Oreg.
M. O. Allum, R. E. Glessner, and J. H. Gakstatter.
Working Paper No 900, June 1977. 82 p, 68 ref, append.

Descriptors: *Eutrophication, *Evaluation, Algae, *Lakes, *Trophic level, Bioassay, *Nutrients, Data collections, *Phosphorus, *Nitrogen, *Primary productivity, Water pollution effects, *Surveys, Organic loading.

Because of the nation-wide scope of the National Eutrophication Survey and the time frame of less than four years for the completion of the sampling of 812 lakes and reservoirs, 4,000+ tributary sites, and over 800 municipal wastewater treatment plants, the Survey sampling program necessarily deviated from what ordinarily would be considered an ideal experimental design. As the Survey progressed, and to the degree permitted by the day-to-day work load, limited comparisons of Survey results with results published by others on the same water bodies were made. Specifically, it is concluded that: (1) the Survey water-body data compare very well with the reported data reviewed, considering the expected variability; (2) the trophic condition of most lakes and reservoirs can be adequately assessed on the basis of three periods of open-water sampling; (3) whether nitrogen, phosphorus, or some other element is limiting primary productivity in a water body can be inferred from algal assay results and nitrogen to phosphorus ratios; (4) considering temporal and spatial variability in nutrient concentrations, the Survey tributary nutrient data compare very well with the data reported by others; (5) for the purposes of the Survey, tributary nutrient loads were determined with acceptable accuracy with a sampling frequency of 14 times per year and flow data provided by the U.S. Geological Survey; (6) the Survey tributary total phosphorus loads and the in-water-body total phosphorus concentrations are highly correlated; (7) the effluent total phosphorus loads measured at 801 municipal wastewater treatment plants are in good agreement with expected values. (EPA-Corvallis)
W77-08710

EXPERIMENTAL DATA ON THE REGULATION OF 1,2-DIBROMOPROPANE IN RESERVOIR WATER, (IN RUSSIAN),
V. I. Antonova, N. E. Mishina, T. V. Vinokurova, G. P. Khazova, and L. L. Latkina.
Gig Sanit 3, p 105-106, 1976.

Descriptors: *Organic compounds, *Water supply, *Toxicity, Reservoirs, Regulation, Water quality standards, Lethal limit, Water pollution effects.
Identifiers: *Dibromopropane, USSR.

To determine the biologically active threshold concentration of 1,2-dibromopropane in the reservoirs of the sanitary and domestic water supply, various concentrations were tested for effect on sprophytic microflora, rats and mice. A threshold concentration of 0.1 mg/l was established, above which the microflora ceased to grow and the rats and mice manifested various functional, biochemical and pathological disorders.--Copyright 1977, Biological Abstracts, Inc.
W77-08718

NEOPLASTIC AND POSSIBLY RELATED SKIN LESIONS IN NEOTENIC TIGER SALAMANDERS FROM A SEWAGE LAGOON,
Texas Tech Univ., Lubbock. Dept. of Biological Sciences.
F. L. Rose, and J. C. Harshbarger.
Science, Vol. 196, No. 4287, p 315-317, April, 1977. 1 fig, 8 ref.

Descriptors: *Cytological studies, *Salamanders, *Growth stages, *Lagoons, *Monitoring, Water

pollution effects, Chemical reactions, Biochemistry, Diseases, Water pollution, Waste water treatment, Settling basins.
Identifiers: Neoplasms, Carcinogens, Tiger salamanders, Skin lesions.

Neoplastic and other skin lesions were studied in neotenic tiger salamanders growing in a lagoon with high concentrations of secondary domestic sewage. Thirty to fifty percent of a 28,000 population developed skin lesions of which 84% were neoplasms. Salamanders in uncontaminated area lagoons developed normally with no neoplasms. Nonneoplastic lesions found were ascites, serous cysts, and epidermal inclusion cysts. Ascites were common to both test populations. The neoplastic lesions developed from skin epithelium, dermal fibroblasts, or dermal melanocytes. Water analyses were negative for 14 nitrosamines, but sediment analyses revealed 300 ppm of perylene, from jet fuel, and trace amounts of benzypyrene. Perylene has caused low tumorigenic activity in mice when combined with other polycyclic aromatic hydrocarbons. Tests should be conducted to determine its effects on salamanders. Metamorphic failure was determined to be a factor in tumorigenesis. Tiger salamanders were considered to be sensitive indicators for certain environmental carcinogens and could possibly monitor sewage ponds. Other vertebrate and invertebrate larval forms could be developed for such purposes by hormonally prolonging the length of the immature stages. (Collins-FIRL)
W77-08729

BIOLOGICALLY ACTIVE METABOLITES OF BLUE-GREEN ALGAE AND THEIR EFFECT ON EXPERIMENTAL ANIMALS, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
V. M. Orlovskii, and Yu. A. Kirpenko.
Gig Sanit 3, p 13-17, 1976.

Descriptors: *Algae, *Algal poisoning, *Anabaena, *Cyanophyta, Reservoirs, Metabolism, Water pollution effects.
Identifiers: Anabaena flos-aquae, Aphanizomenon flos-Aquae, Alga, Blooming, Carbohydrate oxidation, Blood catalase, Cholin esterase, Liver, Metabolites, Microcystis aeruginosa, Myo cardium, Thiaminease, USSR, Pyruvic acid.

Water from the Kremenchug reservoir (USSR) during blooming of blue-green algae, predominantly Microcystic aeruginosa, Aphanizomenon flos-aquae and Anabena flos-aquae, was administered daily to rats for 2.5 mo. Results indicated lowered cholinesterase and blood catalase activity, lower overall thiamine in the organs, the presence of thiaminase, higher concentrations of insufficiently oxidized products in the blood (particularly pyruvic acid) and degenerative changes in the liver and myocardium. Disturbances of carbohydrate oxidation is one of the basic elements of the mechanism of toxic action on warm-blood animals. The possiblity of exposure of humans and animals to biologically active metabolites of blue-green algae indicates that the blooming in water is a potential factor in the decrease of water quality and may lead to adverse consequences.
W77-08749

PARASITES AND DISEASES OF CULTURED CATFISH FOR THE PERIOD JULY 1, 1972 THROUGH JUNE 20, 1975,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
W. A. Rogers, J. A. Plumb, J. H. Schachte, Jr., J. L. Gaines, and R. P. Phelps.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-252 360, Price codes: A03 in paper copy, A01 in microfiche.
Tennessee Fish and Game Commission, Project 2-194-R, Jan. 1976 26 p., 8 tab., 1 fig., 4 ref.

Descriptors: *Aquiculture, Freshwater fish, *Channel catfish, *Fish diseases, Pathology, Fish kill, *Bacteria, *Parasitism, *Viruses, *Pesticides, Water quality, Nutrients, *Fish hatcheries, Fish farming, Fish diets, *Fish parasites, Fish stimulants.
Identifiers: *Nutritional deficiencies, *Pathogens, Flavobacterium, Aeromonas, Flexibacter, Chondrococcus, Immunoglobins, Antibodies, Cultured catfish.

A total of 321 channel catfish cases are examined in this report. Fish kills were caused by viruses, bacteria, parasites, nutritional deficiencies, pesticides and water quality. Channel catfish eggs were destroyed by Flavobacterium sp. Field testing of Aeromonas hydrophila and Flexibacter (Chondrococcus) columnaris was carried out. Immunoglobulins in the serum, gut and skin mucous are characterized. Levels of antibody in the serum, gut and mucuous are determined. Homogenetic and heterogenetic strains of channel catfish were tested for their susceptibility to F. columnaris. (Katz)
W77-08756

FATE AND BIOLOGICAL EFFECTS OF MERCURY INTRODUCED INTO ARTIFICIAL STREAMS,
Savannash River Ecology Lab., Aiken, S.C.
H. J. Kania, R. L. Knight, and R. J. Beyers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 833, Price codes: A07 in paper copy, A01 in microfiche.
Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-060, August 1976. 128 p, 5 tab, 52 fig, 91 ref, append.

Descriptors: *Mercury, *Metals, Streams, *Food chains, Aquatic animals, Water pollution, *Aquatic algae, *Aquatic microbiology, Sediments, Freshwater, Fishes, Invertebrates, Aquatic populations, Fish food organisms, *Periphyton, Laboratory tests, Methodology, Aquatic insects, Water pollution effects, Bioassay.
Identifiers: *Artificial streams, *Total mercury analyses, Periphytic communities, Tissue concentration, Periphytic algae, Life stage inhibition, Life stage stimulation, *Benthic insect communities.

Mercuric ion was continuously input to artificial stream channels to provide water concentrations of 0.01, 1.0 and 5.0 ug/l. Channel components were periodically sampled for total mercury analyses. The effects of mercury on the algal components of the periphytic communities and on the benthic insects were determined. The sampling program continued one full year after mercury inputs were stopped. Approximately 15% of the added mercury was removed from the water. The community components acquired very high concentrations of mercury, although in most cases the levels in these were not a linear function of the water levels. Concentrations in invertebrates decreased most rapidly after mercury inputs were stopped while the sediment levels decreased most slowly. Periphytic algae showed several treatment responses including total inhibition, inhibition of certain life stages, possible stimulation of certain life stages and morphological alterations. One species was found only in the treated channels and disappeared when mercury inputs were stopped. The diversity and evenness of benthic insect communities were affected by mercury treatment. (Katz)
W77-08757

EFFECTS OF A SPILL OF MARINE DIESEL OIL ON THE MEIOFAUNA OF A SANDY BEACH AT PICNIC BAY, HONG KONG,
Chinese Univ. of Hong Kong. Dept. of Biology.
A. P. Wormald.
Environmental Pollution, Vol 11, p 117-130, 1976. 3 fig, 4 tab, 19 ref.

Descriptors: Environmental effects, *Toxins, *Water pollution effects, Populations, *Oil spills, *Copepods, *Oil pollution, *Biological communities, Beaches, *Nematodes, Invertebrates, Oil, Food chains, Sediments, Water pollution, Sampling, On-site data collections, Tropical regions, Mortality.
Identifiers: *Picnic Bay(Hong Kong), *Marine diesel oil, *Meiofauna, *Harpticoids, Recolonisation.

The meiofauna of littoral sandy beaches in Picnic Bay, Hong Kong, was almost totally destroyed within four days of pollution by a heavy marine diesel oil in November, 1973, and recovery was monitored over the following 14 months. A few nematodes reappeared within one month of the spill but harpacticoids did not return in any numbers for 8 months, by which time the oil content had decreased by 50%. Apparently normal populations were established by September, 1974, the lower shore supporting much larger numbers than the steeper, coarser and drier upper shore. By January, 1975, Picnic Bay supported larger meiofauna communities than an unaffected shore, although numbers are lower than reported elsewhere at these latitudes. (Katz)
W77-08760

TOXICITY OF INTERMITTENT CHLORINATION TO BLUEGILL, LEPOMIS MACROCHIRUS: INTERACTION WITH TEMPERATURE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
M. L. Bass, and A. G. Heath.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 4, p 416-423, April 1977. 2 fig, 3 tab, 11 ref.

Descriptors: *Toxicity, *Lethal limit, *Mortality, *Water temperature, *Chlorine, *Sunfishes, *Stress, Fish behavior, *Bioassay, *Heated water, Thermal pollution, *Chlorination, Water pollution sources, Water pollution effects, Environmental effects, Powerplants.
Identifiers: *Lepomis, *Sublethal effects, LT50, LC50.

Juvenile bluegills (Lepomis macrochirus) were held in test aquaria at 6, 15, 25 and 32C and were exposed to chlorine concentrations of 0.21, 0.31, 0.41, and 0.52 mg/l, three times a day for seven days. This was to simulate the intermittent release of chlorine into streams or lakes from power plants. Although no deaths occurred at 0.2 mg/l peak total chlorine, the behavior of fish at the two highest temperatures indicated that they were under stress. A distinct threshold of 0.3 mg/l peak total chlorine was observed, at which chlorine becomes toxic to bluegills. A notable temperature effect was found at peak total chlorine of 0.52 mg/l where the LT50 was 74 h at 6C and decreased to about 20 h at 32C. The 96 h LC50 was approximately 0.40-0.45 mg/l peak total chlorine at all four temperatures. Most of the total residual chlorine was in the free form which has a greater toxicity that combined chloramine forms. (Katz)
W77-08761

PHYTOPLANKTON STANDING CROP AND SEWAGE NUTRIENT ENRICHMENT ALONG THE CENTRAL COAST OF LEBANON,
American Univ., Beirut (Lebanon). Dept. of Biology.
J. T. Hardy, and Z. Jubayli.
Environmental Pollution, Vol 11, p 195-202, 1976. 1 tab, 3 fig, 14 ref.

Descriptors: *Primary productivity, *Biomass, *Standing crops, *Phytoplankton, *Domestic wastes, *Sewage effluents, *Seasonal, *Chlorophyll, *Ammonia, *Nitrates, *Nitrites, *Phosphates, *Nutrients, *Productivity, Sewage disposal, Water pollution effects, Environmental effects, Nitrogen compounds, On-site data collections, Sampling.

Identifiers: *Lebanon.

Surface nearshore water samples from seven stations along the central coast of Lebanon were analysed at different seasons for concentrations of nitrate, nitrite, ammonia, phosphate, and chlorophyll-a standing crop. Concentrations of nutrients and chlorophyll-a are higher with a 10 km long coastal zone south of Beirut and increase with decreasing distance from two major untreated sewage outfalls. In some cases, chlorophyll-a standing crops near outfalls are about 10 times greater (at 2.18 mg per cubic meter) than unenriched stations further south or than values reported from elsewhere in the eastern Mediterranean. Near outfalls, concentrations of phosphate, ammonia, and chlorophyll-a tend to be greatest in summer, while nitrate is highest in winter. Preliminary measurements by carbon-14 assimilation indicate that the enriched coastal region has a higher rate of primary production than the unenriched area more than 10 km south of Beirut. (Katz)
W77-08762

FATE OF LABELED N-ALKANES IN THE BLUE CRAB AND STRIPPED MULLET,
University of Southern Mississippi, Hattiesburg. Dept. of Biology.
P. C. Geiszler, B. J. Grantham, and G. J. Blomquist.
Bulletin of Environmental Contamination and Toxicology. Vol 17, No 4, p 463-465, April, 1977. 2 fig, 1 tab, 12 ref.

Descriptors: *Metabolism, *Absorption, *Organic compounds, *Path of pollutants, *Bioassay, *Crabs, *Mullet, *Tracers, Invertebrates, Marine fish, Laboratory test, Analytical techniques, Radiochemical analysis.
Identifiers: *Mugil, *Callinectes, *Tissue analysis.

To examine the differences in the metabolic capabilities of invertebrates and fish, a study on the uptake, discharge and metabolism of long chain n-alkanes in the blue crab Callinectes sapidus and the stripped mullet Mugil cephalus was undertaken. Organisms were exposed to the hydrocarbons either in the test water or by introduction into the digestive tract. After exposure to labeled n-tricosane for 24 hours, an average of 52,000 cpm of labeled hydrocarbon per crab was taken up. Little was retained with averages of 14,000 cpm, 9,000 cpm and 4,000 cpm after 3, 7, and 14 days, respectively. Blue crabs did not metabolize n-alkanes. In contrast, n-alkanes taken up via the digestive tract in mullet were readily metabolized, probably via microorganisms in the gut. More limited metabolism was observed in mullet when n-alkanes were taken up via the gills. (Katz)
W77-08764

TOXICITY TO FISH OF FLAME RETARDANT FABRICS IMMERSED IN THEIR WATER. PART I,
Cornell Univ., Ithaca, N.Y., Dept. of Veterinary Pathology.
G. A. Maylin, J. D. Henion, L. J. Hicks, L. Leibovitz, and V. D. Ahrem.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 4, p 499-504, 1977. 3 tab, 6 ref.

Descriptors: *Toxins, *Toxicity, *Bioassay, *Mortality, *Inhibitors, *Bromine, *Phosphorus compounds, *Fish physiology, Laboratory test, Enzymes, Biochemistry, Freshwater fish.
Identifiers: *Flame retardants, *TDBPP, *Tris, *Carassius, Goldfish.

A number of commercial and candidate flame retardants were studied with regard to their toxicity to fish when released from fabrics immersed in their water. Immersion of laundered or unlaundered flame retardant 100% polyester or polyester blend fabrics used in children's sleepwear in water containing goldfish (Carassius auratus) resulted in release of the anticholinesterase flame retardant TDBPP (tris (2,3-dibromopropyl) phosphate) and death of all fish within 24 hours. TDBPP undergoes loss of HBr in water and production of a metabolite. (Katz)
W77-08765

THE RESIDUAL OXYGEN BIOASSAY: A RAPID PROCEDURE TO PREDICT EFFLUENT TOXICITY TO RAINBOW TROUT,
E. V. S. Consultants Ltd., Coquitlam, (British Columbia).
For primary bibliographic entry see Field 5A.
W77-08766

COMPILATION OF TEMPERATURE PREFERENCE DATA,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 7C.
W77-08767

APPLICATION OF TEMPERATURE PREFERENCE STUDIES TO ENVIRONMENTAL IMPACT ASSESSMENT,
Ecological Analysts, Inc., Melville, N.Y.
J. J. Gift.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 746-749. 25 ref. 1977.

Descriptors: *Fish physiology, *Fish behavior, *Thermal pollution, Water pollution effect, Habitat, Laboratory tests, On-site-investigation, Environment, Environmental effects, Thermal power, Thermal power plants, *Thermal water, *Methodology.
Identifiers: *Temperature preference studies, *Environmental impact assessment, *Preference, *Avoidance, Power plant siting.

Increasing use of laboratory and field temperature preference and avoidance data in power plant siting and environmental impact assessment studies has created a need for evaluation and standardization of methodologies. Relevant considerations and applications are discussed. (Katz)
W77-08768

THERMAL ACCLIMATION, UPPER TEMPERATURE TOLERANCE, AND PREFERRED TEMPERATURE OF JUVENILE YELLOWTAIL SNAPPERS, OCVURUS CHRVSURUS (BLOCH) (PISCES: LUTJANIDAE),
Auburn Univ., Ala., Dept. of Fisheries and Allied Aquacultures.
R. K. Wallace, Jr.
Bulletin of Marine Science, Vol. 27, No. 2, p. 292-298, 1977 1 tab., 3 fig., 27 ref.

Descriptors: *Thermal pollution, *Water temperature, *Thermal stress, Thermal water, Bioassay, Laboratory tests, *Mortality, Fish physiology, Fish behavior, Marine fish, Water pollution effects, *Lethal limit, Juvenile fish.
Identifiers: *Thermal acclimation, *Thermal tolerance, Yellowtail snappers, Ocvurus, *Lethal temperature, *Upper thermal tolerance, Lethal temperature, Lower temperature limit, *Preferred temperature.

The rate of acclimation and temperature tolerance of juvenile yellowtail snappers, Ocvurus chrvsurus (Bloch) was tested using the method of sudden exposure to elevated temperature. Acclimations of upto 10 days at various temperatures did not significantly change the 24-hour lethal temperature from that of a 1-day acclimation. Upper thermal tolerance was tested after 3-day acclimations at 20, 24, 28, 30, and 32C. Lethal temperatures (for a 7-day exposure) ranged from 32.6C at a 20C acclimation to 35.5C at a 32C acclimation. No significant relationship was found between acclimation temperature and lethal temperature. The ultimate lethal temperature was estimated to fall between 33.5 and 34C. Acclimation significantly raised resistance times at test temperatures of 34 and 35 An upper thermal tolerance polygon of 108.8 un was constructed by arbitrarily considering 18C the lower temperature limit for juvenile yellowt snappers. Preferred temperature was tested by a climating and then exposing fish to a horizon temperature gradient. Acclimation altered t mean preferred temperature, but the preferr temperature remained within the range norma encountered (24-30C) by O. chrysurus. (Katz)
W77-08769

LABORATORY METHODS FOR DETERMI ING TEMPERATURE PREFERENCE,
Wilfrid Laurier Univ., Waterloo(Ontario). Dept. Biology.
R. W. McCauley.
Journal of the Fisheries Research Board Canada, Vol. 34, p. 748-752, 1977. 247 ref.

Descriptors: Laboratory tests, Laboratory equ ment, *Fish physiology, *Fish behavi *Methodology, *Water temperature, Thermal p lution, Thermal properties, Thermal stratificati *Thermal stress, Water pollution effects.
Identifiers: Thermal gradients, *Preferred te perature, Thermoregulation, *Gradient devic Linear gradient, Tanks, Vertical gradients, Boo temperature telemetry, Calorimet *Acclimation.

Different types of temperature-gradient devic used in the laboratory to determine temperatu preferences of fish are classified and reviewe The type of device used seems to have less effe on experimental results than do other variabl such as age, size, season, physiological state, social interactions. (Katz)
W77-08770

METHOD FOR DETERMINING ACUTE TO ICITY OF AN ACID WASTE AND LIMITIN PERMISSIBLE CONCENTRATION AT BOU DARIES OF AN OCEANIC MIXING ZONE,
EG and G Environmental Consultants, Waltha Mass.
C. D. Rose, W. G. Williams, T. A. Hollister, and R. Parish.
Environmental Science and Technology, Vol. No. 4, p. 367-371, April 1977. 3 tab., 3 fig., 10 ref.

Descriptors: *Sea Water, *Toxicity, *Acid water, *Mortality, *Hydrogen ion concentratio *Lethal limit, *Methodology, *Acid-base equilib um, *Acidity, *Alkalinity, *Mixing, *Water qua ty control, Bioassay, Water quality, Alkali water, Neutralization, Saline water, Laborato tests, Water pollution control.
Identifiers: *Acid wastes, Acartia.

A new method is described for determining mo tality of bioassay organisms attributable to acid and nonacidic constituents of an acid waste a for using these measurements to derive a limiti permissible concentration for the whole waste boundaries of an oceanic mixing zone. The meth reports mortality attributable to the acidic co stituent in terms of its direct cause--hydrogen i concentration of bioassay water. Titration of ac waste into a representative sample of seawat from the mixing zone is then performed to obtain limiting permissible concentration for the who waste that recognizes the dominant role neutralization in reducing concentration and to icity of the acidic constituent in the zone. T method, which is demonstrated for a by-produ hydrochloric acid with the copepod Acartia ton as the bioassay organism, can be modified for us with alkaline wastes. (Katz)
W77-08771

THE EFFECT OF THE IMPOUNDMENT O LAKE KAINJI, NIGERIA, ON THE I DIGENOUS SPECIES OF MORMYRID FISHES
Reading Univ. (England). Dept. of Zoology.
B. F. Blake.

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reshwater Biology, Vol. 7, p. 37-42, 1977. 2 tab., fig., 6 ref.

escriptors: *Impoundments, *Rivers, *Lakes, Fish populations, *Biological communities, Environmental effects, *Seasonal, On-site data ollections, Fish reproduction, Sampling, Nocturnal, Commercial fish.
dentifiers: *Mormyrids, *Species composition, Lake Kainji(Nigeria), *Niger River, Gnathonemus.

hanges in the numbers and species composition f mormyrid fishes since the impoundment of the iger (Lake Kainji) are analysed. An initial ecline after impoundment appears to have been eversed and these fish are now increasing. The increase is, however, restricted to a few species nly; many forms common to the river are still eclining or have disappeared altogether. Marked easonal variations in abundance are described nd possible explanations discusses. (Katz)
W77-08772

OXICITY, ACCUMULATION, AND RELEASE OF THREE POLYCHLORINATED APHTHALENES (HALOWAX 1000, 1013, AND 099) IN POSTLARVAL AND ADULT GRASS HRIMP, PALAEMONETES PUGIO,
exas A and M Univ., College Station. Dept. of iology.
. A. Green, Jr., and J. M. Neff.
ulletin of Environmental Contamination and oxicology, Vol. 17, No. 4, p. 399-407, April 1977. tab., 2 fig., 13 ref.

escriptors: *Lethal limit, *Toxicity, Absorption, *Bioassay, *Organic compounds, Chlorination, *Water pollution effects, *Shrimp, Mortality, *Growth stages, Laboratory tests, ath of pollutants, Metabolism, Larvae, Invertebrates.
dentifiers: *Polychlorinated naphthalenes, Halowax, *Bioconcentration, Palaemonetes ugio, *Grass shrimp.

dult and postlarval grass shrimp, Palaemonetes ugio, were exposed to Halowax 1000, 1013, and 099, three polychlorinated naphthalenes. In toxicity tests, Halowax 1099 (trichloro-and etrachloronaphthalenes) was more toxic to grass hrimp than Halowax 1000 (monochoro and ichloronaphthalene). Postlarvae were less olerant than adults to Halowax 1099 and 1013, but vere more tolerant to Halowax 1000 than the dults. Halowax 1099 was concentrated in the tissues of adult grass shrimp to a level 257 times greater than the exposure concentration, whereas Halowax 1013 and 1000 reached magnification factors of 187x and 63x, respectively. The degree to which the different compounds were accumulated corresponded to their relative degree of toxicity. This could be directly related to the relative ability of the shrimp to metabolize or excrete PCN's of different chlorine content. (Katz)
W77-08773

A STUDY OF HEAVY METALS IN LAKE ABAYA, ETHIOPIA, AND THE INCIDENCE OF NON-PARASITIC ELEPHANTIASIS,
London Univ. (England). Dept. of Pharmaceutics.
For primary bibliographic entry see Field 5A.
W77-08774

STUDY ON THE POST-MORTEM IDENTIFICATION OF POLLUTANTS IN THE FISH KILLED BY WATER POLLUTION: DETECTION OF ARSENIC,
South Carolina State Coll., Orangeburg. Water Lab.
For primary bibliographic entry see Field 5A.
W77-08775

THE EFFECT OF TWO PESTICIDES, MIEDZIAN 50 AND GESAGARD 50, ON THE DEVELOPMENT OF TADPOLES OF RANA TEMPORARIA,
Polish Academy of Sciences, Krakow. Dept. of Experimental Zoology.
M. Jordan, K. Rzehak, and A. Maryanska.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 3, p. 349-354, 1977. 4 fig., 10 ref.

Descriptors: Animal physiology, *Water pollution effects, *Growth stages, Animal growth, *Immature growth stage, *Frogs, *Toads, Environmental effects, Animal pathology, *Toxicity, *Pesticides, Amphibians, Aquatic animals, Mode of action, Copper compounds, Agricultural chemicals, Pesticide residues.
Identifiers: *Miedzian 50, *Gesagard 50, Rana temporaria, *Tadpoles.

Tadpoles of the frog, Rana temporaria, in two developmental stages were subjected to the action of aqueous suspensions of two pesticides-Miedzian 50 (basic cupric chloride) and Gesagard 50. The changes caused these substances pertain chiefly to the alimentary canal, brain, and muscles, as shown by microscopic inspection of cross-sections, and are connected with the developmental stage of the animals. Miedzian 50 caused a partial cytolysis in the cells of the intestinal epithelium and the parenchyma of the liver. Gesagard 50 was more toxic. Strong degenerative changes were observed in the alimentary canal and the brain. Developmental disorders were also observed, consisting of a partial growth inhibition and a retardation of the process of completion of the operculum as compared with control animals. (Katz)
W77-08776

THE ACCUMULATION OF POLYBOMINATED BIPHENYLS BY FISH,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
V. Zitko.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 3, p 285-292, 1977. 1 fig, 5 tab, 11 ref.

Descriptors: *Bromine, *Halogenated pesticides, *Bioassay, *Absorption, *Salmonids, *Pesticide residues, Aroclor, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Path of pollutants, Laboratory tests, Atlantic salmon, Persistence, Analytical techniques.
Identifiers: *Polybrominated biphenyls, BP-6, OB.

The accumulation of commercial polybrominated biphenyls (PBBs), BP-6 (Michigan Chemical Corporation) and OB (The Dow Chemical Company), from water and from food by juvenile Atlantic Salmon (Salmo salar) was determined and compared with that of Aroclo 1254. Only bromobiphenyls with six or fewer bromine atoms were accumulated from water by the fish. When administered in food, more brominated biphenyls were taken up as well. Bromobiphenyls with up to four bromine atoms resemble corresponding chlorobiphenyls, while the more substituted bromobiphenyls are less accumulated from water than corresponding PCBs. The accumulation of these bromobiphenyls from food is higher or equal to that of Aroclor 1254. The highly substituted bromobiphenyls are debrominated in the fish, a reaction which may have toxicological consequences not encountered with PCBs. (Katz)
W77-08777

EUTROPHICATION OF AN IMPOUNDED ESTUARINE LAGOON,
Tasmania Univ., Hobart (Australia). Dept. of Zoology.
R. E. Buttermore.
Marine Pollution Bulletin, Vol 8, No 1, p 13-15, January 1977. 4 fig, 15 ref.

Descriptors: *Sewage, *Water pollution effects, *Lagoons, *Estuaries, *Eutrophication, *Impoundments, *Odor, *Odor-producing algae, *Decomposing organic matter, *Water quality, *Mussels, Aquatic productivity, Biological communities, Mollusks, Fishkills, Crustaceans, Heavy metals, Agricultural runoff, *Australia.
Identifiers: *Estuarine lagoon, *Tasmania.

A small lagoon to the east of Hobart is cut off from a larger body of tidal salt water by a causeway, allowing only a limited tidal interchange. Primary treated effluent from a small township is discharged into the lagoon. Causes for noxious odors emanating from the lagoon were investigated. It was found that the effluent, combined with agricultural runoff, has accelerated eutrophication. Wide variations in temperature and salinity occur. Decomposing algal mats account for most of the odors, while rooted aquatics and molluscs appear to play only a small part. Proposed remedies will be costly and still might not achieve their objectives. (Katz)
W77-08778

DEVELOPMENT OF A BLOOD SUGAR BIOASSAY FOR RAPIDLY MEASURING STRESSFUL LEVELS OF PULPMILL EFFLUENT TO SALMONID FISH,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
For primary bibliographic entry see Field 5A.
W77-08779

AVOIDANCE OF BLEACHED KRAFT PULPMILL EFFLUENT BY PINFISH (LAGODON RHOMBOIDES) AND GULF KILLIFISH (FUNDULUS GRANDIS),
Florida State Univ., Tallahassee. Dept. of Biological Sciences.
F. G. Lewis, III, and R. J. Livingston.
Journal of the Fisheries Research Board of Canada, Vol 34, p 568-570, 1977. 1 fig, 12 ref.

Descriptors: *Fish behavior, Fish physiology, *Water pollution effects, Laboratory tests, *Industrial wastes, *Pulp wastes, *Pulp and paper industries, Methodology, Laboratory technique, *Killifishes, Statistical methods.
Identifiers: *Bleached kraft pulpmill effluent, *Gradient trough, *Avoidance, Gulf killifish, Steep gradient trough, *Avoidance response, *Pinfish.

Avoidance of bleached kraft pulpmill effluent (BKME) by fish was investigated in a steep gradient trough. No significant difference was found between the responses of the two species. No avoidance was recorded at 0.01% BKEM, while both species displayed a significant, yet low avoidance at 0.1% BKME. A marked avoidance was observed for both species at 1.0% and 10.0% BKME. In both species the threshold avoidance level was estimated to be 0.06% BKME. (Katz)
W77-08780

STUDIES ON MERCURY CONTENT IN SELECTED FISH SPECIES FROM POMERANIAN GULF AND SZCZECIN FIRTH (BADANIA NAD ZAWARTOSCIA RTECI OGOLNEJ W WYBRANYCH GATUNKACH RYB ZATOKI POMORSKIEJ I),
Institute of Marine Food Technology, Szczecin (Poland).
A. Chodyniecki, M. Kurpios, M. Protasowicki, A. Ociepa, and J. Juran.
Acta Ichthyologica et Piscatoria, Vol 5, No 1, p 51-57, 1975. 1 tab, 2 fig, 16 ref.

Descriptors: *Mercury, *Absorption, *Heavy metals, *Path of pollutants, *Eels, *Herrings, Public health, Water pollution control, Industrial wastes, Marine fish, Biochemistry, Physiology.
Identifiers: Bioconcentration, Tissue analysis, Muscle tissue, *Cod, Gadus, Clupea, Anguilla,

Lucioperca, *Poland, Pomeranian Gulf(Poland), Szezecin Firth(Poland).

Determinations were made on mercury content in muscles of cod and herring from Pomeranian Gulf and of pikeperch and eel from Szczecin Firth. Additionally, the level of Hg was measured in liver and kidneys of selected cod and herring. Mercury content in muscle tissues ranged from 0.00 to 0.37 mg/kg with the highest concentrations found in two eels and two pikeperch, at 0.25, 0.37, 0.35 and 0.21 mg/kg, respectively. The highest average mercury content was 0.11 mg/kg found in eel muscle tissue. Mercury accumulation in cod and herring livers was higher than in muscle tissues. Mercury accumulation in herring kidney was 1.5 times higher than in muscles. (Katz)
W77-08781

THE INFLUENCE OF SOME POLLUTANTS ON THE SURVIVAL OF EGGS AND LARVAE OF TWO SPECIES OF FLATFISH, LIMANDA YOKOHAMAE AND PARALICHTYS OLIVACEUS, (IN JAPANESE),
Y. Yasunaga.
Bulletin of the Tokai Regional Fisheries Research Laboratory, No 86, p 81-112, 1976. 5 tab, 15 fig, 17 ref.

Descriptors: *Larvae, Pollutants, *Toxicity, *Water pollution effects, *Mortality, *Fish eggs, *Lethal limit, *Mercury, *Bioassay, *Phosphates, *Sulfates, Ammonium salts, Hydrogen ion concentration, Growth stages, Surfactants, Phenols, Nitrates.
Identifiers: Limanda, Paralichtys, *Flatfish, Japan.

Laboratory tests were conducted to determine the toxicity and effects of various pollutants on eggs and larvae of flatfish species, Limanda yokohamae and Paralichtys olibaceus. In addition, relationship between survival and hydrogen ion concentration was examined. The TLM values for phosphate ion, nitrate ion and phenol ranged between 100-1, 100 ppm. Ammonia ion, sulphate, mercury and anionic surface active agent were found to be fairly toxic with TLM values ranging between 0.05-0.5 ppm. Nonionic surface active agent was mildly toxic to larvae but it caused a high rate of deformity in hatching even at low concentrations of 10-15 ppm for L. yokohamae and of 0.05 ppm for P. olivaceus. (Katz)
W77-08782

POLYCHLORINATED BIPHENYLS IN ADULT MAYFLIES (HEXAGENIA BILINEATA) FROM THE UPPER MISSISSIPPI RIVER,
Fish and Wildlife Service La. Crosse, Wis. Fish Pesticide Research Unit.
W. L. Mauck, and L. E. Olson.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 4, p 387-390, April 1977. 1 fig, 10 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclor, *Path of pollutants, *Food chains, *Mississippi River, *Mayflies, *Pesticide residues, *Absorption, *Bioindicators, Invertebrates, Aquatic insects, Food webs, Pollutant identification, Public health, Fish food organisms.

The burrowing mayfly (Hexagenia bilineata), an important natural fish food in the upper Mississippi River, was collected from 14 sample sites to determine levels of the PCB, Aroclor 1254. Adult mayflies from all stations contained significant residues of Aroclor 1254 with the highest concentrations (about 2.5 micrograms per gram, whole body weight) in mayflies collected from Lake Pepin. Similar trends were found in fish collected from the same stations, sugesting the contribution of mayflies to PCB levels in fish by way of the food chain. The adult mayfly may be a useful indicator of chemical residue trends in the Upper Mississippi because of its abundance and ease of collection. (Katz)
W77-08783

ACID MINE DRAINAGE (AMD) AND ITS IMPACT ON A SMALL VIRGINIA STREAM,
Virginia Polytechnic Inst. State Univ., Blacksburg. Dept. of Civil Engineering.
R. C. Hoehn, and D. R. Sizemore.
Water Resources Bulletin, Vol 13, No 1, p 153-160, February 1977. 2 fig, 15 ref.

Descriptors: *Water pollution sources, *Mortality, *Hydrogen ion concentration, *Acid mine water, *Mine drainage, *Mine wastes, *Benthic fauna, *Iron compounds, *Bioassay, Fish, *Snails, *Toxicity, *Virginia, Acid water, Water pollution effects, Environmental effects, Water quality, Chemical properties, Iron, Pollutants.
Identifiers: *Chestnut Creek(Virginia).

A study was conducted to chemically characterize three AMD streams entering Chestnut Creek in southwestern Virginia and to assess the biological and chemical alterations in the creek. Over a six mile reach, the benthic macroinvertebrate population was reduced to zero, the natural low alkalinity (25 mg/1) of the stream was reduced to less than 5 mg/1, and the pH was reduced from 7.2 to 6.3. Increased concentration of iron from less than 0.01 mg/1 to more than 4.0 mg/1 was accompanied by the deposition of a coating of iron hydroxide up to 0.25 inches thick in the stream bed, which is probably responsible for the absence of benthic macroinvertebrates. In situ bioassays with bluegill sunfish and one snail species showed that the creek water, after confluence with AMD streams, was not toxic in 192 hours to fish, and snails survived 96 hours before they began to die. Undiluted AMD was highly toxic. (Katz)
W77-08784

EFFECTS OF DIPOTASSIUM ENDOTHALL ON ROOTED AQUATICS AND ADULT AND FIRST GENERATION BLUEGILLS,
Wisconsin Dept. of Natural Resources, Woodruff.
S. L. Serns.
Water Resources Bulletin, Vol. 13, No. 1, p. 71-80, February 1977. 5 tab., 15 ref.

Descriptors: *Sunfishes, *Aquatic plants, *Fish reproduction, *Growth rates, *Herbicides, *Growth stages, Path of pollutants, Pesticide residues, *Aquatic weed control, Pesticides, Absorption, Mortality.
Identifiers: *Endothall, Myriophyllum, Ceratophyllum, Potamogeton, Anacharis.

A 0.31-ha pond was treated with 5.0 mg/1 dipotassium endothall and the effects of this treatment on the rooted aquatics, on bluegill reproduction, survival, and growth, and on the buildup of endothall residues in bluegill flesh was investigated. The treatment eliminated Myriophyllum exalbescens, Ceratophyllum demersum, Potamogeton crispus, and Anacharis canadenis during the first season, however, all but C. demersum became reestablished the following year. Little endothall was incorporated into edible bluegill flesh. The dipotassium endothall did not affect the number of young-of-the-year bluegills produced by the original adult stocking during the year of treatment and the year following treatment and did not affect the reproduction of first generation bluegills. The survival of adult and first generation bluegills was not affected by the herbicide. Bluegills were slower growing in the treatment than the control pond, when similar densities were present in each pond. It is not known whether this was due to some unknown effect of the dipotassium endothall or to other factors. (Katz)
W77-08785

EFFECTS OF SUBLETHAL CONCENTRATIONS OF THE HERBICIDE ATRAZIN ON GROWTH AND REPRODUCTION OF DAPHNI PULEX,
Freiburg Univ. (West Germany). Limnologische Institut.
U. Schober, and W. Lampert.
Bulletin of Environmental Contamination an Toxicology, Vol. 17, No. 3, p. 269-277, 1977. 5 fig 4 tab., 7 ref.

Descriptors: *Bioassay, *Bioindicators, *Wate pollution effects, Environmental effect *Mortality, *Reproduction, *Herbicides, *Growt rates, Longevity, Laboratory tests, Methodology *Daphnia zooplankton.
Identifiers: *Atrazin, *Sublethal effects.

Young Daphnia pulex were exposed to the herb cide Atrazin, an inhibitor of photosynthesis, in e periments designed to provide information c changes in reproduction and growth at subleth doses. In 28 day tests, reproduction was signif cantly affected at 1 ppm. With increasing Atrazi concentrations growth was reduced as evidence by mean length and carbon concentration. Th greatest reduction (53.7%) occurred between 1 an 5 mg Atrazin/l. Experiments lasting 70 days, th approximate life span of Daphnia, showed no e fect on longevity. Various problems associate with testing for sublethal effects of pollutants a discussed.
W77-08786

CONCENTRATIONS OF PCBS, DIELDRIN AN DDT RESIDUES IN MARINE ANIMALS FRO LIVERPOOL BAY,
Liverpool Univ. (England). Dept. of Oceano raphy.
J. P. Riley, and S. Wahby.
Marine Pollution Bulletin, Vol. 8, No. 1, p. 9-1 January 1977. 2 tab., 11 ref.

Descriptors: *Polychlorinated biphenyl *Dieldrin, *DDT, *Absorption, *Sewage sludg *Sewage disposal, *Mollusks, *Benthic faun *Crustaceans, *Pesticide residues, *Marine fis Chlorinated hydrocarbon pesticides, Path of poll tants, Bays.
Identifiers: *Liverpool Bay(England *Bioaccumulation, Irish Sea.

The levels of DDT residues, dieldrin and PC have been determined in the tissues of fifteen sp cies of marine animals from the Liverpool Ba area of the Irish Sea. In general, the concentr tions of these compounds are lower than those r ported earlier for fish from other British insho areas, depsite the fact that the Bay is subject pollution, not only from the River Mersey, b also from extensive sewage sludge dumping. Th level of the compounds in the sampled organism were below those which present a hazard to ma These low levels may reflect recent controls on th use of these compounds.
W77-08788

SOME EFFECTS OF OIL DISPERSANTS O THE FEEDING BEHAVIOUR OF THE BROW SHRIMP, CRANGON CRANGON,
Southampton Univ. (England). Dept. of Oceano raphy.
G. W. Evans, M. Lyes, and A. P. M. Lockwood.
Marine Behaviour and Physiology, Vol. 4, p. 17 181, 1977 4 fig, 12 ref.

Descriptors: *Oil, *Oil pollution, *Water pollutio effects, *Shrimp, Marine animals, Commerci shellfish, *Animal behaviour, Animal physiolog Feeding rates, Bioassay, Laboratory tests, *O spills.
Identifiers: Brown shrimp, Crangon, *Oil dispe sants, *Tween 80, *BP 1100X, *Slickgone LT Food detection, Food consumption.

Concentrations in the range 1 ppm - 100 ppm Tween 80, BP 1100X and Slickgone LT2 in s water are shown to decrease both the food co

sumption of the shrimp, Crangon crangon, and the ability of the animal to select the arm of a Y-maze which contains food extract. The ability to locate food is largely recovered within four hours of return of the animals to clean sea water after prior exposure to 10 ppm Tween 80, 10 ppm BP 1100X or 10 ppm Slickgone LT2. (Katz)
W77-08790

EFFECTS OF A PARASITE, EUBOTHRIUM SALVELINI (CESTODA: PSEUDOPHYLLIDEA), ON THE RESISTANCE OF JUVENILE SOCKEYE SALMON, ONCORHYNCHUS NERKA, TO ZINC,
Fisheries and Marine Service, Nanimo (British Columbia). Biological Station.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 706-709, 1977. 1 fig, 12 ref.

Descriptors: *Zinc, *Metals, *Fish diseases, Water pollution effects, *Sockeye salmon, Toxicity, Salmon, Freshwater fish, Laboratory tests, Lakes, Bioassay, *Fish parasites.
Identifiers: British Columbia, Babine Lake, *Tapeworm, Eubothrium, *Biological stressors, Intestinal cestodes.

Most research to date on the tolerance of natural populations to physical and chemical stressors appears to have overlooked that parasites may themselves be stressors, and that they may be capable of modifying the resistance of the host to other applied stressors. Sockeye salmon (Oncorhynchus nerka) smolts trapped at the outlet of Babine Lake, central British Columbia, were subjected to 1 mg/l dissolved zinc under laboratory conditions. Smolts infected with the intestinal cestode Eubothrium salvelini proved to be significantly more susceptible to zinc than were noninfected smolts. We recommend that future investigations of environmental effects, especially on wild populations, include consideration of the state of parasitism of the test organisms. (Katz)
W77-08791

ALGAL UPTAKE OF COPPER FROM COMPOUNDS AND ITS EFFECT ON SALT METABOLISM IN ALGAE,
Moscow State Univ. (USSR).
V. G. Khobot'yev, V. I. Kapkov, Ye. G. Rukhadze, N. V. Turunina, and N. A. Shidlovskaya.
Hydrobiological Journal, Vol. 12, No. 1, p. 29-34, 1976 2 tab., 1 fig., 7 ref.

Descriptors: *Copper, *Metals, Algae, *Phytoplankton, Biochemistry, Physiology, *Water pollution effects, Path of pollutants, Toxicity, Bioassay, Potassium, Herbicides, *Algicides, *Absorption.
Identifiers: *Algal copper uptake, Copper compounds, *Inorganic copper, Salt metabolism, *Biocides, Protococcal algae, Toxicity mechanism.

The dynamics of algal copper uptake from media containing various copper concentrations was studied. A direct relationship was found between the copper accumulation by the cells and algicidal action of a given compound. The high biocidal activity of copper complexes is due to the ability of the cells to take up large quantities of copper from compounds with a coordination bond between the metal and the ligand. Toxic (0.78 x 10 to the 5th power to 7.8 x 10 to the 5th power M) concentrations of copper complexes disturb salt metabolism in algal cells due to copper accumulation or potassium loss. If the concentration of a copper compound with a coordination bond is 7.8 x 10 to the 5th power M, the content of potassium in the algal cells decreases by 80% within 30 to 60 min. (Katz)
W77-08792

ECOLOGY OF TOXICITY IN MARINE SPONGES,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
G. Green.
Marine Biology, Vol. 40, p. 207-215, 1977 3 tab., 21 ref.

Descriptors: *Toxicity, *Marine animals, North America, Washington, Mexico, Bioassay, *Invertebrates, Geographical regions, Latitudinal studies, Methodology, California, Fish food organisms, Fish diets, Fish diseases, *Fish repellents, *Fish toxins, Marine fish, Fish behavior.
Identifiers: Force feeding experiments, *Sponges, *Sponge species, San Juan Island, Santa Catalina Island, *Toxic sponge extract.

An investigation of the ecology of toxicity in marine sponges from different latitudes on the North American continent was made. Results indicated that toxicity in sponges increased with decreasing latitude. Three of the 34 species (9%) of sponges from San Juan Island, Washington, USA (48oN), were toxic to fishes. Nine of the 44 species (20%) of sponges from Santa Catalina Island, California, USA (33oN), were toxic. Seven of the 11 species (64%) of sponges from Zihuatanejo Bay, Guerrero, Mexico (17oN), were toxic. Twenty-seven of the 36 species (75%) of sponges from La Bianquilla, Veracruz, Mexico (19oN), were toxic. Most of these toxic sponges are openly exposed to fishes. The most common exposed sponges proved to be highly toxic to fishes. Force-feeding experiments conducted with wrasses demonstrated the effectiveness of the toxin of sponges. A hypothesis is proposed which explains the relationship between species diversity of fishes and sponge toxicity with latitude. (Katz)
W77-08793

EFFECT OF THE WATER-SOLUBLE FRACTIONS OF CRUDE, REFINED AND WASTE OILS ON THE EMBRYONIC AND LARVAL STAGES OF THE QUAHOG CLAM MERCENARIA SP.,
Florida State Univ., Tallahassee. Dept. of Oceanography.
C. J. Byrne, and J. A. Calder.
Marine Biology, Vol. 40, p. 225-231, 1977 3 tab., 31 ref.

Descriptors: *Oil wastes, Spills, *Toxicity, Bioassay, Laboratory tests, *Mollusks, *Clams, Marine animals, Embryonic growth stage, *Larvae, Larval growth stage, Water pollution effects, Water pollution sources, Water quality, Methodology.
Identifiers: *Quahog clam, Mercenaria sp., *Crude oil, *Refined oil, *Waste oils, *Water-soluble fractions, Kuwait crude, Southern Louisiana Crude, Florida Jay Crude, LC50, *Used motor oil.

The embryonic and larval stages of the quahog clam Mercenaria sp. were exposed to the water-soluble fractions (WSFs) of 6 oils and the effects on survival and growth rate of the various stages were noted. Kuwait crude oil was the least toxic on initial exposure to both stages, having LC50 values in excess of 10 ppm after continuous exposure to the WSF for up to 6 days. However, at 10 days, Kuwait was slightly more toxic than Southern Louisiana crude oil, with both oils having LC50 values near 2 ppm. Florida Jay crude oil was much more toxic, with an LC50 of less than 1 ppm at 48 h and less than 0.2 ppm at 10 days. Two refined oils, No. 2 fuel oil and Bunker 'C', had LC50 values of 1 to 2 ppm after 48 h, while used crankcase motor oil, the most toxic oil tested, had LC50 values of 0.10 ppm or less at all exposure times. Larvae surviving exposure to water-soluble fractions of the various oils often grew at slower rates than the controls. (Katz)
W77-08794

A CERTAIN MARINE CATENATE DINOFLAGELLATE TENTATIVELY APPLIED FOR DETECTING CARCINOGENS,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
For primary bibliographic entry see Field 5A.
W77-08795

INCORPORATION OF BENZATHRONE INTO THE NUCLEI OF GYRODINIUM SP. AND THE HEREDITY OF CONSEQUENT MITOTIC DELAYS,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
S. Ishio, J. C. Chen, and N. Ohba.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43, No. 3, p. 289-299, 1977 3 tab., 1 fig., 19 ref.

Descriptors: *Organic compounds, Organic waste, *Oil pollution, *Marine algae, *Phytoplankton, Path of pollutants, *Water pollution effects, Biochemistry, Methodology, *Genetics, Nutrients, Herbicides.
Identifiers: *Gyrodinium, Benzathrone-3H, *Bioconcentration, Gyrodinium nuclei, *Mitotic delays, Heredity.

Benzathrone added to ASP2NTA medium was incorporated in a short period, mainly into the thecae and the crude nuclei of Gyrodinium sp. The benzathrone incorporated into purified nuclei was less, but its concentration amounted to 800 times as large as the initial 1 ppm concentration of the medium. Benzathrone in purified nuclei was extremely hard to remove and was presumed to intercalate between DNA base pairs. Since Gyrodinium sp. was separated from the medium containing benzathrone continued to propagate, showing mitotic delays over three to five generations at least in the normal medium, the mitotic delay caused by benzathrone was concluded to be of a hereditary nature. (Katz)
W77-08796

METHOXYCHLOR RESIDUE STUDIES IN CAGED AND WILD FISH FROM THE ATHABASCA RIVER, ALBERTA, FOLLOWING A SINGLE APPLICATION OF BLACKFLY LARVICIDE,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
W. L. Lockhart, D. A. Metner, and J. Solomon.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 626-632, 1977 3 tab., 18 ref.

Descriptors: *On-site-investigation, *Insecticides, *Chlorinated hydrocarbon pesticides, Aquatic insects, Laboratory tests, Rainbow trout, Freshwater fish, Suckers, Minnows, *Monitoring, Water pollution effects, *Toxicity, Bioassay, *Larvicide, *Pesticide residues, Pollutant identification.
Identifiers: *Methoxychlor, *Residue studies, Athabasca River, Alberta, *Blackfly larvicide, Catostomus, Hybopsis, Tissue residue, Pesticide residues.

On June 4, 1974, the Athabasca River was treated with methoxychlor for control of blackfly larvae. Pesticide was introduced into the water in a manner calculated to generate a 15-min pulse of treated water containing 300 microgram methoxychlor/l. A preliminary experiment with rainbow trout (Salmo gairdneri) indicated that liver of kidney residues of methoxychlor would be suitable for monitoring likely times and places to expect toxic effects on fish in the river. Fish (Salmo gairdneri, Catostomus commersoni, C. Catostomus, and Hybopsis gracilis) were caged in order to observe residues and mortality. Caged fish were not killed by methoxychlor but they contained lower liver residues than wild fish of the same species captured near cages. Contaminated wild fish were found upstream of the treatment site after treatment. Residues were below detection limits by

June 16. Residue measurements suggested that the most likely times to expect fish poisoning were the 2 wk following treatment and that the most likely places were those river areas extending a few kilometers in both directions from the point of application. Evidence of fish movements and low pesticide residues in caged individuals reduced confidence in residue methods as monitoring tools. (Katz)
W77-08797

OPTIMAL TEMPERATURE FOR GROWTH OF JUVENILE BLUEGILLS,
Environmental Research Lab-Duluth, Minn.
A. E. Lemke.
The Progressive Fish Culturist, Vol. 39, No. 2, p. 55-57, April 1977 1 tab., 14 ref.

Descriptors: Freshwater fish, *Sunfishes, *Water temperature, *Thermal stress, Laboratory tests, Methodology, Juvenile fish, Bioassay, Water quality, *Growth rates, *Aquiculture, Fish physiology, Statistical methods.
Identifiers: *Constant temperature test, *Specific growth rate.

Juvenile bluegills, Lepomis macrochirus (initial weight, 1.8-8.0 g) were individually marked and fed to excess during a 30-day constant temperature test; day length was 16 h. Fish were tested at temperature intervals of 2 deg. from 20 to 36 C. The highest specific growth rate occurred at 30 C (2.35%/day); however, growth rates of only the groups held at 20 C and 36 C were statistically different from the rate for the group held at 30 C. (Katz)
W77-08798

BEHAVIORAL STUDIES ON CHEMORECEPTION IN BALANUS HAMERI,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.

Descriptors: *Animal behaviour, Animal physiology, Animal populations, Benthos, *Marine animals, *Feeding rates, Feeds, Bioassay, Biochemistry, Methodology, Laboratory tests, *Hydrogen ion concentration, Amino acids.
Identifiers: *Barnacles, Balanus, Amino acids, *Feeding behaviour, Threshold, 1-glutamic acid, Glycine, *Feed response, *Algae extracellular products, *Chemoreception.

Solutions of amino-acid and some related compounds were found to release feeding behaviour in Balanus hameri. The lowest threshold was to a-glutamic acid (2.3 x 10 to the 5th power M) followed by glycine (4.5 x 10 to 5th power M) followed by glycine (4.5 x 10 to the 4th power M). The experiments suggest that the animals can distinguish the isomers of glutamic acid. Strong feeding responses were also obtained from the Iripeptide, reduced glutathione (5 x 10 to the 4th power M). Solutions of glycollic acid, an extracellular product of some algae, were only weakly stimulatory. Acidic and alkaline solutions in the ranges pH 1-3.5 and 9.5-13 also evoked apparent feeding responses, but the pH of the solution had no observable effect in the range of 5-9.5. (Katz)
W77-08799

PHYSIOLOGICAL AND BEHAVIORAL REACTIONS OF FISHES TO TEMPERATURE CHANGE,
Yale Univ., New Haven. School of Medicine.
L. I. Crawshaw.
Journal of the Fisheries Research Board of Canada, Vol 34, p 730-734, 1977. 2 fig, 45 ref.

Descriptors: Fish, *Fish physiology, Fish behavior, *Themal pollution, *Water pollution effects, *Thermal power, Thermal stress, Thermal water, Temperature, Trout, Salmon.
Identifiers: *Temperature change, *Behavioral responses, *Physiological responses, Temperature regulation, *Physiological temperature optima, Acute effects, Peripheral temperature change, *Thermal exchange, Respiratory homeostasis, Thermal acclimation.

Teleost fishes possess a central nervous system thermoregulatory mechanism remarkably similar to that of other vertebrates. Inputs from peripheral and anterior brainstem thermosensitive elements are integrated to effect appropriate thermoregulatory responses. The integrated output signal from the thermoregulatory center also appears to provide an input to the respiratory system. Short-term deviations from a given temperature alter respiratory requirements, produce acid-base imbalance, and cause disturbances in fluid-electrolyte regulation. Acclimation to a given temperature involves changes that counteract these disturbances. (Katz)
W77-08802

EFFECT OF HOT EFFLUENT DISCHARGE FROM THE KONAKOVO POWER PLANT ON THE GROWTH OF BREAM IN IVAN'KOVO RESERVOIR,
Vserossiiskii Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khozyaistva, Moscow (USSR).
G. B. Sappo.
Hydrobiological Journal, Vol 11, No 6, p 43-47, 1975. 3 tab, 2 fig, 14 ref.

Descriptors: *Heated water, *Environmental effects, *Growth rate, *Water pollution effects, *Water temperature, *Freshwater fish, *Biomass, *Metabolism, Temperature, Fish reproduction, Powerplants, *Thermal pollution, Thermal water, Populations, Adaptation, Benthos, Feeding rates.
Identifiers: *Bream, *Ivan'kovo Reservoir(USSR).

The effect of a heated water effluent on the growth rate of bream in the Ivan'kovo Reservoir was determined by sampling fish from control stations, from a station strongly affected by the heated water and from a station slightly affected by the heated effluent. The most rapid growth rate was found in fish from the area slightly affected by heated water, followed by fish from the control area. The fish with the slowest growth rate came from the area strongly affected by heated water. Even though this group of fish showed a higher feeding rate and the biomass of benthos was greater, the increased metabolic rate due to high temperatures were not satisfied by the food intake. Bream in areas with higher water temperatures were found to mature at smaller sizes. (Katz)
W77-08803

THE EFFECT OF WARM EFFLUENT FROM THE NOVOROSSIYSK THERMAL POWER PLAN ON ZOOPLANKTON,
Kuban State Univ., Novorossisk (USSR). Marine Biology Research Station.
L. I. Goryaynova.
Hydrobiological Journal, Vol 11, No 6, p 19-23, 1975. 2 tab, 9 ref.

Descriptors: Populations, *Biomass, *Zooplankton, *Heated water, *Seasonal, *Water temperature, Water pollution effects, *Larvae, *Copepods, Environmental effects, *Thermal pollution, Bays, Powerplants, Temperature, Invertebrates, Plankton.
Identifiers: *Black Sea, *Species composition, *Novorossiysk Bay(Black Sea).

Novorossiysk Bay in the Black Sea was the site of an investigation to determine the yearly pattern of species composition and distribution of zooplankton in a thermal powerplant discharge. The mean annual temperature in the area near the discharge of the heated effluent was 1.30C higher than at the control station. During the winter season the species composition of the zooplankton in the effluent zone was more diverse that at the control station. In the spring 17 species of zooplankton were found in the effected areas as compared to 11 species in the control area. In the summer and fall more species were found in control areas because 'cold-loving' species avoided warmer water. A higher concentration of copepod nauplii and larvae of bottom organisms was observed in the warm-water zone. The average annual abundance and biomass of the zooplankton in the warm water zone was almost double those at the control station. (Katz)
W77-08804

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATION AREA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 6B.
W77-08805

EVALUATION OF NITRIFICATION IN THE WATER COLUMN OF THE PASSAIC RIVER,
Rutgers - The State Univ., New Brunswick N. J. Dept. of Environmental Science.
M. S. Finstein, J. Cirello, P. F. Strom, M. L. Morris, and R. A. Rapaport.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 859, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, Rutgers University, Water Resources Research Institute, April 1977. 41 p, 4 tab, 16 fig, 20 ref. OWRT A-053-NJ(1), 14-34-0001-7063.

Descriptors: *Nitrification, *Waste assimilative capacity, Water quality standards, *New Jersey, Evaluation, Oxygen demand, Nitrogen cycle, Sampling, Nutrients, Ammonium.
Identifiers: *Nitrifying bacteria, *Nitrogenous biochemical oxygen demand, *Passaic River(NJ), Microbial ecology, Substrate ammonium.

In connection with waste load allocation, it is often controversial whether the nitrogenous oxygen demand measured in the effluent is exerted in the receiving stream. The basis of this controversy is outlined through the use of historic data from the Passaic River, and a consideration of the nitrogen cycle. The experimentation consisted of following the course of nitrification in Passaic River water samples through the dtermination of nitrogen species, and of enumerations of nitrifying bacteria. Based on the course of nitrification, substrate ammonium appears to have been present in non-growth limiting concentrarion over most of the Passaic main stem. Other nutrients were adequate for nitrification, and there was no evidence of inhibitive effects. These findings lead to an expectation of a nitrifier population expansion with downstream travel, which is not observed. This discrepency is ascribed to the removal of cells from the water column through settling. The results are discussed in relation to the controversy.
W77-08813

PRODUCTION AND HEAVY METAL CONCENTRATION OF VASCULAR AQUATIC MACROPHYTES IN THREE EASTERN CONNECTITUCT RIVERS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5B.
W77-08814

DENSITY AND DISTRIBUTION OF BENTHOS IN LAKE KEOWEE, SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Zoology.
G. L. Ryals, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 897, Price codes: A05 in paper copy, A01 in microfiche. Ph.D. Dissertation, December 1975. 78 p, 38 fig, 6 tab, 66 ref. OWRT A-027-SC(1).

Descriptors: *Benthos, *Heated water, *Diptera, Water temperature, Dissolved oxygen,

*Distribution, Density, Lakes, *South Carolina, *Invertebrates, Impoundments, Depth, Seasonal.
Identifiers: *Lake Keowee(SC).

Density and distribution of benthic macroinvertebrates were studied from August 1971, to August 1973, in Lake Keowee, a large newly formed impoundment in northwestern South Carolina scheduled to receive discharges of heated water. The effects of depth, station location, and season on density and taxonomic composition of benthos were examined. Total numbers of benthos varied inversely with depth. Abundance was affected by location of sampling sites within the lake, being lower in the discharge canal and proximal areas than in the intake canal and control areas. Station differences were probably related to variations in the particle size distribution and organic content of the substrate. The differences among substrates resulted from preimpoundment construction activities in the discharge area. Total density generally had 3 peaks, in the spring, summer, and autumn. The dipterous families Chironomidae and Chaoboridae were the major taxa. Chironomids were most abundant at 5 m, and chaoborids were most numerous at 20 m. Temperature, dissolved oxygen, and other water quality parameters did not vary significantly among the stations.
W77-08818

EFFECTS OF HYPOLIMNETIC AERATION ON NITROGEN AND PHOSPHORUS IN A EUTROPHIC LAKE,
Adelphi Univ., Garden City, N.Y.; and Adelphi Univ., Oakdale, N.Y. Inst. of Marine Science.
M. H. Garrell, J. C. Confer, D. Kirschner, and A. W. Fast.
Water Resources Research, Vol. 13, No. 2, p 343-347, April 1977. 3 fig, 4 tab, 11 ref.

Descriptors: *Aeration, *Water pollution control, *Oxygenation, *Lakes, *New York, Eutrophication, Dissolved oxygen, Nutrients, Water treatment, Hypolimnion, Oxygen, Nitrogen, Stratification, Organic loading, Surface waters, Water quality, Limnology.
Identifiers: *Lake Waccabuc(NY), *Lake Oscaleta(NY).

The effects of hypolimnetic aeration on total P, NO3-N, and NH4-N in eutrophic Lake Waccabuc (New York) were described. The lake was aerated for two consecutive summers (1973 and 1974) by using the system described in an earlier paper. Although reductions in hypolimnetic P concentrations appeared in the first summer, the reductions failed to reappear during the second summer. NH4-N and NO3-N concentrations were compared with those in an unaerated control lake. Lake Oscaleta (New York). Very slight changes in relative hypolimnetic NH4-N concentrations and corresponding increases in hypolimnetic N 3-N concentrations were seen. The overall results suggested that the aerated lake is subjected to substantial external loading, which may mask aeration effects on the internal nutrient cycles. (Sims-ISWS)
W77-08824

INLAND WATERS. MONOGRAPHS FROM LIMNOLOGY AND RELATED AREAS, VOL. 26, PART 1. THE ZOOPLANKTON OF INLAND WATERS,
For primary bibliographic entry see Field 2H.
W77-08861

EFFECTS OF TEMPERATURE AND KELTHANE ON GRASS SHRIMP,
California Univ., Davis. Water Science and Engineering Section.
S. Khorram, and A. W. Knight.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 102, No EE5, Proceedings paper No 12475, p 1043-1053, October 1976. 2 fig, 6 tab, 25 ref. (Calif. Water Resources Ctr., Project W243).

Descriptors: *Water pollution effects, *Continuous flow, Model studies, *Bioassay, *Insecticides, *Shrimp, Temperature, Aquatic animals, Pollutant identification.
Identifiers: *Organic chlorides, Keloids.

Proportional continuous-flow bioassay tests were used to determine the effects of temperature and Kelthane (organochlorine) on grass shrimp Crangon survival for exposure periods of 24, 48, and 72 hours under laboratory conditions. All specimens were collected from San Pablo Bay, California. Both elevated temperature and Kelthane concentration had a significant inverse effect on Crangon survival, and the responses to an increase in temperature and Kelthane concentration were strongly interdependent. As temperature increased, the Kelthane concentration lethal to a given percentage of shrimp decreased, and, conversely, as Kelthane concentration increased, the temperature lethal to a certain percentage of population decreased. The results are in general agreement with values reported for other aquatic animals. Sublethal effects of Kelthane on Crangon were also observed. Feeding, molting, and motor control were affected by Kelthane. (Bell-Cornell)
W77-08874

EFFECTS OF TREATED MUNICIPAL WASTEWATER AND COMMERCIAL FERTILIZER ON GROWTH, FIBER, ACID-SOLUBLE NUCLEOTIDES, PROTEIN AND AMINO ACID CONTENT IN WHEAT HAY,
Arizona Agricultural Experiment Station, Tucson.
A. D. Day, Abdul Rahman, F. R. H. Katterman, and Varon Jensen.
J Environ Qual. 3(1), 17-19, 1974.

Descriptors: *Water reuse, *Hay, *Crop response, *Wheat, *Irrigation effects, Fertilization, Crop production, Proteins, Amino acids, Irrigation practices, Irrigation water, Nutrients, Water sources, Arizona.
Identifiers: Fiber, Nucleotides, Triticum aestivum, Treated waste water, Nitrogen utilization.

Experiments were conducted at Tucson, Arizona to study effects of treated municipal wastewater on growth, total fiber, acid-soluble nucleotides, total protein and amino acids in hay from wheat (Triticum aestivum L.). Plant heights and number of culms per plant for wheat grown with wastewater were similar to plant heights and number of culms per plant when wheat was produced with well water and suggested amounts of N, P, and K and when it was grown with well water plus N, P, and K in amounts equal to those in wastewater. Wheat plants grown with wastewater had culms with a larger diameter and a higher total fiber content than did plants produced with the other treatments. Highest hay yields were obtained when wheat was grown with wastewater, followed by hay produced with well water plus N, P, and K in amounts present in wastewater, and hay grown with well water plus suggested amounts of N, P and K, in decreasing order. Wheat plants from the 3 irrigation and fertilizer treatments contained similar amounts of acid-soluble nucleotides. Wheat grown with well water plus N, P, and K in amounts equal to those in wastewater and hay produced with wastewater alone contained similar amounts of total protein, and more protein than did hay grown with well water plus suggested amounts of N, P, and K. Wheat utilized the N in wastewater more efficiently than it used the N in well water plus N, P, and K equal to wastewater. The amino acids alanine, glycine, phenylalanine and tyrosine were present in higher concentrations in wheat hay grown with wastewater than in hay produced with the other 2 treatments. Hay grown with the 3 irrigation and fertilizer treatments contained similar amounts of leucine, proline and threonine. When wheat hay was grown with wastewater, none of the observed amino acids were decreased below the levels at which they were present in hay produced with suggested cultural practices. Treated municipal wastewater was an effective source of irrigation water and plant nutrients for the production of high quality hay from wheat in the Southwest.--Copyright 1974, Biological Abstracts, Inc.
W77-08876

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W77-08900

ANALYSIS OF POLLUTION FROM MARINE ENGINES AND EFFECTS ON THE ENVIRONMENT.
Environmental Control Technology Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W77-08902

A TRANSIENT, TWO-DIMENSIONAL, DISCRETE-ELEMENT, FAR-FIELD MODEL FOR THERMAL IMPACT ANALYSIS OF POWER PLANT DISCHARGES IN COASTAL AND OFFSHORE REGIONS. PART I: GENERAL DESCRIPTION OF THE MATHEMATICAL MODEL AND RESULTS OF AN APPLICATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W77-08905

AN EXAMINATION OF SOME PHYSICAL AND BIOLOGICAL IMPACTS OF DREDGING IN ESTUARIES,
Oregon State Univ., Corvallis. School of Engineering; and Oregon State Univ., Corvallis. School of Oceanography.
L. S. Slotta, D. A. Bella, D. R. Hancock, J. E. McCauley, and C. K. sollitt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 742, Price codes: A12 in paper copy, A01 in microfiche. Interim Progress Report to the National Science Foundation, December 1974. 262 p, 5 tab, 5 append. GI-34346.

Descriptors: *Estuaries, *Water pollution effects, *Environmental effects, *Baseline studies, *Resources development, Dredging, Monitoring, Toxins, Turbidity, Sediments.

The major research achievements of the NSF-RANN dredging research group at Oregon State University for the first 10 months of its activity is reported. The research focuses on 4 major topics: (1) the effects of dredging on estuarine research can be used effectively by user groups, and (4) the development of concepts and techniques for monitoring impacts of dredging and other alterations to estuaries. The various kinds of impacts discussed in the study include: impacts of dredging and marine traffic; impacts of sediment turnover; impacts of sediment physical changes; impacts of turbidity; and impacts of release of toxins from sediments. (Sinha - OEIS)
W77-08918

EFFECTS OF PRIMARY TREATED AND BIOLOGICALLY STABILIZED KRAFT MILL EFFLUENTS ON THE PRODUCTION, BIOMASS AND GROWTH RATES OF JUVENILE SALMONIDS IN THREE STREAM CHANNELS,
Oregon State University, Corvallis, Dept. of Fisheries and Wildlife.
D. L. Borton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 023,

Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Thesis, June 1975. 87 p, 16 fig, 8 tab, 32 ref, 3 append. OWRT B-029-ORE(1).

Descriptors: *Effluents, *Biomass, Fish, *Salmonids, *Pulp wastes, Biochemical oxygen demand, *Juvenile growth stage, *Growth rates, *Trout, Salmon, Lethal limit, Production, Biological treatment, Waste water treatment.
Identifiers: Production rates.

The effects of sublethal concentrations of primary kraft mill effluent and biologically stabilized kraft mill effluent on the biomass, growth rate, and production of cutthroat trout, Salmo clarki, coho salmon, Onchorhynchus nerka, chinook salmon, Onchorhynchus tschawytscha, and brown trout, Salmo trutta stocked in three experimental channels were studied from 1970 through 1973. These experiments were a part of an investigation of the direct and indirect effects of kraft mill effluents on fish growth and production. Three stream channels, 100 meters long and 2 meters wide with 11 riffles and 11 pools, received 12.7 liters per second each of dilution water pumped from the Willamette River during the entire experimental period. Primary KME from the settling lagoon of an Oregon pulp mill entered one of the streams at a rate of 0.75 mg per liter BOD during experimental periods I and II from January 2, 1970 to March 12, 1971. Biologically stabilized KME from the aeration lagoon of the pulp mill entered stream 2 at 0.75 mg per liter BOD during experimental periods III, IV, V, and VI from March 16, 1971 to January 30, 1973. (See also W71-11659)
W77-08921

PHYSICAL AND CHEMICAL PARAMETERS ASSOCIATED WITH PHYTOPLANKTON ABUNDANCE AND PERIODICITY IN A FERTILIZED FISH POND,
Auburn University, Auburn, Alabama, Dept. of Fisheries and Allied Aquacultures.
R. W. Parks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 995, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, March 18, 1975. 52 p, 12 fig, 93 ref. OWRT A-042-ALA(2).

Descriptors: *Phytoplankton, Dissolved oxygen, Alkalinity, Carbon dioxide, Nitrates, Nitrogen, Solar radiation, Light penetration, Wind velocity, Air temperature, Fish hatcheries, *Cyanophyta, Anabaena, Water pollution effects.
Identifiers: Soluble inorganic phosphorus, Die-offs, *Anabaena circinalis, *Microcystis aeruginosa.

Physical and chemical parameters associated with phytoplankton abundance and periodicity were studied in a pond (S-3) at the Auburn University Fisheries Research Unit, Auburn, Alabama, from February 1, 1974 to September 6, 1974. Data involving water temperatures, dissolved oxygen, pH, alkalinity, free carbon dioxide, soluble inorganic phosphorus, nitrate-nitrogen, ammonia-nitrogen, incident solar radiation, light penetration, air temperatures, and wind velocity were recorded. Attempts were made to find correlations between the information obtained from the data and the periodicity and abundance of phytoplankton in S-3. Two species of blue-green algae, Anabaena circinalis (Kutz.) Rab. and Microcystis aeruginosa Kutz. were studied in particular. These two species dominated the phytoplankton population at different times of the year. Several die-offs of these species occurred in which only a portion of their populations died. Factors responsible for these partial die-offs were hypothesized. Chemical factors had little effect on these die-offs, instead the die-offs had a noticeable effect on the chemical parameters. Physical factors were thought to set conditions which eventually lead to the die-offs. It was hypothesized that the lack of wind action allowed surface scums of Anabaena circinalis and Microcystis aeruginosa to form. Other physical factors such as light and temperature then contributed to the death of the algal cells near the surface.
W77-08922

BENTHIC MACROINVERTEBRATES AS INDEXES OF WATER QUALITY IN THE SCIOTO RIVER BASIN, OHIO,
Akron University, Akron, Ohio, Department of Biology.
For primary bibliographic entry see Field 5A.
W77-08925

MINIMUM OXYGEN LEVELS SURVIVED BY STREAM INVERTEBRATES,
Virginia Commission of Game and Inland Fisheries, (Richmond).
E. W. Surber, and W. E. Bessey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 012, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 81, December 1974, (VPI-WRRC-BULL 81). 52 p, 15 fig, 5 tab, 4 ref.

Descriptors: *Invertebrates, Oxygen, *Dissolved oxygen, *Mortality, Water pollution effects, *Ohio, *Bioassay, *Benthic fauna, Mayflies, Stoneflies, *Aquatic insects, Dragonflies, Amphipoda, *Crustaceans, Clams, Snails, Isopods, Crayfish, Caddisflies, Larvae, *Lethal limit.
Identifiers: Damselflies, Alderflies, Water penny, Hellgrammites, Craneflies, Horseflies, Whirligig beetles, *Oxygen level fluctuations.

The objective was to explore, experimentally, the lowest levels of dissolved oxygen that could be tolerated by some of the common invertebrate animals of streams in the Cincinnati area. Most of the bottom animals used in the experiments were collected from riffles of the Little Miami River above Milford, Ohio; the East Fork of the Little Miami above Batavia; the Mad River above Urbana, Ohio; and Mt. Carmel Creek near Mt. Carmel, Ohio. The experiments were carried out in a constant temperature bioassay room of EPA's Robert A. Taft sanitary Engineering Center, Cincinnati, Ohio. Results of all experiments are summarized; specimens used in the experiments, elapsed time of each experiment, the experimental dissolved oxygen, and mortality data are presented. The following species or specimens were investigated: Sphaerium striatinum; Goniobasis livescens; Lirceus fontinalis; Crangonyx setodactylus; Gammarus fasciatus; Cambarus ortmanni; Orconectes rusticus; Stenonema tripunctatum; Stenonema heterotarsale; Stenonema ares; Stenonema vicarium; Stenonema femoratum; Heptagenia maculipennis; Heptagenia flavescens; Leptohlebia; Isonychia bicolor; Ephoron leukon; Hexagenia limbata; Acroneuria lycorias; Neoperla clymene; Phasganophora capitata; Psephenus herrick: Corydalus cornutus; Sialis; Agrion maculatum; Argia moesta; Boyeria vinosa; Anax junius; Plathemis lydia; Hdropsyche slossonae; Tipula abdominalis; Tabanus; Hyalella azteca; and Dineutes.
W77-08926

INDUCED VERTICAL MIXING IN A STRATIFIED IMPOUNDMENT BY A SUBSURFACE WARM WATER DISCHARGE,
Wisconsin University, Madison. Department of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-08929

A PREDICTIVE PHOSPHORUS MODEL FOR LAKES - DEVELOPMENT AND TESTING,
North Carolina University, Chapel Hill, Department of Environmental Sciences and Engineering.
W. J. Snodgrass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 985, Price codes: A15 in paper copy, A01 in microfiche. PhD Thesis, 1974. 309 p, 61 fig, 27 tab, 127 ref, 5 append. OWRT A-074-NC(1).

Descriptors: Phosphorus, Eutrophication, Lakes, *Mathematical models, Cycling nutrients, *Input-output analysis, Seasonal, Water pollution effects, Water pollution sources, Nutrients, *Model studies.
Identifiers: *Phosphorus concentration models. Hydraulic loading.

The main goal was to develop a mathematical input-output model capable of predicting the phosphorus concentration in a lake as a function of mean depth, hydraulic loading, and nutrient loading to the lake. The developed model shows excellent agreement between observed and predicted phosphorus concentrations for lakes with a wide range of mean depths (14-300 m) and hydraulic detention times (1 to 700 yr.). For lakes with oxic hypolimnia, the model is verified to make predictions concerning (1) the P concentration in a lake resulting from a given rate of input of P and (2) the extent of lake improvement which can result from a given reduction in the land-based nutrient loading. Model predictions of the P retention factor are made for hydraulic loadings and mean depths characteristic of a wide range of lakes, and are described by nomographs. Sensitivity analyses indicate that the model is most sensitive, in decreasing order of sensitivity, to the input rate of P, the settling coefficient, and the decomposition coefficient. The model is fairly sensitive to vertical exchange across the thermocline, but quite insensitive to the epilimnetic production coefficient and the epilimnetic depth. Model predictions of temporal trends are compared with observed monthly values for Lake Ontario and Sempachersee and with recovery of Lake Washington after removal of sewage inputs. Model predictions of mass flows between P compartments and the time to reach stable-state are analyzed. Sufficient data for verifying these model predictions are not available. (See also W76-03243) (Stewart-NC State)
W77-08930

TRAP RESPONSES OF THE GRAY SQUIRREL (SCIURUS CAROLINENSIS CAROLINENSIS), RACCOON (PROCYON LOTOR LOTOR), AND OPOSSUM (DIDELPHIS VIRGINIANA VIRGINIANA) TO ENVIRONMENTAL FACTORS IN TWO SWAMP WATERSHEDS OF NORTHEASTERN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 6G.
W77-08936

KINETIC RESPONSE OF PERTURBED MARINE NITRIFICATION SYSTEMS,
Delaware Univ., Newark. Coll. of Marine Studies.
R. F. Srna, and A. Baggaley.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-75-11079, Price codes: A02 in paper copy, A01 in microfiche. Report DEL-SG-13-75, June 1975. Reprint from Journal of the Water Pollution Control Federation, vol. 147, no. 3, March, 1975, p. 472-486, 1 tab, 7 fig, 25 ref.

Descriptors: *Marine bacteria, Marine microorganisms, Microbiology, *Nitrites, *Nitrogen compounds, *Nitrogen cycle, Nitrogen fixation, *Ammonia, Ammonium compounds, *Ammonium salts, Hydrogen ion concentration, Analytical methods, Kinetics, Water pollution effects.
Identifiers: *Ammonium chloride, *Nitrifying bacteria, First-order rate equations, Michaelis-Menten kinetics.

Large, stable, reproducible populations of nitrifying bacteria may be defined and maintained by a daily ammonium chloride input to a bacterial culture. The rate of conversion of ammonium ion and

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rite ion by large populations of nitrifying bac-
ia may be described accurately by first-order
e equations. The first-order rate equations may
combined to provide more general equations
t include consideration of the consecutive na-
e of the nitrification process. Michaelis-Menten
etics may be used to explain the decrease in the
t-order rate constant at high initial concentra-
ns of ammonium or nitrite ions. The tempera-
e, pH, and sulfide ion concentrations signifi-
tly affect the rate of nitrification, while small
nges in salinity, (5 to 8 ppt) do not. (Katz)
7-08946

**XICITY OF FOUR PESTICIDES TO WATER
EAS AND FATHEAD MINNOWS,**
and G, Bionomics, Wareham, Mass.
A. Macek, M. A. Lindberg, S. Sauter, K. S.
xton, and P. A. Costa.
ailable from the National Technical Informa-
n Service, Springfield, VA 22161 as PB-262 912,
ce codes: A04 in paper copy A01 in microfiche.
vironmental Protection Agency, Ecological
search Series, Report EPA 600/3-76-099,
vember 1976. 57 p, 29 tab, 49 ref.

scriptors: *Pesticides, *Toxicity, Bioassay,
eshwater fish, Crustaceans, Daphnia,
oplankton, *Heptachlor, Methodology, Mor-
ty, Fish reproduction, Aquatic animals,
uatic populations, Water pollution effects, Pol-
ant identification.
ntifiers: *Acrolein, *Endosulfan, *Trifluralin,
ute toxicity, Chronic toxicity, Maximum ac-
otable toxicity concentrations, *Fathead min-
ws, Pimephales, *Water fleas.

ximum acceptable toxicant concentration
ATC's) for each pesticide for both species were
imated by measuring survival, growth and
oduction success as indicators of toxic effects.
e MATC for acrolein was estimated to be >16.9
l <33.6 microgram/l for daphnids and >11.4
l <41.7 for fathead minnows, those estimated
heptachlor were >12.5 and <25.0 microgram/l
daphnids and >0.86 and <1.84 microgram/l for
head minnows, those estimated for endosulfan
re >2.7 and <7.0 microgram/l for daphnids and
.2 and <0.4 microgram/l for fathead minnows,
l those estimated for trifluralin were >2.4 and
.2 microgram/l for daphnids and >1.9 and <5.1
crogram/l for fathead minnows. (Katz)
7-08948

**UALITATIVE AND QUANTITATIVE
IANGES IN THE BENTHIC FAUNA OF A
OUT STREAM, THE COUZE PAVIN PUY-
-DOME, CAUSED BY AGRICULTURAL AND
BAN POLLUTION, (IN FRENCH),**
stitut National de la Recherche Agronomique,
ris (France).
Echaubard, and A. Neveu.
n Stn Biol Besse-En-Chandesse 9, p 1-24.
74/1975.

scriptors: *Benthic Fauna, *Agricultural ru-
ff, *Urban runoff, *Tubificids, *Streams, Ef-
ents, Diptera, Water pollution sources,
oneflies, Sewage effluents, Environmental ef-
cts, Biomass, Mayflies, Water pollution effects.
ntifiers: Coleoptera, Couze Pavin, *France,
y-De-Dome, Trichoptera.

e upper reaches of the stream are relatively un-
lluted while the lower reaches receive the ef-
ent from a cheese factory and sewage from the
wn of Besse (France). The benthic fauna was
died over a 3 yr period at a number of stations
th above and below the sources of pollution. Tu-
icids and Chironomids show great abundance
low the sources of pollution. Plecoptera are
undant only above the pollution. The total
omass of benthos in the stream is at a maximum
t below the region where the sewage enters the
er. The diversity of the population is at a
nimum in this area also increasing both up-
stream and downstream. Downstream (n10km) of the sources of pollution the benthic fauna is almost. (Trichoptera, Coleoptera and Ephemeroptera are mentioned.)--Copyright 1977, Biological Abstracts, Inc.
W77-08955

CHIRONOMID FAUNA OF THE UPPER COURSE OF THE ISETI RIVER, (IN RUSSIAN),
Sverdlovskii Selskokhozyaistvennyi Institut (USSR).
G. A. Sokolova.
Gidrobiol Zh. 10(2), p 73-76, 1974.

Descriptors: *Diptera, Rivers, Self purification, Water pollution.
Identifiers: *Orthocladiinae, *Pelopiinae, *USSR(Iselti River).

An investigation of a 175-km stretch of the Iseti River from the source to the city of Kamensk-Ural'skii (Sverdlovsk district, USSR) revealed 51 forms of larva Chironomidae belonging to the subfamilies Chironominae (27 forms), Orthocladiinae (20 forms) and Pelopiinae (4 forms). The chironomid fauna was impoverished at places where waste waters entered the river. With self-purification of the river and its dilution by tributary waters, the species diversity of chironomids increased.--Copyright 1975, Biological Abstracts, Inc.
W77-09048

ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
D. M. Ward.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 193, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Thesis, 1975. 136 p, 5 tab, 14 fig, 70 ref. OWRT A-054-WIS(1), 14-31-0001-3850, 14-31-0001-5050.

Descriptors: *Microbial degradation, Environmental effects, *Oil pollution, *Nitrogen, *Phosphorus, *Wisconsin, Lakes, Organic compounds, Water pollution effects, Bacteria, Biodegradation, *Nutrients.

Nutritionally versatile heterotrophic bacteria inhabit lakes and develop in response to hydrocarbon introduction. However, the response of naturally-occurring oil-degrading microorganisms depends on environmental conditions within a lake. The rate of hydrocarbon biodegradation varied seasonally in Lake Mendota because of temperature limitation in spring and fall and nutrient limitation in mid-summer, and was optimal for only one month during the year. Nutrient limitation was also observed in lakes of varying nutrient content in Vilas County. Relationships between hydrocarbon oxidation rates and temperature or nutrient levels were shown by correlation and experimentally, and optimum conditions were established. Hexadecane oxidation was inhibited in lake water and sediment samples incubated anaerobically. The lack of oxygen also inhibited hexadecane oxidation in the presence of nitrate, a thermodynamically favorable electron acceptor. Acetate and glucose were also found to inhibit hexadecane oxidation in lake water samples. Acetate inhibition was indirectly caused by depletion of nitroglen and phosphorus by acetate-oxidizing bacteria. Glucose inhibition occurred in the presence of excess nitrogen and phosphorus and may result from regulatory interference such as catabolite repression. The presence of oil-degrading bacteria does not ensure rapid removal of oil pollutants in temperate lakes where environmental conditions usually limit hydrocarbon biodegradation. (See also W75-10407)
W77-09059

ENVIRONMENTAL REGULATION OF GAMETOGENESIS IN SCENEDESMUS OBLIQUUS,
Connecticut Univ., Storrs.
J. R. Cain.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 146, Price codes: A05 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1975. 60 p, 5 tab, 9 fig, 48 ref, 2 append. OWRT A-052-CONN(5), 14-31-0001-3507.

Descriptors: *Environmental control, *Algae, *Cultures, *Nutrients, *Nitrogen, *Light, *Temperature, *Water pollution effects, Incubation.
Identifiers: *Gametogenesis, *Scenedesmus obliquus, Laboratory media, Salt concentrations.

The roles of nutrients, light and temperature in regulating Scenedesmus obliquus gametogenesis have been studied in culture. Gametogenesis is inhibited by the presence of nitrogen, but not by the presence of other medium components, at the concentrations found in a routine algal culture medium. Data indicate, however, that gametogenesis is not a response to nitrogen depletion or starvation. Nitrogen concentration in the medium determines the number of cells in the culture which will form gametes, but does not affect the rate of gamete production or time of onset of gametogenesis. Temperatures 30C or higher not only inhibit gamete formation, but are detrimental to survival of gametes formed at lower temperatures. A minimum of 20-24 hours exposure to favorable nitrogen levels and 15C temperature is required before any cells in the culture reach a point of no return for gamete formation. Light stimulates gametogenesis, but is not an absolute requirement, as a small but significant number of cells are capable of producing gametes in the absence of light, under nitrogen concentrations favorable to gametogenesis. The stimulatory effect of light depends upon exposure both early and late in the incubation period for gamete induction. Cultures maintained in the laboratory lose their capacity for gamete formation; evidence indicates that unnaturally high salt concentrations in laboratory media are involved. (See also W77-05314) (de Lara-Conn)
W77-09060

MAN'S EFFECT ON THE FISHES OF THE UPPER SHETUCKET RIVER SYSTEM,
Connecticut Univ., Storrs.
R. M. Goldstein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 094, Price codes: A03 in paper copy, A01 in microfiche. Ph.D. dissertation, 1975. 43 p, 14 tab, 6 fig, 64 ref. OWRT A-052-CONN(8), 14-31-0001-3507.

Descriptors: *Fish populations, *Physiological ecology, *Fish management, Water pollution effects, *Sewage effluents, *Water level fluctuations, *Urbanization, *Silting, Impoundments, Dams, *Connecticut.
Identifiers: *Fish species composition, *Human influence index, Seining, Snorkeling, *Upper Shetucket River system(Conn).

Man's effect on the fishes of the upper Shetucket River System and the effect of the city of Willimantic on fishes were determined by (1) comparing changes in species composition in the four major rivers on the upper Shetucket River system, above and below the city of Willimantic, and growth of fishes above and below the city, with expected trends or values; (2) evaluating historical information on the building of dams, growth of industry and human population, and a present 'human influence index' with relative abundance of selected species; and (3) comparing species composition and a 'human influence index' in the Shetucket River with trends developed from 15 rivers in southern New England. The fishes of all four rivers of the upper Shetucket River system were affected to some degree by man; and the city of Willimantic did affect fish populations

downstream. The effects of fluctuating water levels from power generation at Scotland Impoundment are discussed. This factor may have had greater effects on fish populations below the city of Willimantic in the Shetucket River than any of man's other actions. (de Lara-Conn)
W77-09061

STUDIES OF THE FISH POPULATIONS IN TWO EASTERN NORTH CAROLINA SWAMP STREAMS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W77-09062

HYDROLOGIC CONSIDERATIONS IN DEWATERING AND REFILLING LAKE CARLTON, ORANGE AND LAKE COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-09080

WILLIMANTIC RIVER ORGANISMS GROWN IN MEDIA WITH NATURAL SUBSTRATE LEVELS AS INOCULA FOR ALGAL ASSAYS,
Connecticut Univ., Storrs, Inst. of Water Resources.
F. R. Trainor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 192, Price codes: A01 in paper copy, A01 in microfiche. Completion Report, 1977. 18 p, 13 fig, 1 tab, 1 ref. OWRT A-061-CONN(1). 14-31-0001-6007.

Descriptors: *Algae, Assay, *Carrying capacity, *Nutrients, *Sewage effluents, *Growth rates, *Nitrogen, *Phosphorus, Chlorella, *Connecticut, *Bioassay, Water pollution effects, Pollutant identification.
Identifiers: *Growth media evaluation, *Natural substrate levels, *Nutrient carryover, *Maintenance media, *National test organism, Ankistrodesmus, Selenastrum, *Willimantic River(Conn), *Algal growth.

Field and laboratory studies were utilized in the evaluation of the Willimantic River as a growth medium for Selenastrum, Chlorella, and Ankistrodesmus. The algae were grown in low nutrient water collected above and below the University of Connecticut sewage effluent as well as in the nutrient rich effluent itself. The growth of all three algae (as measured in doublings per day) increased in the effluent medium. Phosphorus, measured as orthophosphate, was the limiting nutrient. The order of algal growth in the nutrient poor water was Chlorella, Selenastrum, and Ankistrodesmus (PO4 = .07-.47 mg.l-1). When nutrient rivch water was used, the order of growth was Chlorella, Ankistrodesmus, and Selenastrum (PO4 = 1.0-5.0 mg.l-1). At extremely high phosphorus (PO4 greater than 5.0 mg.l-1) Ankistrodesmus became the most actively growing alga followed by Chlorella and Selenastrum. Nitrogen effects seem to be secondary. The primary usable nitrogen source in this system was NO3. NH4 has little effect on algal growth at natural levels and becomes toxic at high concentrations. N/P ratios did not adequately define the carrying capacity of this system. Medium 3.6 was evaluated in terms of its suitability as a maintenance medium for the three algae. Lowered nitrogen or phosphorus resulted in Selenastrum death and inconsistent Chlorella and Ankistrodesmus growth. Increased nitrogen or phosphorus resulted in carry-over on all cases. (de Lara-Conn)
W77-09091

EFFECTS OF PRIMARY SEWAGE EFFLUENT FROM THE CITY OF WILLIMANTIC ON THE BENTHIC INVERTEBRATE FAUNA OF THE WILLIMANTIC/SHETUCKET RIVERS,
Connecticut Univ., Storrs.
R. P. Klattenberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 187, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, 1974. 68 p, 10 fig, 12 tab, 47 ref, append. OWRT A-052-CONN(4), 14-31-0001-3507.

Descriptors: Water pollution effects, *Sewage effluents, *Silting, *Benthic fauna, *Invertebrates, *Aquatic fungi, Physicochemical properties, Carrying capacity, Organic loading, Sewage treatment, *Connecticut, Artificial substrates, Sampling, Monitoring, Pollutant identification.
Identifiers: Hester-Dendy samplr, *Willimantic/Shetucket Rivers(Conn).

A year-long water quality sampling program was conducted to evaluate what effects sewage discharge by the Willimantic Sewage Treatment Plant had on the physicochemical characteristics and benthic macroinvertebrates of the Shetucket River, Connecticut. Benthic macroinvertebrates were collected above and below the sewage discharge at sixteen sampling stations using Hester-Dendy artificial substrate samplers. Water quality analysis and the presence of Tricoptera larva indicated the Willimantic/Shetucket Rivers to be affected only marginally by organic loading and temporary heavy siltation, resulting from construction activities at the new treatment plant site. Nutrient enrichment resulted in an abundance of 'sewage fungus' below the sewage treatment plant. A larger population of three taxa of benthic macrofauna (Tendipedidae as a group and two genera of Hydropsychidae) below the sewage treatment plant was attributed to increased carrying capacity associated with the sewage fungus organic matter which the benthic macrofauna could utilize as food. Sampler selectivity seemed to be reflected in the limited benthic fauna collected along the study reach as well as in the high positive relationship between increases in silt collecting on samplers and standing crop biomass. Color illustrations reproduced in black and white. (de Lara-Conn)
W77-09093

THE EFFECT OF THE WILLIMANTIC SEWAGE TREATMENT PLANT ON THE MICROFLORA AND METABOLISM OF THE SHETUCKET RIVER,
Connecticut Univ., Storrs.
E. A. Matson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 183, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 78 p, 14 fig, 14 tab, 98 ref. OWRT A-052-CONN(6), 14-31-0001-3507.

Descriptors: *Aquatic microorganisms, Sewage effluents, Water pollution effects, *Chlorination, *Productivity, River flow, *Coliforms, Aquatic bacteria, Yeasts, *Connecticut, Bioindicators, *Streptococcus.
Identifiers: *Indicator microbial populations, *Dissolved organic carbon, Net community production, *Shetucket River(Conn).

This study was initiated to determine the effects of the effluent of the Willimantic, Connecticut Sewage Treatment Plant (STP), which accounts for an annual average of 1% of river volume, on the indicator microbial populations, dissolved organic carbon (DOC), productivity and metabolism of the Shetucket River. Total fecal coliforms, fecal streptococci, 'plate count' bacteria and yeasts capable of growth at 20 and 37 C were monitored biweekly for 16 months. DOC was measured seasonally and diurnally for one year using the thermal combustion technique. Net community production was measured using the upstream-downstream technique and respiratory estimates were made for fish and invertebrates. The results indicate that during nonchlorination periods, populations of indicator microflora downstream of the treatment plant are substantially higher than those upstream, and are also modified by dilution of the effluent due to seasonal trends in river volume. During chlorination periods downstream populations are generally equal to or less than those upstream. The sewage treatment plant does not significantly affect productivity or metabolism of this otherwise eutrophic river. However, during low river flow in summer, the increased DOC load due to the treatment plant can reduce net community production by half. (de Lara-Conn)
W77-09094

THE EFFECT OF SECONDARILY TREATED SEWAGE ON THE ALGAL POPULATIONS OF THE WILLIMANTIC/SHETUCKET RIVERS,
Connecticut Univ., Storrs.
R. L. Klotz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 172, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 46 p, 10 fig, 1 tab, 77 ref. OWRT A-052-CONN(7), 14-31-0001-3507.

Descriptors: *Algae, *Competition, Sewage treatment, Rivers, Water pollution effects, Bioassay, Pollutant identification, *Connecticut, Sewage effluents, Monitoring.
Identifiers: *Two-membered algal assay, *Attached algae, *Competitive balance, *Sewage treatment effluent, Achnanthes deflexa, Unicellular algae, *Willimantic/Shetucket Rivers(Conn).

Field and laboratory procedures have proven that the secondarily treated effluent from the Willimantic, Connecticut sewage treatment plant influences the composition of the attached algal flora in the Shetucket River. This effect is due to the effluents altering the competitive balance between the two algal species. A unicellular alga completely dominates highly polluted stretches of the river, while Achnanthes deflexa shares dominance with this organism in other areas. The degree of river pollution can be estimated by enumerating the natural standing crops of these two algae. A two-membered assay utilizing these organisms is a sensitive laboratory pollution monitor and a useful predictive tool. (de Lara-Conn)
W77-09096

THE EFFECTS OF WASTEWATER IRRIGATION ON THE ACTIVITIES AND MOVEMENTS OF SONGBIRDS,
The Pennsylvania State Univ., University Park. School of Forest Resources.
J. R. Snider.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 185, Price codes: A03 in paper copy, A01 in microfiche. Master of Science Thesis, March 1974. 41 p, 10 tab, 6 fig, 25 ref, append. OWRT B-059-PA(2), 14-31-0001-3932.

Descriptors: *Song birds, *Return flow, Marking techniques, Nesting irrigation, Waste water disposal.
Identifiers: *Wastewater irrigation, *Mixed-oak forest, Songbird activity, *Shrub cover, *Irrigated sites, Unit of netting time, Aspen-white pine-shrub area, Cat bird, Yellow throat, Song sparrow, Ovenbird, Scarlet tanager, Indigo bunting.

Songbird responses to the irrigation of wastewater appeared to be closely correlated with habitat alterations and changes in food sources and avilability. The mixed-oak area had a higher capture rate on the non irrigated site during the first half of each of the two summers with a change in songbird activity occurring in mid-July. During the second half of the summer in both 1972 and 1973, significantly more birds per unit of netting time were caught on the irrigated site of the mixed-oak forest and this increase in activity appeared to be related

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an increased food supply. On non-irrigation
s in the aspen-white pine-shrub area, a signifi-
tly higher repeat capture rate was recorded for
irrigated site and was primarily due to the
nber of captures of catbirds, yellow throats and
g sparrows. The difference in recapture rate
the three summer residents is an apparent
ponse to the increased amount of shrub cover
he irrigated site. A reduction in songbird use of
irrigated site. A reduction in songbird use of
irrigated site of the aspen-white pin-shrub area
s observed on irrigation days when captures of
v birds per unit of netting time were signifi-
tly higher in the non-irrigated site in 1973. (Sink
nn State).
7-09098

ER HABITAT RESPONSE TO IRRIGATION
TH MUNICIPAL WASTEWATER,
nsylvania State Univ., University Park. Dept.
Biology.
. Dressler.
ailable from the National Technical Informa-
Service, Springfield, VA 22161 as PB-269 166,
e codes: A03 in paper copy, A01 in microfiche.
ster of Science Thesis, June 1973. 29 pp, 8 tab,
ref, append. OWRT B-059-PA(1), 14-31-0001-
2.

scriptors: *Deer, *Irrigation water, *Wildlife,
wage effluents, *Irrigation effects, *Waste
er disposal, Forages.
ntifiers: *Wastewater irrigation, *Deer habitat,
ed-oak stands, Forage production, Pokeweed,
r use, Snow track, Bed count.

ee main points were established concerning the
cts of wastewater irrigation on deer and deer
itat in mixed-oak stands. About the same
ounts of forage appeared to be available during
winter and early spring months on the irrigated
as compared to the non-irrigated site. Second,
l forage production in the summer period was
tly increased by irrigation. However, the bulk
he total forage production was in one species,
eweed, which was a monor component in the
r's diet in this plant community. Similarly the
rient content was reduced because most of the
rients were tied up in the pokeweed. Third,
se changes had no adverse effects in terms of
erring deer use of the irrigated site. Semi-free
ging lead deer used the irrigated site for feeding
ut four times as much as the non-irrigated site.
ed on the evidence of snow track and bed
nt data no indication was found of reluctance
wild deer to use the irrigated site. (Sink - Penn
te)
7-09099

5. Waste Treatment Processes

GH SPEED LIQUID CHROMATOGRAPHIC
ALYSIS OF COBALAMIN PRODUCTIVITY
D DISTRIBUTION IN ACTIVATED SEWAGE
UDGE TREATMENT,
rk Univ., Worcester, Mass.
primary bibliographic entry see Field 5A.
7-08621

TRIFICATION AND HEAVY METAL
MOVAL IN THE ACTIVATED SLUDGE
EATMENT PROCESS,
as A and M Univ., College Station.
A. Richards.
ailable from University Microfilms, Inc., Ann
or, Mich., 48106. Order No. 77-2662. PhD The-
1976. 182 p.

scriptors: *Nitrification, *Heavy metals,
ctivated sludge, *Separation, Sludge treatment,
alysis, Sewage treatment, Dissolved oxygen,
nperature, Suspended solids, Chemical oxygen
nand, Nitrogen, Hydrogen ion concentration,
alinity, Waste water treatment.

The relationship between nitrification and heavy metal removal was investigated in the activated sludge treatment process. Chromium was studied at 0.1-10.0 milligrams/liter, and silver was studied at 0.1-0.5 milligrams/liter in settled primary domestic sewage. The analyses covered heavy metal concentration, pH, dissolved oxygen, temperature, suspended solids, chemical oxygen demand, nitrogen species, and alkalinity. There were indications that sludge wasting rates are directly related to heavy metal removal. Nitrification indirectly affects the process because sludge wasting controls sludge age, which controls nitrification. A theory on the mechanisms of heavy metal removal was developed; sludge wasting was considered the key mechanism of this process. (Collins-FIRL)
W77-08623

PREDICTION OF NITROGEN TRANSFORMATIONS IN THE STORAGE LAGOON OF A LAND TREATMENT SYSTEM,
Massachusetts Univ., Amherst.
Y-S. Su.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 77-6425. PhD Thesis, 1976. 178 p.

Descriptors: *Storage, *Lagoons, Biological treatment, Algae, Bacteria, Nitrogen, Model studies, Nitrification, Ammonification, Pilot plant, Sewage effluents, Irrigation, Waste water treatment.
Identifiers: Land treatment system.

The influence of storage lagoons on the nitrogen balance in a land treatment system was studied. The lagoon functions as a biological reactor where algae and bacteria transform input nitrogen. A simulation model was developed to predict yearly concentrations of ammonium, nitrate, organic nitrogen and algae in the lagoon. Ammonification, nitrification, and algal uptake were considered, as were the effects of temperature, solar radiation, and rate-limiting nutrients. Data were taken from a storage lagoon with a three-month winter storage followed by a nine-month empty period. There was a great reduction of obtainable inorganic nitrogen during a substantial portion of the irrigation period; algal uptake of nitrogen was indicated as the most important factor in the lagoon's dynamic behavior. Algal growth and death rate constants had the greatest effect on ammonium-N and nitrate-N-profiles. Nitrification and ammonification were much less important. Reductions in the required irrigation land area resulted from the decrease in nitrate due to storage lagoon transformations. Lagoon effluent should be blended with secondary effluent in varying ratios during the growing season in order to design a system with a nitrogen supply equal to crop demand. (Collins-FIRL)
W77-08624

REMOVAL OF FLUORINE FROM WASTE WATERS. III. FUNDAMENTAL TESTS WITH CHEMICAL REAGENTS (HAISUICHU NO FUSSO JOKYO NIKANSURU KENKYU. III. SHIYAKU KEI NIYORU KISOSHIKEN),
M. Mori, Y. Iwasaki, Y. Utsumi, H. Miura, and J. Ando.
Senkko to Skkai, (Gypsum and Lime), No. 146, p 9-14, 1977. 2 ref.

Descriptors: *Fluorine, *Separation techniques, *Calcium compounds, *Waste water treatment, Pollution abatement, Lime, Magnesium, Coagulation, Chemical reactions, Analysis.

Various chemical reagents were tested in an investigation of fluorine removal from waste water. Lime added to a dilute hydrogen fluoride solution produced minute calcium fluoride particles; a portion of these tended to pass through a filter. Magnesium was found to reduce crystal size, make precipitate gelatinous, and aid separation and coagulation. It did not reduce fluorine below 15 ppm since magnesium fluoride is more soluble than calcium fluoride. The length of time needed to reduce the supersaturation of calcium fluoride was the major obstacle in reducing fluorine to meet water quality standards. The addition of lime raises the pH and causes fluorine removal to be difficult in waters with a high concentration of alkaline substances. Reduction of fluorine was aided by the addition of an acid or soluble calcium compound. (Collins-FIRL)
W77-08626

WHAT'S UP WITH OXYGEN/2,
Brown and Caldwell, Walnut Creek, Calif.
B. D. Bracken.
Water and Wastes Engineering, Vol. 14, No. 4, p 48-49, 52-56, April, 1977. 3 fig, 2 tab.

Descriptors: *Oxygen, *Treatment facilities, Design criteria, Construction, Equipment, Water purification, Cooling water, Heat balance, Personnel, Instrumentation, *Waste water treatment, Electric power demand, Heat exchangers.
Identifiers: *Liquid oxygen.

Design factors are discussed in the second of two articles on cryogenic oxygen plants. Heat exchange is a part of the oxygen production process. A cryogenic expansion turbine produces refrigeration for air separation and liquid production. Plants with a capacity of 180 tons/day or more generate enough work to justify the equipment necessary to recover the work as electrical power. About 75 kw can be obtained from a plant of this size operating at maximum design production. Liquid oxygen is stored near the cryogenic oxygen plant in horizontal or vertical tanks. These are double-walled and designed to reduce oxygen losses to 0.3-0.4% per day of contained oxygen by weight. Oxygen vaporizers are used to convert stored liquid oxygen to vapor for a supplemental or substitute oxygen source to supply the dissolution system. Vaporization of one ton of liquid oxygen stored at just under the boiling point will require 92 Btu/pound or 184,000 Btu/ton. Liquid oxygen vaporization can be conducted with a water-to-oxygen heat exchanger. This heat exchanger. This heat exchanger can provide the continuous heat so that vaporization may be instituted at any time necessary. Considerations for a cryogenic oxygen plant for municipal waste water treatment include plant size, electrical requirement, cooling water needs, effluent heat load, noise levels, instrument or dry, filtered, oil-free air requirements, staff requirement, site requirements, and instrumentation and control equipment. (Collins-FIRL)
W77-08627

SLUDGE DISPOSAL IN THE NORTH WEST,
For primary bibliographic entry see Field 5E.
W77-08628

FINE SCREENING OF RAW SEWAGE,
For primary bibliographic entry see Field 8G.
W77-08629

WASTE WATER AERATION SYSTEM PRODUCES SMALL BUBBLES.
Chemical Engineering, Vol 84, No 9, p 81-82, April, 1977.

Descriptors: *Aeration, Equipment, *Performance, *Evaluation, Operating costs, Capital costs, Oxidation lagoons, Chlorination, Treatment facilities, Municipal wastes, *Waste water treatment.

The Aerocleve submerged secondary treatment aeration system is described by Clevepak Corp., Fall River, Massachusetts. It was promoted as being 150% as effective as mechanical surface aerators. A bubble diameter of 0.2-0.4 millimeters is produced as compared to 1-2 millimeters from

diffused-air systems and 2-2 1/2 millimeters from mechanical surface devices. Air and recirculated waste water are concurrently passed at different velocities through the mixing chamber, creating air pockets. A vortex and fine air bubble mist are formed from exerting a compressive force on the air pockets. The bubble stream discharges as a high-velocity, turbulent horizontal plume. Increased dwell time is the result; this, combined with the small bubble diameter, produces an efficient use of energy. Operating costs are 50% that of diffused-air systems and 75% that of surface aeration. Capital costs are 30% less than diffused air and 20% less than surface aeration. Clogging is avoided in this system by eliminating porous plates and perforated sparges; the smallest passage is 1 1/4 inches in diameter. There are no moving parts in the manifolds or mixing chambers. Submerged parts are constructed of polyvinyl chloride or stainless steel. The system can be used for deep-tank applications, activated sludge aeration basins, and extended aeration lagoons. It is useful in upgrading conventional diffused-air systems and is especially useful in freezing climates. It can also be used in package treatment plants, and in chemical mass transfer and chlorination processes. Field tests showed a 50% reduction in power costs in municipal applications. (Collins-FIRL)
W77-08630

ADVANCED WASTE TREATMENT DESIGN PROTECTS LAKE ALTON,
For primary bibliographic entry see Field 5G.
W77-08631

NEW PLYMOUTH SEWERAGE SCHEME,
J. R. Fitzmaurice.
New Zealand Engineering, Vol 32, No 2, p 26-30, February, 1977. 4 fig, 6 ref.

Descriptors: *Sewers, Drainage, *Outfalls, *Waste water treatment, Waste disposal, Bacteria, Sewage effluents, *Treatment facilities, Environmental effects, *Water pollution control, Construction, COsts, Waste disposal.
Identifiers: New Plymouth(New Zealand).

Treatment schemes were devised for New Plymouth, New Zealand, after a survey to determine the inadequacies of its sewerage system. The studies indicated that outfalls would be very expensive and few locations were adequate for them. Surface movement of water near the shoreline and strong winds would not regularly assist diluted waste discharge movement in either direction along the coast. There are no present water quality standards for receiving waters, but any treatment system should be adaptable for easy and economical improvements if standards are later required. Several alternative plans were considered involving outfalls at various locations, varying treatment levels, disposal to oxidation ponds, and drainage systems. Environmental impact studies were also conducted. The treatment plant proposed for the area will be a primary treatment facility with provisions for adding secondary treatment and chlorination. The level of treatment will depend on water quality standards to be developed and may alter with time. Processes included will be screening, grit removal, sedimentation, and sludge digestion. Power will be derived from process methane and the on-site generation of electricity. Capital costs are expected to be about $8,230,000, with annual costs of about $965,000. (Collins-FIRL)
W77-08632

PRETREATMENT HELPS NIAGARA CUT COSTS,
Niagara Falls Sewage Dept., New York.
J. Sirianni, and E. C. Richardson.
Water and Wastes Engineering, Vol 13, No 11, p 44-46, 51, November, 1976. 1 fig, 1 tab.

Descriptors: *Treatment facilities, *Costs, *Pollution abatement, *Industrial wastes, *Waste water treatment, Cities, Water purification, Nitrification, Activated sludge, Filtration, Adsorption, Water pollution sources, *Pre-treatment(Water).
Identifiers: Niagara Falls(NY).

Pretreatment of industrial wastes and reuse of existing municipal facilities have reduced costs at a new treatment facility in Niagara Falls, New York. Alteration in treatment processes were investigated in 1971 due to the discharge into the river of 164 mgd of waste water by industries involved in electrochemical, electrometallurgical, paper, food, organic chemical, and abrasive products. Water quality standards were instituted for effective disinfection; substantial removal of settleable and flotable solids; an effluent phenol concentration of less than 5 ppb; a pH of 6.7-8.5; a minimum dissolved oxygen concentration of 4 ppm; and the maximum possible removal of phosphates. A physical-chemical process using activated carbon for filtration and adsorption was used. The plant has a 48 mgd capacity and is located on the site previously used by a power generating facility. The tailrace tunnel of the power plant was rehabilitated to be used as an outfall and a 210,500-foot-long, six-foot-diameter, concrete-lined rock tunnel intercepting sewer was constructed. Cost savings resulted from early industrial cooperation to reduce pollution; the joint treatment facility which created economy of scale savings; the reuse of the tailrace tunnel of the power plant; the use of parts of the city's former treatment plant foundation for the new pumping station; the regeneration of exhausted carbon used for filtration and adsorption; and the use of plant effluent to backwash carbon. The toxic effects of chemical wastes on microbial populations precluded biological treatment, so the physical-chemical system was used. Sludge is disposed in landfills. This arrangement allows nitrification, conventional activated sludge and contact stabilization, or combinations of any two processes. (Collins-FIRL)
W77-08633

APPLICATION OF PHYSICO-CHEMICAL TREATMENT AS A METHOD OF ACHIEVING PARTIAL STANDARDS ON SEWAGE EFFLUENTS DISCHARGED IN ESTUARIAL AND COASTAL SITUATIONS,
Anglian Water Authority, Huntingdon (England). Directorate of Scientific Services.
P. J. Matthews.
The Public Health Engineer, Vol 5, No 2, p 31-37, March, 1977. 3 tab, 49 ref.

Descriptors: *Water quality standards, Sewage effluents, Estuaries, Coasts, Water purification, Industrial wastes, Electrolysis, *Waste water treatment.
Identifiers: England.

Applying variouss physico-chemical treatment (PCT) methods to wastes which would be discharged to estuaries and coastal waters in England was considered. There has been a continuing argument for and against treatment of wastes for this type of disposal. Those in favor of treatment stress that oceans must be protected, and that treatment would diminish disease, eliminate long outfalls conflicting with other water uses, and remove certain pollutants which would otherwise persist. Those opposing treatment emphasize that great amounts of oxygen in the sea purify wastes, and that dilution renders the waste similar to biologically treated effluent. They add that costs are less for operating an outfall and that a well-sited outfall is less aesthetically objectionable. PCT was used in the nineteenth century, but biological treatment outweighed it by appearing more effective and by producing a more easily disposable sludge. Chemicaly aided sedimentation can be of use, however, where there is a solids standard of 60 to 150 milligrams/liter of suspended solids, or where this standard and a BOD and/or a COD limit are appropriate. The most common systems of chemical sedimentation include lime, ferric and ferrous salts, alum alone or with anionic polyelectrolytes, and cationic polyelectrolytes. These can be added before wastes undergo flocculation chamber followed by sedimentation tank treatment, or before combined flocculation/sedimentation tank treatment. The sludges produced are less filterable than primary sludges, but they can be treated, disposed of, or used in agriculture. Lime seems to be the most cost effective coagulant/flocculant. Partial treatment allows for shorter effluent pipelines than needed for crude sewage outfalls. Higher hydraulic loadings permit reduced sedimentation tank size and reduced sedimentation capital costs. The drawbacks to lime treatment are possible increases in capital costs by as much as 200% and in operating costs by 10-20% over sedimentation costs. Finally, the effects of coagulants, flocculants, and their impurities on effluent quality and sludge production must be considered. (Collins-FIRL)
W77-08634

SEWAGE TREATMENT IN DEVELOPING COUNTRIES,
Loughborough Univ. of Technology (England).
J. Pickford.
Water Pollution Control, Vol 76, No 1, p 65-66, 1977. 1 tab.

Descriptors: *Sewage treatment, *Urban areas, *Water supply, Water quality, Water quality control, Sanitation engineering, Sewage disposal, Domestic wastes, Septic tanks, Separate sewers, Oxidation lagoons, Corrosion, Economics, Activated sludge, *Waste water treatment.
Identifiers: *Developing nations.

Factors associated with sewage treatment in developing countries were discussed. The high growth rate of urban populations is characteristic of most of these nations, and the phenomenon of shanty-towns is a growing problem. Approximately two-thirds of these urban populations have access to piped water, though it may be intermittent or from public standpipes. Empty pipes contribute to inward leekage of groundwater which may be polluted where there is inadequate sanitation. Excreta is usually handled by municipal treatment, but often water is insufficient for basic needs, and it cannot be spared for toilet flushing. Pit latrines, septic tanks, and aqua-privies all have some drawbacks. Nightsoil is often buried in trenches but is usually treated with sewage sludge and in aerated lagoons. Separate sewage systems are used because of the heavy rainfalls in most developing countries and sewage blockage is common, as are problems resulting from hot climates, such as sewer corrosion. Stabilization ponds are ideal for many of these nations because they are simple, requie easy maintenance, use little imported materials, and have no power requirements. Diffused-air activated-sludge treatment and biological filters can also be used, but capacity in tropical climates can be less than in temperate areas. (Collins-FIRL)
W77-08635

CONTROLLING SLUDGE BULKING,
D. Liu, K. Kwasniewska, and D. B. Cohen.
Water and Sewage Works, Vol 124, No 3, p 52-53, March, 1977. 3 fig, 4 ref.

Descriptors: *Sludge treatment, *Activated sludge, *Microorganisms, Chlorination, Dissolved oxygen, Performance, *Waste water treatment, Analytical techniques, Laboratory tests, Biological treatment, Chemical treatment.
Identifiers: *Sludge bulking, Filamentous microorganisms.

Filamentous microorganisms have contributed to the problem of activated sludge bulking. Various means used to control them include chlorination,

ydrogen peroxide treatment, increasing the dissolved oxygen of the return sludge, and reducing ne sludge loading rates. A program was conducted o establish means for isolating these microorganms from normal and bulking sludges. Testing evealed two compounds which had a high selecve specificity for filamentous microorganisms: n-myl alcohol (n-pentanol) and isoamyl alcohol. his provided the basis for procedures to isolate ne microorganisms. Various amounts of n-amyl lcohol are added to four flasks containing a odified nutrient broth. The flasks are shaken to nsure homogeneity and one drop of bulking ludge is added to each. The broth is checked very 24 hours for the growth of filamentous nicroorganisms, after incubation at room temerature on a gyrotary shaker. If filamentous nicroorganisms growth is substantial the broth hould be streaked on a pre-dried modified utrient agar plant for microorganism isolation. A econd procedure involves adding bulking sludge r normal sludge to a sterile test tube, and then ading n-amyl alcohol and sterile distilled water. hese are mixed, allowed to stand at room temerature, and mixed again. Three samples are uickly plated onto the pre-dried modified nutrient gar plates. The plates are incubated until there is omplete colony development. Biochemical and axonomical tests may be performed or colonies nay be transferred to modified nutrient broth vithout n-amyl alcohol to confrim the procedure. Collins-FIRL)
W77-08636

THE USE OF PACKED BEDS IN WATER POLLUTION CONTROL,
K. E. Porter.
La Tribune du Cebedeau, Vol 30, No 398, p 30-42, January, 1977. 16 fig, 5 tab, 11 ref.

Descriptors: *Packed beds, *Design criteria, *Mass transfer, *Biological treatment, Water pollution control, Filtration, Microorganisms, Biochemical oxygen demand, Industrial wastes, Plastics, Mineralogy, Organic matter, Separation techniques, Water purification, Treatment facilities, Costs, Physicochemical properties, *Waste water treatment, Performance, Evaluation.

Various types and designs of packed beds, as well as design criteria and mass transfer mechanisms used in water pollution control were described. The filter bed process generally involves two settling tanks with an intermediate filter treatment step. Microorganisms which consume the organic pollutant, in packed filter beds, grow over the surfaces of the packing as a film. The biomass removes BOD and becomes the solid product to be settled out. Packed beds are economical in situations where there is high BOD and/or high BOD concentrations maintained throughout the packed bed. Higher organic loading on the packing produces lower treatment costs, but increases the chance of blockage. Mineral media have been traditionally used. Modern packings include plastics such as polystyrene, polypropylene, and polyvinyl chloride, and various forms of vertical sheets and vertical tubes which allow organic loading to be increased about twenty times that used with the traditional packing. Packed beds are used to partially treat industrial wastes and industrial waste waters that cannot be treated with activated sludge methods, and to increase the capacity of existing sewage plants. Design techniques are reviewed with data on design criteria. Equations are presented for the biochemical rate and limiting solutions for diffusion and reaction in the biomass film, and for boundary conditions. Factors involved in the derivation of design equations were also considered. (Collins-FIRL)
W77-08637

OZONE DISINFECTION OF SECONDARY EFFLUENT,
PCI Ozone Corp., West Caldwell, N.J.
L. J. Bollyky, and B. Siegel.
Water and Sewage Works, Vol 124, No 4, p 90-92, April, 1977. 5 fig, 2 tab, 5 ref.

Descriptors: *Ozone, *Disinfection, Performance, Evaluation, Costs, Coliforms, Design criteria, Water quality control, Oxidation, Chemical reactions, Chlorination, Domestic wastes, *Waste water treatment, Effluents.

A New York City treatment facility was the site of a demonstration project for the disinfection of secondary effluent by ozone. Influent at the plant was of domestic origin. A disinfection level of 200 fecal coliform/100 milliliters was obtainable with an ozone dose of 1.75 milligrams/liter and a contact time of 3.5 minutes. The holding time was 10 minutes. Holding times were critical with low ozone doses because disinfection continues throughout that period. Costs should be reduced with low dose disinfection. Tests indicated that the performance of a well-designed diffusion system was equal to or better than a positive pressure injection or mechanical mixing system. Most disinfection occurred during the first four minutes of contact time when more than 2.5 ppm of ozone was present. Doses of less than 1.5 milligrams/liter were insufficient. Doses of 1.75 milligrams/liter with a 10-20 minute holding time produced the required disinfection. Most additional disinfection occurred during the first 10 minutes of holding time and little additional activity was found after 20 minutes holding time. Nearly complete destruction of fecal coliform was obtained with a 3.5 milligram/liter ozone dose and a 20 minute holding time. Increasing COD in a range of 22-34 milligrams/liter slightly reduced disinfection. Disinfection was also inhibited when suspended solids were increased in the range of 6-16 milligrams/liter. The quality of the influent waste water probably contributed to the success of these low doses. Further testing should be conducted to determine other influential factors. The availability of ozone for disinfection is determined by water ozone demand and chemical oxidation reaction rates. Other factors may include bubble size, diffuser pore size, water pressure, and surface tension. An economical approach to ozone usage might be the design of systems to allow the alternative of either ozone or chlorine disinfection. (Collins-FIRL)
W77-08638

SLUDGE TREATMENT: PROBLEMS AND SOLUTIONS, PART 1,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. E. Smith, Jr.
Water and Sewage Works, Vol. 124, No. 4, p 80-83, April, 1977. 5 fig, 7 tab.

Descriptors: *Sludge treatment, *Biological treatment, *Heat treatment, Anaerobic digestion, Aerobic treatment, Pathogens, Microorganisms, Dewatering, Filtration, Drying, Sludge disposal, Landfills, Incineration, Pollutants, Suspended solids, Biochemical oxygen demand, Heavy metals, *Waste water treatment.

Stricter waste water treatment effluent standards are expected to double secondary treatment sludges by 1985, and chemical sludges are expected to be produced in large quantities. Problems and suggested solutions were considered for future sludge treatment. The major concern is to evaluate process alternatives, to eliminate inappropriate methods, and to produce a total system of treatment. Various processes considered were sludge thickening, heat treatment, sludge conditioning, dewatering and filtration, and drying. Disposal techniques, such as landfilling and applying sludge agriculturally, were discussed. Mechanisms, chemical treatment, and resource recovery involved in municipal and various industrial sludge treatment procedures were evaluated. (Collins-FIRL)
W77-08640

COMPOSTING DESTROYS PATHOGENS IN SEWAGE SOLIDS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Health.
For primary bibliographic entry see Field 5E.
W77-08641

INSTRUMENTATION IMPROVES WASTE WATER TREATMENT PLANT CONTROL,
Rochester Water Reclamation Plant, Minn.
M. T. Skodje.
Public Works, Vol. 108, No. 4, p 88-90, April, 1977.

Descriptors: *Instrumentation, *Treatment facilities, *Monitoring, Equipment, Operation maintenance, Temperature, Dissolved oxygen, Sludge treatment, Analysis, Waste water treatment, Minnesota, Biological treatment.
Identifiers: Rochester(MI).

Research and pilot tests have resulted in more accurate design relationships for biological treatment processes. For these processes, such as trickling filter and activated sludge treatment, design formulas involve dissolved oxygen uptake rates, mixed liquor suspended solids, waste sludge concentrations, sludge wasting rates, return sludge concentrations, and sludge return rates. The operator can be aided by instrumentation which allows either rapid tests or continuous and reliable monitoring. Instrumentation testing has been undertaken by a Rochester, Minnesota, treatment plant for its expansion program. Fixed-probe dissolved oxygen meters and sonic sludge density controllers were tested. The plant contained parallel, rectangular plug-flow aeration tanks followed by circular clarifiers with peripheral feed and effluent collectors. Sensors were placed in the peripheral inlet channel of the clarifier, adjacent to the aeration tank inlet pipe, to obtain steady readings. These readings provide a correlation between inlet channel readings and desired aeration tank DO levels. Performance was very acceptable and cleaning of membrane surfaces and calibration were simple operations. Membrane replacement was not needed more than twice during the first year's operation. The sludge density controllers measured the absorption of sound waves transmitted across the pipe diameter. Installation was in a pipe line common to the primary tanks, where a mixture of primary and waste activated sludge was received. A shutdown control was set at a sludge density of 2.5%. A delay switch allowed up to 30 minutes pumping to clear the pipe of dilute sludge before the density unit would take control. The unit was reliable, but one with a visual indicator improved the instrument's value by inducing operator interest in its operation. So far only weekly flushing has been required for maintenance. Operation efficiency was greatly improved with these instruments. (Collins-FIRL)
W77-08642

RATIONAL DESIGN OF AEROBIC DIGESTION SYSTEMS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
L. G. Rich.
Water and Sewage Works, Vol. 124, No. 4, p 94-95, April, 1977. 1 fig, 1 tab, 2 ref.

Descriptors: *Aerobic treatment, *Design criteria, Suspended solids, *Biodegradation, Microorganisms, Biological treatment, Oxygen demand, Sludge digestion, Solid wastes, Temperature, Activated sludge, *Waste water treatment, Analysis.
Identifiers: *Aerobic digestion.

Equations were presented for various aspects of the design of aerobic digestion systems. The process is used to stabilize organic solids for discharge to the environment by converting the biodegradable-solids fraction to carbon dioxide, ammonia, and water. Operation may be carried out in three modes: batch, semi-continuous, and con-

tinuous. In the first, solids are aerated for the entire stabilization period, aeration is ended, and supernatant and settled solids are discharged. Aeration is discontinued more frequently in the second method, permitting solids settling, partial solids withdrawal, and the addition of new solids. The third mode is carried out in a single or multi-stage form. The addition of a clarifier-thickener after digestion is not generally feasible with the continuous-flow, multi-stage system. Hydraulic retention time should be based on average air temperatures for the coldest month. Diffused-air aeration systems contribute to temperature stability. The equations provide means for determining the relationship of specific oxygen uptake rate, temperature, biodegradable-to-nonbiodegradable volatile suspended solids ratio in the initial suspension, and the mean solids age. These are useful for a fundamental and predictable specification of the degree of stabilization. (Collins-FIRL)
W77-08643

THE EFFECT OF SURCHARGING ON DISCHARGE THROUGH A PIPE,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 8B.
W77-08644

SLUDGE INCINERATION,
For primary bibliographic entry see Field 5E.
W77-08717

NEW DIRECTIONS IN ION EXCHANGE,
Water Purification Associated, Cambridge, Mass.
C. Calmon, and H. Gold.
Environmental Science and Technology, Vol 10, No 10, October 1976, p 980-984, 2 fig, 3 tab, 5 ref.

Descriptors: *Ion exchange, *Reverse osmosis, Electrodialysis, Capital costs, Operating costs, Desalination, *Waste water treatment.
Identifiers: *Sirotherm process, *Materials recovery, Regenerants.

Two ion exchange processes have recently been applied on a commercial scale that eliminate the need for regenerant chemicals, while minimizing the quantity of dissolved salts in the effluent waste stream, or substantially reduce the quantity of regenerants, making it easier to recover the contaminante ions. The Sirotherm process can reduce dissolved salts by 80%. It does not require expensive regenerating chemicals, consumes small amounts of energy, and can be easily scaled up to larger units. Within certain limits, the process is competitive with reverse osmosis and electrodialysis. Performance data and the capital and operating costs for three typical installations are presented. Specific ion exchanges that are capable of reacting with specific ions in solution are discussed. The new exchangers make possible: the recovery of a specific material through the removal of trace contaminants from valuable chemical baths; the recovery of valuable materials present in trace amounts in solutions or rinses; the removal of toxic ions below their solubility limits as insoluble salts; an increase in the amount of water that can be treated for a fixed amount of ion exchanger; and a decrease in the chemical regenerant usage and in the amount of regenerant waste. (Nessa-NC)
W77-08719

SOIL TESTING FOR SLUDGE DISPOSAL.
For primary bibliographic entry see Field 5E.
W77-08728

NEOPLASTIC AND POSSIBLY RELATED SKIN LESIONS IN NEOTENIC TIGER SALAMANDERS FROM A SEWAGE LAGOON,
Texas Tech Univ., Lubbock. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-08729

MAKE MONEY BY COMPUTER,
E. Watkins, and J. Burger.
The American City and County, Vol 92, No 4, p 57-58, April, 1977.

Descriptors: *Computers, *Costs, *Monitoring, Operating costs, Maintenance costs, Evaluation, Equipment, Cities, Water districts, Water quality control, Treatment facilities, Water rates, Waste water treatment, Florida.
Identifiers: Melbourne(FL).

Computerization was the solution to sewage collection problems created by the merger of Eau Gallie and Melbourne, Florida. Difficulties included meeting EPA regulations, conveying sewage in a level terrain to two treatment plants, and monitoring sealed overflow pipes on lift station wet wells. The computer used remot terminals at lift stations and distant treatment plants, and telemetric reports on operational and emergency conditions. Lift station terminals monitor water levels and control pump activity. Power failures and maintenance operations are also monitored. Infiltration/inflow data are collected to aid evaluation of future expansion needs. Operation and maintenance costs have been reduced and rate increases have been avoided by the installation of this system. A computerized billing system also reduced cost and billing errors. (Collins-FIRL)
W77-08730

THE DEVELOPMENT OF A TEST FOR THE POTABILITY OF WATER TREATED BY A DIRECT REUSE SYSTEM,
Cincinnati Univ., Ohio. Coll. of Medicine.
For primary bibliographic entry see Field 5A.
W77-08758

SEGREGATION AND RECLAMATION OF HOUSEHOLD WASTEWATER AT AN INDIVIDUAL RESIDENCE,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
C. C. Withee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 810, Price codes: A14 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 286 p, 52 fig, 61 tab, 61 ref, 2 append. OWRT A-021-COLO(4). 14-31-0001-5006.

Descriptors: *Colorado, Water utilization, Domestic wastes, *Waste water treatment, *Domestic water, *Waste identification, Septic tanks, *Water reuse, Waste disposal, Separation techniques.
Identifiers: Gray water treatment, Aerobic home sewage treatment units, Evaporation-transpiration beds, Home water reuse.

Disposal of wastewater from isolated homes in mountainous and rural locations in Colorado presents unique and difficult problems. The purpose of the study was to evaluate the flow and pollution patterns from individual homes and to evaluate existing and potential treatment methods. Field evaluation of home wastewater flow and pollutional characteristics was accomplished. The average per capita water use in the home was 44.4 gallons per day and the waste strength was 0.11 pounds per capita per day of BOD per person. Data for individual fixtures and appliances were obtained with measurement of many pollutional parameters. A brief evaluation of the home treatment methods was accomplished. Laboratory bench scale studies were made to evaluate methods for treatment of the soap related wastes in the home for reuse as toilet flushing water. (Bennett and Linstedt - Colo)
W77-08806

ELECTROCHEMICAL DETERMINATIONS O TRACE QUANTITIES OF PHOSPHATE AN NITRATE,
Southern Illinois Univ., Carbondale. Dept. Chemistry and Biochemistry.
For primary bibliographic entry see Field 5A.
W77-08817

NORTH CAROLINA CONFERENCE O WATER CONSERVATION.
North Carolina Water Resources Research Ins Raleigh.
For primary bibliographic entry see Field 3D.
W77-08820

DEWATERING CHEMICAL-PRIMAR SLUDGES,
Envirotech Corp., Salt Lake City, Utah. Eim BSP Div.
D. Di Gregorio, and G. L. Shell.
Journal of the Environmental Engineering Div sion, Proceedings of the American Society of Civ Engineers, Vol. 102, No. EE5, Proceedings pap No. 12474, p 1087-1106, October 1976. 8 fig, tab, 7 ref. EPA 68-01-0183.

Descriptors: *Waste water treatmen *Centrifugation, *Lime, *Dewatering, Cost anal sis, Economic efficiency, Evaluation, Equation Treatment facilities, Size, Sludge, Sludge trea ment, Filtration.
Identifiers: *Vacuum filtration, *Alums.

The efficiency and the cost of dewatering lim and alum-generated physical-chemical treatme sludge were developed utilizing a continuo vacuum filter and a solid bowl conveyor ce trifuge. Centrifugal dewatering included evalu tion of both single-stage and two-stage classific tion dewatering. The evaluation of the da showed that lime recovery was economical wi both a single and two-state centrifugal as well vacuum filter above the plant size of 25,000,0 gal/day. Tables show the comparative cost of d watering the lime and alum sludges for vario sizes of treatment plants and with costs itemize for capital and operating considerations. Vacuu filters are the least-cost approach based on t results of the field studies. The paper also sho the process effects of varying operating param ters for these centrifuge and vacuum filter oper tions. (Bell-Cornell)
W77-08865

TRICKLING FILTER-ACTIVATED SLUDG COMBINATIONS,
Rieke, Carroll, Muller Associates, Inc., Hopkin Minn.
R. F. Roskopf, J. C. Young, and E. R. Baumann.
Journal of the Environmental Engineering Div sion, Proceedings of the American Society of Civ Engineers, Vol 102, No EE5, Proceedings pap No 12460, p 1005-1018, October 1976. 8 fig, 4 tab 28 ref.

Descriptors: *Sewage treatment, Treatment facil ties, *Trickling filters, *sludge disposal, *Sludg treatment, *Activated sludge, *Waste water trea ment, Water quality control, Hydraulics Biochemical oxygen demand, Effluents.

Activated sludge processes were used on a pilo plant scale as a means of upgrading trickling filte plants treating domestic wastewater. Parallel us of units provided increased hydraulic capacity an produced effluent BOD concentrations con sistently below 25 mg/l. Series activated sludge trickling filter or trickling filter-activated sludg processes produced effluent BOD consistentl below 15 mg/l. This performance was maintaine in all cases when operating at organic loadings u to about 50 lb BOD/day/1,000 cu ft (0.80 kg/day/m 3) of treatment unit volume. (Bell-Cornell)
W77-08868

ROLE OF NITROGEN IN ACTIVATED SLUDGE PROCESS,
ittsburgh Univ., Pa. Dept. of Civil and Environmental Engineering.
. C. Wu.
ournal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 102, No EE5, Proceedings paper No 12454, p 897-907, October 1976.

Descriptors: *Activated sludge, *Waste water treatment, *Water pollution control, *Chemical oxygen demand, *Biochemical oxygen demand, Nitrogen, *Sludge disposal, Proteins, Carbohydrates, Phosphorus, Respiration, Kinetics, Equations.
Identifiers: Oxygen utilization.

Study of the effect of nitrogen limitation on metabolic activities of activated sludge has been conducted by utilizing a completely mixed continuous flow bench-scale activated sludge unit. The system was operated at various dilution rates with and without cellular recycle and was maintained at a constant temperature, 26 plus on minus C, and pH of 6.5. The results show that the concentration of nitrogen in the feed will significantly affect the contents of sludge phosphorus, sludge protein, and carbohydrate, as well as the morphological configuration of sludge organisms. However, the results obtained from the system with cellular recycle show that the substrate utilization rate and sludge yield coefficient are independent of nitrogen concentration in the feed. The rate of oxygen utilization is higher in the nitrogen-rich activated sludge system than in the nitrogen-deficient activated sludge system, but the endogenous respiration rate constant is identical in both systems. (Bell-Cornell)
W77-08869

METHOD OF PURIFYING WASTE WATER,
Feldmuhle Anlagen- und Produktions-gesellschaft m.b.H., Duesseldorf-Oberkassel (West Germany). (Assignee).
T. Ploetz, U. Haupt, and E. Solich.
Patent No 3,998,730, 3 p, 5 ref; Official Gazette of the United States Patent Office, Vol 953, No 3, p 1153, December 21, 1976.

Descriptors: *Patents, *Waste water treatment, *Water quality control, *Organic wastes, Lignin, Industrial wastes, Hydrogen ion concentration, Separation techniques, Pulp and paper industry, *Pulp wastes.
Identifiers: Granular alumina, Aluminum ions.

The purification of waste water from lignin and its derivatives formed during the manufacture and processing of wood pulp, and particularly to an improvement in the purification of such waste water by contact with granular alumina is described. It has now been found that the loss of alumina into the purified water can be reduced sharply by mixing aluminum ions with the water prior to contact with the alumina at a pH not greater than 7 at which the aluminum ions are soluble in the water. When aluminum ions are added to the waste water prior to contact with the alumina, the capacity of the alumina is enhanced and its dissolution is repressed. The aluminum ions are mixed with the waste water preferably in the form of the aluminum salts of acids strong enough to lower the pH of the waste water. The waste water purified by this method may still contain formic acid, acetic acid, and monosaccharides which are readily decomposed by conventional exposure to microorganisms. (Sinha-OEIS)
W77-08881

METHOD FOR PURIFYING WATER OF ORGANIC COMPOUNDS NOT READILY BIODEGRADABLE,
Feldmuhle Anlagen- und Produktions-gesellschaft m.b.H., Duesseldorf-Oberkassel (West Germany). (Assignee).
H. Solbach, and H. Foerster.
U.S. Patent No. 3,998,732, 7 p, 2 fig, 1 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 953, no 3, p 1153, December 21, 1976.

Descriptors: *Patents, *Waste water treatment, *Organic wastes, *Water purification, *Pulp wastes, Water pollution sources, Lignins, Absorption, Pulp and paper industry.
Identifiers: Alumina grains, Al203.

This invention relates to the purification of waste water, and particularly to the removal of organic compounds which are not readily bio-degradable from water by adsorption on granular forms of Al203. For adequate contact of the waste water with a sufficient amount of alumina grains, it is necessary to employ a multiplicity of adsorption columns in which a maximum concentration ratio of granular alumina to water must not be exceeded. Because of the turbulence which keeps the granular adsorbent in suspension, it is not possible to hold the alumina grains in a fixed position. The selected grain size of the porous alumina is essential for successful operation of the method of the invention because it avoids clogging of the passages between the grains, yet still provides an adequate adsorbent surface. The flow velocity at which the waste water to be purified is passed through an adsorbent column has a major influence on the effectiveness of the process. The contact between the water to be treated and the alumina grains is to be maintained for 30 minutes to 2 hours and the contact time varies with the nature of the waste water.
W77-08883

METHOD AND APPARATUS FOR PURIFYING AQUEOUS STREAMS CONTAMINATED WITH ORGANIC MATERIALS,
BASF Wyandotte Corp., Mich. (Assignee).
K. K. Ladha, W. M. Herring, and J. F. Louvar.
U.S. Patent No. 4,000,065, 13 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1609, December 28, 1976.

Descriptors: *Patents, *Waste water treatment, Water pollution control, *Water purification, Water quality control, *Organic wastes, *Reverse osmosis, Separation techniques, Pressure, Equipment, *Filtration.
Identifiers: *Ultra-filtration.

Aqueous streams contaminated with minor amounts of organic materials are separated into an aqueous fraction which is concentrated with respect to the organic contaminants and a water fraction relatively free of the organic contaminants by a method which includes a combination of reverse osmosis (RO) and ultra-filtration (UF). The organic contaminants include substances having molecular weights of less than 10,000 which are soluble in the aqueous stream initially but have limited solubility ranges and are precipitated upon concentration. The contaminated aqueous stream is circulated from the high pressure compartment of a RO unit to the high pressure compartment of an UF unit, then to the low pressure compartment of the UF unit, and then back to the high pressure compartment of the RO unit. The contaminants are concentrated in the high pressure compartment of the RO unit, and a portion of it is precipitated or otherwise rendered amenable to removal along with the UF concentrate upon passing the RO concentrate from the high pressure compartment of the RO unit to the high pressure compartment of the UF unit. Soluble organic contaminants remaining in the aqueous stream are removed in the UF permeate and are recycled back to the high pressure compartment of the RO unit for further concentration and precipitation, followed by recycling to the high pressure compartment of the UF unit for removal. (Sinha-OEIS)
W77-08889

POLLUTED WATER PURIFICATION,
Phillips Petroleum Co., Bartlesville, Okla. (Assignee).
W. T. Nelson, and H. D. Holtz.
U.S. Patent No. 4,000,068, 4 p, 3 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1611, December 28, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water quality control, *Water purification, Organic wastes, Chemical wastes, Industrial wastes, *Oxidation.
Identifiers: Cupric nitrate.

A process is provided for converting water contaminated with organic materials to a potable aqueous product by contacting contaminated water under oxidation conditions with a water soluble copper salt such as cupric nitrate under conditions sufficient to convert the organic materials to innocuous materials so that the aqueous stream which has been substantially freed of contaminating materials can be safely discarded or reused. The water soluble copper salt catalyst of the invention is cupric nitrate. The process of the invention can be carried out under a variety of conditions depending upon the feedstock, cupric ion concentration, temperature, desired degree of organic removal, and other conditions. (Sinha-OEIS)
W77-08890

METHOD FOR PURIFYING WASTE WATERS WHICH CONTAIN ANIONIC-TYPE ORGANIC COMPOUNDS,
Anic S.p.A., Palermo (Italy). (Assignee).
R. Fusco.
U.S. Patent No. 4,000,069, 3 p, 4 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1611, December 28, 1976.

Descriptors: *Patents, *Waste water treatment, *Water treatment, Water quality control, *Water pollution treatment, Organic wastes, Chemical precipitation, Dyes.
Identifiers: Bis-triarylphosphonium, Textile industry.

A method for the purification of waste water which contains organic compounds of an anionic nature exploits bis-triarylphosphonium salts. With the use of salts of bis-triarylphosphonium saline compounds are formed, which are very poorly soluble, with organic compounds of an anionic nature, the latter being thus quickly precipitated. The salts in question supply very poorly soluble saline compounds with numerous classes of dyes, provided that the latter possesses one or more sulphone groups in their molecules. This property can be exploited to precipitate, and thus to strip the dyes from the residual dyeing baths, especially when the dyestuffs in question cannot be stripped with the conventional organic precipitants. (Sinha-OEIS)
W77-08891

FLOCCULANT USE ON TANKERS,
Exxon Research and Engineering Co., Florham Park, N.J. Environmental Control and Safety Div.
For primary bibliographic entry see Field 5G.
W77-08906

EFFECTS OF PRIMARY TREATED AND BIOLOGICALLY STABILIZED KRAFT MILL EFFLUENTS ON THE PRODUCTION, BIOMASS AND GROWTH RATES OF JUVENILE SALMONIDS IN THREE STREAM CHANNELS,
Oregon State University, Corvallis, Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-08921

PLANT SIZE INFLUENCE ON PERFORMANCE IN ACTIVATED SLUDGE SYSTEMS WITH AP-

PLICATION TO REGIONAL WASTEWATER TREATMENT PLANNING,
California University, Davis, Department of Civil Engineering.
T. R. Grovhoug.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 983, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, (1973). 50 p, 6 fig, 9 tab, 18 ref, append. (California Water Resources Center Project UCAL-WRC-W-476). OWRT B-173-CAL(1).

Descriptors: *Waste water treatment, *Sludge treatment, *Economic efficiency, Management, *Activated sludge, *Treatment facilities, Regional analysis, *Performance, *Planning.
Identifiers: *Regional wastewater treatment.

Plant performance data from 30 existing activated sludge plans of varying size were evaluated to determine the relationship between plant performance and plant performance stability as a function of plant size using effluent suspended solids concentration as a measure of plant performance and variability of effluent suspended solids concentration as a measure of performance stability. Judgment of the superiority of single, large plant or grouped, small plant systems was made based on these results. Following the data analysis portion of the study, a further comparison of single plant vs. multiplant wastewater treatment systems was made based on economic and operational considerations to serve the second purpose. The following conclusions may be made based on the results, (1) No relationship exists between plant size and plant performance for the plants studied. (2) Single plant treatment systems exhibit no apparent advantages over multiplant treatment systems. (3) Research is needed to evaluate performance capabilities of existing treatment systems. (4) A greater understanding of regional wastewater treatment management considerations should be obtained before further regional systems are developed. (Snyder-California, Davis).
W77-08928

ENZYMATIC TREATMENT OF DAIRY EFFLUENTS,
Nebraska Univ., Lincoln. Dept. of Food Science and Technology.
P. J. Bailey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 980, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, June 1977. 82 p, 10 fig, 21 tab, 67 ref. OWRT A-040-NEB(2). 14-34-0001-7058.

Descriptors: Water quality, Effluents, Water pollution, Enzymes, *Waste water treatment, *Dairy industry, Industrial wastes, Biodegradation, *Biochemical oxygen demand, Biological treatment.
Identifiers: *Enzymatic treatment.

The purpose was to examine waste from a local multi-purpose dairy for compositional analysis and organic strength and to apply enzyme technologies to achieve reduction in the BOD of dairy waste. Prior to the studies with enzymes, wastewater from a local dairy was collected, and its proximate composition was determined. Those effluent constituents which were found to contribute the greatest amount of BOD were chosen for enzymatic pretreatment. It was felt that specific enzymatic pretreatment of certain effluent constituents might reduce the BOD of dairy wastewater and thereby reduce the stress on sewage treatment facilities. It was concluded that the enzymatic prehydrolysis of effluent constituents did not lower the BOD or the COD of dairy wastewater and did not increase BOD removal efficiencies in an activated sludge plant; however, the enzyme lactose dehydrogenase would decrease the BOD and the COD of lactose, a major component of dairy wastewater.
W77-08937

EFFECTS OF ECONOMIC DEVELOPMENT ON WATER RESOURCES,
Maryland Univ., College Park. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-09051

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENT - PHASE I,
Massachusetts Univ., Amherst. Environmental Engineering.
For primary bibliographic entry see Field 5E.
W77-09063

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENTS, PHASE II,
Massachusetts Univ., Amherst. Environmental Engineering.
For primary bibliographic entry see Field 5E.
W77-09064

REAL-TIME MEASUREMENTS OF AQUATIC NITROGEN,
Connecticut Univ., Storrs.
J. S. Mazurek.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 182, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 48 p, 15 fig, 1 tab, 36 ref, 2 append. OWRT A-030-CONN(6), 14-31-0001-3007.

Descriptors: *Waste water treatment, *Sewage treatment, *Instrumentation, *Nitrogen compounds, Activated carbon, Anion exchange, Cation exchange, Nitrates, Ammonia, *Measurement, Pilot plants, Treatment facilities, Pollutant identification.
Identifiers: Real-time measurements, *Aquatic nitrogen, Model pilot treatment plant, Total nitrogen.

This research involves real-time measurements of aquatic nitrogen utilizing a nitrate (NO3(-)) probe, an ammonia (NH3) probe and a pyrolysis/microcoulometric total nitrogen (TN) analyzer. Organic nitrogen can be estimated by difference (Org N) = (TN) - (NO3(-)) - (NH3). The objectives are to evaluate the measurement system for real-time determination of aquatic borne nitrogen and to learn the nitrogen removals and interactions within a model pilot sewage and advance treatment plant. Utilizing the mentioned instrumentation, real-time measurements were obtainable within 15 minutes but when the sensitivity levels of the instruments are approached and relative errors increase, misleading estimations of organic nitrogen can occur. From statistical analysis (and % removal - % relative error) of data it is concluded that nitrogen is removed by secondary treatment /at least 18% to 28%/, by activated carbon /17% to 27%/, by anion exchange /1%/, and by cation exchange /10% to 25%/; nitrates are removed by anion exchange /13%/ and ammonia by cation exchange /20% to 38%/. The concept of real-time analysis is feasible and practical only after the causes of errors are quantitated and minimized. (de Lara-Conn)
W77-09095

PHOSPHATE AND NITRATE REMOVAL BY A GRASS FILTRATION SYSTEM FOR FINAL TREATMENT OF MUNICIPAL WASTE WATER,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
J. N. Walter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 171, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, August 1974. 57 p., 16 tab., 3 fig., 29 ref., append. OWRT B-054-PA(2), 14-31-0001-3931.

Descriptors: *Overland flow, *Waste water treatment, Seasonal, Effluents, Phosphates, Nitrates, Municipal wastes, Municipal water, *Filters, *Filtration.
Identifiers: *Grass filtration system, *Nitrate removal, *Phosphate removal, Waste water systems, Flow distance, Application frequency, Long contact time.

Effects of application rate, flow distance, and seasonal changes on phosphate and nitrate removal were evaluated. The higher rates of application had lower nutrient removals. The longer distances produced high degrees of renovation. Different seasons produced variations in treatment effectiveness because the hydrologic characteristics of the soil changed. Both phosphate and nitrate removals were low. The lower application rates and longer flow distances removed the greatest amount of phosphate; however, all of the phosphate removal values were low due to the short contact time with the soil. Nitrate removals were low because the well-drained soil on which the study was conducted prevented anaerobic conditions necessary for denitrification. The Winter series had more nearly impervious soil conditions than the other three. The most important finding was that for a Northeastern, moderately to well-drained soil, overland flow treatment, as conducted in this experiment, was not effective. The removal efficiencies obtained are not sufficiently high to warrant installing systems of this type. (Sink - Penn State)
W77-09100

5E. Ultimate Disposal Of Wastes

NITROGEN REMOVAL FROM SECONDARY EFFLUENT BY A LABORATORY SOIL COLUMN,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-08607

PREDICTION OF NITROGEN TRANSFORMATIONS IN THE STORAGE LAGOON OF A LAND TREATMENT SYSTEM,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5D.
W77-08624

SLUDGE DISPOSAL IN THE NORTH WEST,
G. L. Symes, and A. P. Michaelson.
Water Pollution Control, Vol. 76, No. 1, p 50-58, 1977. 1 fig, 3 tab, 9 ref, 1 append.

Descriptors: *Sludge disposal, *Irrigation, Equipment, Planning, Analysis, Treatment facilities, Waste water treatment, Disposal, Land reclamation, Water districts.
Identifiers: North West Water Authority(England), Ocean disposal, Marine sanitation.

Sludge disposal in areas controlled by the North West Water Authority, England, was discusses. The most common method is disposal to agricultural land. Seventy-five percent of the treatment plants supply liquid sludge for this purpose. Transport is accomplished by road tankers discharging sludge through irrigation pipes and rain guns, fixed pipes laid beneath fields, and slurry tanker disposal. Disposal to lagoons and tips is declining. Raw sludge is mixed with bulk transported refuse, in one case, to form stable lagoons which, when dry, aid land reclamation. Ocean disposal is carried out by pumping to an outfall and by ship transport. One major problem is that of sludge disposal in the Greater Manchester area. Planning and investigative groups are presently devising schemes to alleviate this problem. (Collins-FIRL)
W77-08628

IEW PLYMOUTH SEWERAGE SCHEME,
For primary bibliographic entry see Field 5D.
W77-08632

EWAGE SLUDGE INCINERATION SHOULD E IMPROVED BY ADDITION OF NEWSPRINT ULP.
Vater and Pollution Control, Vol 115, No 4, p 54-5, April, 1977.

Descriptors: *Incineration, *Pulp wastes, *Waste isposal, Performance, Equipment, Fuels, Vacuum filters, Municipal wastes, Flocculation, Polyelectrolytes, Testing, Waste water treatment, Cities, *Canada.

ncreased treatment plant size, treatment cenralization, and the growing lack of landfill areas ave increased investigations into using incinerain for sewage disposal in Canadian municipalies. The addition of pulped newsprint to sludge hould provide several benefits. A drier cake with ess than a 70% water content should result in fuel avings of about 50%. The newsprint fibers, mounting to 10% of cake weight, can act as fuel o reduce supplemental fuel source needs. Replacng lime with newsprint pulp would aid vacuum filration and eliminate lime scale on pipes, equipnent, and tanks. A pulper and a press would be the nly added equipment necessary, and the $160,000 osts could be repaid in two years through fuel avings. A low-cost newsprint source would be ecessary; a domestic newspaper collection cheme was proposed as one way to obtain a ewsprint supply. Field tests were conducted to stablish the best proportions of newspaper pulp o sludge ratio, and to determine the best polyelectrolyte to use as a flocculant before vacuum filtraion. Other studies showed that sludge dewatering roduced a sludge cake suitable for pressing. Fullscale testing of the process is currently underway. (Collins-FIRL)
W77-08639

COMPOSTING DESTROYS PATHOGENS IN SEWAGE SOLIDS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Health.
K. Kawata, W. N. Cramer, and W. D. Burge.
Water and Sewage Works, Vol. 124, p 76-79, April, 1977. 6 fig, 13 ref.

Descriptors: *Pathogenic bacteria, *Viruses, *Aerobic treatment, Temperature, Water purification, Bacteria, Growth rates, Nutrients, Waste disposal, *Sewage treatment, *Waste water treatment.
Identifiers: *Composting.

Composting can be most effective in the destruction of pathogens. Various past and present studies were used to describe the development of composting from its embryonic stages to its immediate state of usage. Many of the less industrialized nations have long used composting. Recently it has gained wider interest among the more industrialized, urbanized nations for their waste disposal programs. The most important factor in pathogen destruction by composting is the maintenance of temperature throughout the compost mass which will inactivate the organisms. In recent studies, Salmonella newport, Candida albicans, Ascaris lumbricoides, and poliovirus I were seeded in dewatered sludge. Results of activity in a fully aerobic and completely mechanized plant showed substantial organism reduction. Salmonella was inactivated at 60 C in 30 minutes, Candida at 70 C in 60 minutes, Ascaris at 60 C in 60 minutes, and poliovirus at 50 C in 30 minutes. Outdoor composting in windows produces a pile with a temperature similar to ambient temperature, although it can rise to 70 C in the center of the pile. The pathogens are destroyed deeper in the pile, but survive on the pile surface. Evidence suggested that there is a temperature zone at which bacterial growth is optimum. This growth may continue as long as proper nutrients are available. It was shown that some pathogens survive waste water treatment and are included in waste solids. Composting has been shown to be a good option for waste disposal and destruction of these pathogens. (Collins-FIRL)
W77-08641

CARBON ISOTOPIC STUDY OF THE FATE OF LANDFILL LEACHATE IN GROUNDWATER,
Indiana Univ., Bloomington. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-08670

SLUDGE INCINERATION,
J. Jacknow.
Environmental Science and Technology, Vol 10, No 12, November 1976, p 1080-1082, 1 tab, 6 ref.

Descriptors: *Incineration, *Sludge disposal, *Environmental effects, Heat budget, Pesticides, Pathogenic bacteria, Viruses, Waste treatment, Waste disposal.
Identifiers: *Energy conservation, Land disposal, Heat balance, Energy costs, Health costs.

A synopsis of alternative sludge disposal techniques and their environmental impacts is presented by a consultant to the Water and Wastewater Equipment Makers Association. Energy saving systems in use today are discussed. Many present sludge incineration systems are meeting local and state particulate standards, which are more stringent than Federal standards. Mercury and lead are discharged, but at insignificant levels. Pesticides present in the sludge are destroyed in the incineration process at efficiency rates of between 94 and 99.9 percent. A process is discussed whereby the latent heat in incinerator flue gases is used to precondition sludge. This and other processes result in a positive heat balance in the incinerator that can be used to generate steam for other operations at the treatment plant. Twenty-five million BTU's per day can be recovered from an incinerator serving a community of 100,000 people. Incineration has been found to have fewer energy and health costs than land application. The ash from the incineration process is free from pathogens, viruses and pesticides. The metals in the ash have been converted to the less soluable oxide form. (Nessa-NC)
W77-08717

SOLID WASTE MANAGEMENT: A TEST OF ALTERNATIVE STRATEGIES USING OPTIMIZATION TECHNIQUES,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geography; and Rutgers - The State Univ., New Brunswick, N.J. Div. of Urban Studies.
M. Greenberg, J. Caruana, and B. Krugman.
Environment and Planning A, Vol. 8, No. 5, p 587-597, August, 1976, 4 tab, 13 ref.

Descriptors: *Linear programming, *Solid wastes, *Waste disposal, *Domestic wastes, *Optimization, Analytical techniques, Systems analysis, Watersheds(Basins), Management, Incineration, Landfills, Energy, *New Jersey.
Identifiers: *Hackensack Meadowlands(NJ), Gas pyrolysis, Dry fuel technology, Fuel credits, Resource recovery, Energy recovery.

A linear program is developed that tests the efficacy of different solid waste disposal technologies, locations, and fuel credits for recovered energy. The research design focuses on the cost of continued centralized landfilling and the opportunity cost of choosing either dispersed landfilling or resource recovery strategies. Twenty-five watersheds in the Hackensack Meadowlands of New Jersey formed the geographical unit of analysis. Four disposal technologies were evaluated, including present practices, disposal at sites in other communities, dry fuel technology which recovers an energy by-product, and gas pyrolysis. High, medium and low revenue pictures were developed for the last two options in order to determine the threshold revenue at which the systems become economically feasible. A low price charged for use of a central site results in continuation of present practices. When costs rise 55 percent, pressures develop for alternative sites. A low revenue for recovered resources justifies at least one dry fuel plant. The optimization procedure assigns all of the region's wastes to dry fuel facilities when medium and high revenues are assumed. The gas pyrolysis system cannot compete economically with the dry fuel system at any fuel credit level. (Nessa-NC)
W77-08723

SOIL TESTING FOR SLUDGE DISPOSAL.
Compost Science, Vol. 18, No. 1, p 16-17, January-February, 1977.

Descriptors: *Sludge disposal, *Soil tests, Heavy metals, Fertilizers, Soil properties, Monitoring, Ultimate disposal, *Soil disposal fields, Soil analysis, Waste water treatment, Water reuse.

Graduate and undergraduate students at the Penn State School of Agronomy are investigating sludge disposal for agricultural use. Soil testing is part of their research. The method developed uses an ideal solution of macro elements in combination with a soil sample. The solution adds to the soil or adsorbs from it the basic elements needed for plant growth; excesses or deficiencies of these elements can be pinpointed by examination of the solution after it interacts with the soil. The type and amount of fertilizer needed to promote optimum growth can be determined, as can the presence of heavy metals in sludge fertilizer. Monitoring the use of sludge as compost will be much easier with these test methods. (Collins-FIRL)
W77-08728

DENSITY CURRENTS AND THEIR APPLICATIONS,
Catholic Univ. of America, Washington, D. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08844

AGENTS, METHODS AND DEVICES FOR AMELIORATION OF DISCHARGES OF HAZARDOUS CHEMICALS ON WATER,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5G.
W77-08910

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY--TEXAS: AREA DESCRIPTION,
National Marine Fisheries Service, Galveston, Tex. Gulf Coastal Fisheries Center.
For primary bibliographic entry see Field 2L.
W77-08916

OCEAN DUMPING IN THE UNITED STATES - 1975, THIRD ANNUAL REPORT OF THE ENVIRONMENTAL PROTECTION AGENCY ON THE ADMINISTRATION OF TITLE I OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972, AS AMENDED.
Environmental Protection Agency, Washington, D. C. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5B.
W77-08919

INTERNATIONAL LAW AND RADIOACTIVE POLLUTION BY OCEAN DUMPING: 'WITH ALL THEIR GENIUS AND WITH ALL THEIR SKILL...'
For primary bibliographic entry see Field 5G.
W77-08957

SAY GOODBYE TO OCEAN DUMPING,
For primary bibliographic entry see Field 5G.
W77-08969

TO EXTEND THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT (HEARING ON S 3147 TO EXTEND THE ACT 2 YEARS).
For primary bibliographic entry see Field 6E.
W77-08981

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENT - PHASE I,
Massachusetts Univ., Amherst. Environmental Engineering.
D. D. Adrian, C. S. Chen, M. A. DiGiano, J. H. Baker, and J. T. Clayton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 092, Price codes: A08 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRC Publication No. 70, April 1976, 157 p, 20 fig, 35 tab, 115 ref. OWRT B-033-MASS(1), 14-31-0001-4092.

Descriptors: Sludge disposal, Soil physical properties, *Heavy metals, *Sewage disposal, *Nitrogen, *Sewage effluents, *Sewage lagoons, Infiltration, Permiability, *Waste water disposal, Percolation, Water reuse, Absorption.
Identifiers: Fragipan soils, New England soils.

This project was initiated in response to a concern about the suitability of various sewage effluent land disposal alternatives; findings of Phase I of the dual phase project are presented. The sources of greatest concern include sewage effluents applied to land as a 'living filter' and sludge from wastewater treatment plants. The following papers are presented: (1) Measurement of the Infiltration Properties of Fragipan Soils; (2) Experimental Study of Waste Effluent Infiltration through Soil Media; (3) Heavy Metal Reactions in Soils; (4) Modeling of Plant Uptake of Nitrogen; (5) Mathematical Modeling of Nitrification/Denitrification in a Wastewater Storage Lagoon of a Spray Irrigation System; and (6) Nitrogen Transformations in Storage Reservoirs. (See also W77-09064) (Lefferts-Mass)
W77-09063

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENTS, PHASE II,
Massachusetts Univ., Amherst. Environmental Engineering.
D. D. Adrian, J. T. Clayton, M. E. Weeks, J. H. Baker, and F. A. DiGiano.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 093, Price codes: A07 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRC Publication No. 86, December 1976, 134 p, 54 fig, 18 tab, 90 ref. OWRT B-038-MASS(1), 14-31-0001-5080.

Descriptors: Waste disposal, Sewage disposal, *Soil physical properties, Permeability, Sewage lagoons, *Waste water disposal, *Heavy metals, Water reuse, *Percolation, Soil engineering, *Nitrogen, Mathematical models, Sewage effluent.
Identifiers: New England soils, Fragipan soils, Land application.

This project was undertaken as a result of the controversy surrounding the disposal of treated waste effluent. Five papers are presented, each related to the fate of contaminants in a land disposal system operating on New England soils. Topics discussed are: (1) The distribution of fragipan soils in New England as well as the physical characteristics of these hardpan soils; (2) The reactions of heavy metals in wastewater applied to soils; (3) Nitrogen transformations in wastewater applied to soils; (4) A mathematical model related to nitrogen transformation during lagoon storage to help determine suitable loading rates in a land application system; (5) Utilization of a computer simulation of rainfall to investigate the importance of annual precipitation patterns in determining land application rates. (See also W77-09063) (Lefferts-Mass)
W77-09064

STORAGE OF LOW-LEVEL RADIOACTIVE WASTES IN THE GROUND: HYDROGEOLOGIC AND HYDROCHEMICAL FACTORS,
Geological Survey, Reston, Va. Water Resources Div.
S. S. Papadopulos, and I. J. Winograd.
Open-file report 74-344, 1974. 49 p, 1 fig, 43 ref, append.

Descriptors: *Radioactive waste disposal, *Underground waste disposal, *Water pollution control, *Hydrogeology, Reviews, Methodology, Evaluation, Geologic units, Aquifers, Groundwater movement, Path of pollutants, Model studies, Mathematical models.

The status of mathematical simulation techniques, as they apply to radioactive waste burial sites, is briefly reviewed, and hydrogeologic and hydrochemical data needs are listed in order of increasing difficulty and cost of acquisition. Predictive modeling, monitoring, and management of radionuclides dissolved and transported by ground water can best be done for sites in relatively simple hydrogeologic settings; namely, in unfaulted relatively flat-lying strata of intermediate permeability such as silt, siltstone and silty sandstone. In contrast, dense fractured or soluble media, and poorly permeable porous media (aquitards) are not suitable for use as burial sites, first because of media heterogeneity and difficulties of sampling, and consequently of predictive modeling, and second, because in humid zones burial trenches in aquitards may overflow. A buffer zone several thousands of feet to perhaps several miles around existing or proposed sites is a mandatory consequence of the site selection criteria. As a specific example, the Maxey Flats, Kentucky low-level waste disposal site is examined. (Woodard-USGS)
W77-09086

POPULATION RESPONSE AND HEAVY METAL CONCENTRATIONS IN COTTONTAIL RABBITS AND SMALL MAMMALS IN WASTEWATER IRRIGATED HABITATS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5B.
W77-09097

THE EFFECTS OF WASTEWATER IRRIGATION ON THE ACTIVITIES AND MOVEMENTS OF SONGBIRDS,
The Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5C.
W77-09098

DEER HABITAT RESPONSE TO IRRIGATION WITH MUNICIPAL WASTEWATER,
Pennsylvania State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-09099

PHOSPHATE AND NITRATE REMOVAL BY A GRASS FILTRATION SYSTEM FOR FINAL TREATMENT OF MUNICIPAL WASTE WATER,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-09100

5F. Water Treatment and Quality Alteration

THE DEVELOPMENT OF A TEST FOR THE POTABILITY OF WATER TREATED BY A DIRECT REUSE SYSTEM,
Cincinnati Univ., Ohio. Coll. of Medicine.
For primary bibliographic entry see Field 5A.
W77-08758

INFLUENCE OF INITIAL MIXING ON DIRECT FILTRATION,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
R. R. Sama.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 907, Price codes: A05 in paper copy, A01 in microfiche. Master's Thesis, December 1974. 88 p, 24 fig, 7 tab, 30 ref. OWRT A-062-ILL(4). 14-31-0001-4013.

Descriptors: *Water treatment, *Flocculation, *Polyelectrolytes, Lake Michigan, *Mixing, *Filtration, Filters, Cations, Coagulation, Performance.
Identifiers: *Direct filtration, Organic polyelectrolytes, Mixing time, Filtration rate, Zeta potential measurements.

A literature review describes the history and development of direct filtration as a means for economical treatment of water with a low turbidity and compares the various procedures used. Experiments were conducted using a dual-media filter and a commercially available organic cationic polyelectrolyte coagulant. The primary objective was to study the effect of the mean fluid resident time and the mixing intensity in a continuous flow reactor on the length of the filter run. Polyelectrolyte concentrations of 2.0, 3.0 and 5.0 mg/l were used. Results are given for various operating conditions. At higher optimal values, the benefits resulting from increased deposit density are offset by increased deposition in the anthrocite-sand mixture region, when, because of the relatively lower initial porosity, deposition results in a relatively rapid head loss buildup and consequently shorter filter runs.
W77-08809

DIRECT FILTRATION OF LAKE MICHIGAN WATER,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
R. D. Tanner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 890, Price codes: A05 in paper copy, A01 in microfiche. Master's Thesis, May 1974. 74 p, 23 fig, 11 tab, 21 ref. OWRT A-062-ILL(3), 14-31-0001-4031.

Descriptors: *Water treatment, *Flocculation, *Polyelectrolytes, *Lake Michigan, *Filtration, Filters, Colloids, Coagulation, Cations, Turbidity, Pilot plants.
Identifiers: *Direct filtration, Cationic polyelectrolytes, Zeta potential measurements.

A review of current theories concerning the mechanisms of colloid destabilization and filtration mechanisms is discussed, and finally the current application of direct filtration is reviewed. Two identical pilot plant filters were set up to evaluate the clarification of Lake Michigan water when cationic polyelectrolytes were used as the sole coagulant. One filter served as a blank, receiving only chlorinated water while the other filter received polymer treated water. During the test period the influent water turbidies ranged from 0.65 to 35 FTU. After 6.5 hours of filtration the effluent turbidity was less than 0.10 FTU. Four cationic polyelectrolytes were tested. The head loss developed during a filter run varied significantly between each of the polymers studied due

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to development of a filter cake by certain polymers. Head loss buildup was also a function of the influent turbidity and the polyelectrolyte concentration. It appears that direct filtration of Lake Michigan water with cationic polyelectrolytes as the sole coagulant might be a feasible alternative to the conventional water treatment plan. Additional research is needed when the turbidity is greater than 10 FTU.
W77-08812

PHOTOCHEMICAL DECHLORINATION OF WATER SUPPLY FOR FISH TANKS WITH COMMERCIAL WATER STERILIZERS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
F. A. J. Armstrong, and D. P. Scott.
J Fish Res Board Can 31(12), p 1881-1886. 1974.

Descriptors: *Water treatment, *Chlorine, Fish, Habitats, Water supply.
Identifiers: *Dechlorination, Mercury, Lamp, *Photochemical, Dechlorination, Water, *Fish, Tanks, Chlorine removal.

Commercial Hg-lamp water sterilizers can be used for removal of free C12 in water supplies, by photochemical action. The efficiency of removal decreases with increasing pH, but is little affected by temperature. It is greatest at low initial C12 concentration. Equipment with either low or high presure Hg vapor lamps may be used. Removal of 90% of free C12 can be effected at about 13.01 min-1 with a sterilizer using 8 low presure lamps of 40 W, or at 50 1 min-1 or more with 2 1200-W sterilizers with high presure lamps in tandem. Treated water appears to be harmless to fish. -- Copyright 1977, Biological Abstracts, Inc.
W77-08842

PHILADELPHIA'S WATER SYSTEM AUTOMATION PLAN,
Philadelphia Water Dept., Pa. Office of Water Commissioner and Chief Engineer.
C. F. Guarino, J. V. Radziul, A. Hess, P. R. Cairo, and R. E. Day.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineering, Vol. 102, No. EE5, Proceedings paper No. 12473, p 953-968, October 1976. 6 fig, 7 ref.

Descriptors: *Water distribution(Applied), *Water quality, *Water treatment, *Automation, Computers, Design, Comprehensive planning, Rivers, Control, Treatment facilities, Algorithms.
Identifiers: *Information systems, Nomographs, Waterworks.

Described is the development of a five-year master plan to implement a modern integrated total system automation of the City of Philadelphia's water treatment and distribution facilities, including associated components. Analytical instrumentation and other devices located in the rivers, the treatment process, and the distribution system provide information through communication links to process control computers. The data are analyzed by the master control computer which utilizes specially derived algorithms to determine adjustments of chemical feeds and process flows via supervisory control of the plant's equipment. Examined is the multidisciplined approach taken to solve the problem. Considered are: a review of the treatment processes; strategies for improving treatment methods; the development of the five-level hierarchical control structure; and the derivation of advanced control strategies for computer-based process control and management. (Bell-Cornell)
W77-08864

5G. Water Quality Control

QUANTITATIVE AND QUALITATIVE IMPLICATIONS OF URBAN STORM RUNOFF ABATEMENT MEASURES,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
G. Aron, D. A. Long, A. C. Miller, and M. J. O'Brien.
Available from the National Technical Information Service, Springfield Va as PB-268 777, Price codes: A06 in paper copy, A01 in microfiche. Research Publication 97, Institute for Research on Land and Water Resources, University Park, PA., December 1976. 101 p, 18 tab, 23 fig, 52 ref. 3 append. OWRT B-076-PA(2), 14-0001-5108.

Descriptors: *Planning, *Computer models, *Storm runoff, *Storm water, Surface runoff, *Urbanization, *Floods, *Urban drainage, *Urban hydrology, Urban runoff, Water quality, Management, Model studies.
Identifiers: *Urban runoff models, *Total watershed response, *Runoff quality, Subarea flow, Quantity of stormwater runoff, Hydrologic budget models.

Stormwater detention devices can be effective in reducing downstream problems as a result of urban development and they can be compatible with their surroundings. Problems can arise with stormwater detention devices especially if they are not constructed or maintained properly. Some devices are environmentally more acceptable than others in cerain areas, but there should be no problems which cannot be handled with adequate planning. Uraban runoff models are becoming more refined and reliable with use, but they still have a long way to go. They will, however, continue to be an important tool to the engineer and planner in the future. The decision-making process in regard to urban storm-water management and non-point source pollution control is severly hampered by the lack of good real-time data on both urban runoff quantity and quality. The present market demand for stormwater monitoring equipment has resulted in a desirable research effort into the development of more reliable equipment at lower cost. (Sink-Penn State)
W77-08602

ADVANCED WASTE TREATMENT DESIGN PROTECTS LAKE ALTON,
E. Maran, and D. J. Sulick.
Water and Sewage Works, Vol 124, No 4, p 68-69, April, 1977. 1 fig, 1 tab.

Descriptors: *Treatment facilities, *Water pollution control, Lakes, Activated carbon, Incineration, Biological treatment, Chemical treatment, Oxidation-reduction potential, Ammonia, Disinfection, Chlorination, Chemical reactions, Water purification, *Waste water treatment, *Tertiary treatment.
Identifiers: St Charles(MO), *Lake Alton(MO).

An advanced treatment system was used to produce a high quality effluent for discharge into Alton Lake, near St. Charles, Missouri. The lake was created by the construction of a flood control lock and dam on the Mississippi RIver, and is used for recreational purposes. The city's 5.5 mgd primary treatment plant was upgraded by the addition of activated sludge treatment and granular carbon adsorption. The entire system consists of a bar screen, comminutor, aerated grit chamber and primary clarifier, four aeration basins, and two secondary clarifiers. The sludge is thickened, filter pressed, and incinerated. Secondary clarifier effluent is pumped to the granular carbon system which functions as a suspended solids filter and adsorbs dissolved organic chemicals. The carbon life in each adsorber is about 200 days. The carbon is exhausted at a rate of nearly 200 pounds/miligram of waste water treated. Spent carbon is fed into a multiple hearth furnace operated at about 1650 F and fueled by natural gas or No. 2 fuel oil. The furnace has an afterburner and wet scrubber for complete organic matter combustion and removal of particulates from exhaust gases. Reactivated carbon is water-quenched and educted to an adsorber for reuse. A 5 to 7% carbon loss results from handling and reactivation. The design of the system provides for conversion of the plant to physical-chemical treatment in case of biological process failure. Chlorination is provided before and after carbon adsorption to reduce plugging of the carbon beds from the physical carryover of excess secondary slime growths, and to aid oxidation-reduction reactions of mono- or dichloroamines formed by free ammonia conversion at breakpoint chlorination. These reactions do not interfere with carbon adsorption properties. Carbon post-chlorination is for disinfection. (Collins-FIRL)
W77-08631

APPLICATION OF PHYSICO-CHEMICAL TREATMENT AS A METHOD OF ACHIEVING PARTIAL STANDARDS ON SEWAGE EFFLUENTS DISCHARGED IN ESTUARIAL AND COASTAL SITUATIONS,
Anglian Water Authority, Huntingdon (England). Directorate of Scientific Services.
For primary bibliographic entry see Field 5D.
W77-08634

GET READY FOR DUAL WATER SYSTEMS,
Weston Environmental Consultants-Designers, West Chester, Pa.
A. K. Deb.
Water and Wastes Engineering, Vol. 14, No. 4, p 88-89, 91-92, April, 1977. 3 fig, 2 tab, 5 ref.

Descriptors: *Water supply, *Domestic water, Water quality control, Municipal water, Water consumption(Except consumptive use), Industrial water, Cities, Water use, Water purification, Water demand, Treatment facilities, Model studies, Costs, Recycling.
Identifiers: *Dual water supply systems.

Technological advances are increasing the probability of dual water systems and mathematical models have been developed for the costs involved in these systems. If the current rate of increased water demand, population growth, and development of chemicals which enter natural waters continue, the quality of water will decline and high quality supplies of domestic water will not remain at present levels. It is important to understand that a majority of water uses do not require the quality levels of potable water. It was suggested that a hierarchy of water use and relative quality levels be established. The supply of two or more water grades should be considered. Separate systems could be used to supply potable water and non-potable water. A higher quality level of water treatment, including disinfection, would be necessary for potable water, but non-potable water would receive treatment somewhat similar to present levels. Benefits would include lowered public health risks and water conservation. Dual systems are being used in various locales at present. An English system separates domestic (potable) and industrial (non-potable) water and, in Singapore, part of filtered waste water is used for industry and toilet flushing. A plan for St. Petersburg, Florida, would use reclaimed municipal water for lawn sprinkling. Non-potable water in dual systems should nevertheless be of such quality that accidental or inadvertent ingestion would not cause harm. (Collins-FIRL)
W77-08645

PLANASA--A NATIONAL PLAN FOR WATER SUPPLY AND SEWERAGE IN BRAZIL,
Banco Nacional da Habitacao, Rio de Janeiro (Brazil).
For primary bibliographic entry see Field 6E.
W77-08646

TOTAL ENERGY USE IN AN URBAN-AGRICULTURAL POWER PLANT COMPLEX,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. Boersma, L. R. Davis, and J. C. Ringle.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 135-143, 1 fig, 2 tab, 19 ref.

Descriptors: *Geothermal studies, *Heated water, Powerplants, Agriculture, *Energy.

The rationale for agricultural applications of warm water appearing as waste heat from power generating plants or from geothermal waters is described. Because it is available over a wide temperature range, the use of geothermal water is identified as being particularly attractive. It was concluded that the use of warm water to satisfy existing and future energy needs should be developed. (See also W77-08677) (Chilton-ORNL)
W77-08691

RECREATIONAL WATER RESOURCES PROBLEMS.
Bureau of Outdoor Recreation, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-08711

UTILITY ANALYSIS FOR THE URBAN GROWTH INSIDE THE RECHARGE ZONES OF THE GROUNDWATER RESOURCES OF SAN ANTONIO, TEXAS,
Texas Univ. at San Antonio. Dept. of Environmental Studies.
For primary bibliographic entry see Field 6B.
W77-08713

EXPERIMENTAL DATA ON THE REGULATION OF 1,2-DIBROMOPROPANE IN RESERVOIR WATER, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-08718

MAKE MONEY BY COMPUTER,
For primary bibliographic entry see Field 5D.
W77-08730

REACTIONS IN THE AQUEOUS ENVIRONMENT OF LOW MOLECULAR WEIGHT ORGANIC MOLECULES,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-08754

THE MICROBIAL DEGRADATION OF AROMATIC PETROLEUM PRODUCTS,
Texas Univ. at Austin. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W77-08759

EFFECTS OF DIPOTASSIUM ENDOTHALL ON ROOTED AQUATICS AND ADULT AND FIRST GENERATION BLUEGILLS,
Wisconsin Dept. of Natural Resources, Woodruff.
For primary bibliographic entry see Field 5C.
W77-08785

SEGREGATION AND RECLAMATION OF HOUSEHOLD WASTEWATER AT AN INDIVIDUAL RESIDENCE,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W77-08806

PROCEEDINGS: THE CONNECTICUT RIVER SYSTEM: A WORKSHOP ON RESEARCH NEEDS AND PRIORITIES.
Massachusetts Univ., Amherst. Inst. for Man and Environment; Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08808

MOVEMENT OF MANURIAL NITROGEN IN COOL, HUMID CLIMATES,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-08819

EFFECTS OF HYPOLIMNETIC AERATION ON NITROGEN AND PHOSPHORUS IN A EUTROPHIC LAKE,
Adelphi Univ., Garden City, N.Y.; and Adelphi Univ., Oakdale, N.Y. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-08824

THE DESIGN OF A SYSTEM FOR COLLECTING LEACHATE FROM A LINED LANDFILL SITE,
Toronto Univ. (Ontario). Dept. of Geophysics.
J. Wong.
Water Resources Research, Vol. 13, No. 2, p 404-410, April 1977. 7 fig, 1 tab 4 ref, 2 append.

Descriptors: *Landfills, *Waste disposal, *Leachate, *Model studies, Mathematical models, Garbage dumps, Waste dumps, Disposal, Solid wastes, Leaching, Drainage, Infiltration, Tiles, Drainage systems, Subsurface drains, Tile drains, Linings, Leakage, Water pollution, Water pollution control.
Identifiers: Leachate collecting.

A system for collecting leachate at the bottom of a landfill site was conceptualized, and the design parameters for the system were specified. The core of the system is a sloped low-permeability earthen liner that deflects downward infiltration to a series of collector tiles. Equations were derived that describe the drainage and leakage processes on top of the leaky liner. A simple graphical procedure was developed to quantitatively evaluate the collection efficiency of the system. With the developed procedure, some implicatons of various options available to landfill design were examined. The main assumptions used in the model were examined critically to explain qualitatively the limitations of the model. (Sims-ISWS)
W77-08827

DESIGN EFFICIENCY OF STORMWATER DETENTION BASINS,
National Weather Service, Silver Spring, Md., Hydrologic Research Lab.
For primary bibliographic entry see Field 4D.
W77-08841

INTEGRATED EVALUATION PROGRAMS FOR FAIRFAX COUNTY, VA.,
Fairfax County Office of Comprehensive Planning, Va. Director's Office.
For primary bibliographic entry see Field 6B.
W77-08862

WATER SUPPLY ECONOMICS,
Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.
For primary bibliographic entry see Field 6B.
W77-08863

REAERATION AND VELOCITY PREDICTION FOR SMALL STREAMS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08867

INCIDENCE OF THE BENEFITS AND COSTS OF ENVIRONMENTAL PROGRAMS,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W77-08870

WATER--AN ELEMENT OF LAND-USE AND URBAN GROWTH POLICIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08872

BARRIER FOR WATER CARRIED POLLUTANTS,
P. Preus.
U.S. Patent No 3,998,060, 6 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 953, No 3, p 934, December 21, 1976.

Descriptors: *Patents, *Oil pollution, *Water pollution control, Water pollution treatment, *Barriers, Floating, Obstruction to flow, Adsorption, Absorption.
Identifiers: Oleophilic-hydrophobic material.

Floating barriers, known generally as oil booms, are found to have great utility in containing and controlling oil slicks and other water carried pollutants on and in bodies of water. This barrier is composed of a series of boom sections which are connectable in end to end relationship with each of the boom sections containing a flotation material which comprises an oleophilic-hydrophobic-lighter than water composition which will selectively absorb and/or adsorb hydrocarbons or other pollutants. The boom sections are connected to flexible draft members such as cables or chains which maintain the integrity of the boom even if it becomes necessary to replace one or more of the boom sections or to enlarge the area confined by the boom or to decrease such area by removing boom sections. In addition to the flexible draft members and associated connectors, the invention provides for fluid impervious connectors which engage opposed boom section ends and prevent the escape of the contained floating substance at each joint or connection. (Sinha-OEIS)
W77-08878

DETERGENT COMPOSITION FOR DISPERSING OIL SPILLS,
British Petroleum Co. Ltd., London (England). (Assignee).
P. M. Blanchard, and D. G. Meeks.
U.S. Patent No. 3,998,733, 5 p, 1 fig, 2 tab, 15 ref; Official Gazette of the United States Patent Office, Vol. 953, no 3, p 1153-1154, December 21, 1976.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution, *Water quality control, *Dispersion, Emulsions, Detergents, Organic compounds, Chemical reactions.

A dispersant composition can be dispersed in sea water at the time of spraying, the water acting as carrier. The dispersant composition can also be diluted with dearomatised kerosine. When the dispersant composition is to be diluted with sea water the composition can be sprayed from a vessel. When the composition is to be used to clear beaches it can be used dissolved in a suitably refined kerosine. Thus the composition can have a dual role. The detergent composition comprises an ester of a polyoxyethylene glycol ester of a C10-24 fatty acid, an organic sulphate or sulphonate deter-

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gent, an alcohol or glycol of molecular weight 90-250. (SinhanOEIS)
W77-08884

FENDING DEVICE FOR OIL CONTAINMENT BOOM,
E. C. Nielsen.
U.S. Patent No. 3,000,532, 7 p, 11 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 108, January 4, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution, *Water pollution control, *Water quality control, Barriers, Equipment.
Identifiers: Fenders, Modular units, Containment.

Oil booms or barriers are in general use today for containing oil slicks floating on water. When oil booms are used in conjunction with vessels the boom must be held away from the hull of the vessel since a discharge from either above or below the waterline of the vessel will enter the plane of the water surface several feet away from the hull depending on the current and wind direction and velocity. The greater the distance of spacing of the boom, the better the likelihood of safe containment under most conditions. It is all imperative that the boom be kept away from the rotating propeller and destroyed with an attendant possibility of damage to the ship's propulsion gear. A durable fending device of suitable size for floating objects such as oil barriers is provided which has a maximum strength/weight ratio and is formed from a high strength material. It may be readily assembled from components of conventional shipping size by connecting them by standard fastening means into an efficient overall large span structure. (Sinha-OEIS)
W77-08892

SKIMMER FENCE,
Exxon Production Research Co., Houston, Tex. (Assignee).
U.S. Patent No. 4,000,618, 4 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 137, January 4, 1977.

Descriptors: *Patents, Water pollution, *Water pollution control, *Water quality control, Oil pollution, *Skimming, *Barriers, Baffles, Floating, Engineering structures.
Identifiers: Containment, *Skimmer fences.

A barrier for use in a flowing stream of liquid accumulates floating material including petroleum products so that such material can be easily removed. The barrier may be used as a safeguard in locations, such as ravines or drainage ditches, which are normally dry but which might occasionally contain a flowing stream. The apparatus is designed to skim or control a flowing stream which may vary in depth from very shallow to deep water. The barrier includes a series of vertically 'stacked' baffles. When in operating position the barrier extends across the breadth of the stream and to any desired distance above and below the surface of the liquid. The baffles are spaced apart with each baffle overlapping a portion of the baffle adjacent to it to form a passageway between each baffle for flow of the stream through the barrier. In cross section each baffle may comprise two straight members perpendicular to and extending in opposite directions to a third straight member or each baffle may comprise a semicircle in cross section. (Sinha-OEIS)
W77-08893

REMOTE SEALING OF MINE PASSAGES CONTAINING FLOWING WATER,
Department of the Interior, Washington, D.C. Office of the Secretary.
K. R. Maser.
U.S. Patent No. 4,000,621, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 137, January 4, 1977.

Descriptors: *Patents, *Underground streams, *Subsurface water, *Mine water, Tunnels, Underground structures, Boreholes, Sealants.

There is often need to construct seals within underground passageways such as mine drifts or tunnels. Access to the seal site may be hazardous and often times impossible. This invention describes how a seal may be remotely constructed in an underground passage having water flowing by providing a diversion path for the water during construction of the seal and thereafter closing off the diversion path. This is accomplished by drilling at least one borehole communicating from the surface to the passage through which a first layer of sized aggregate is placed on the passage floor to allow percolation of the flowing water through the aggregate layer without water overflowing the layer. A dry sealing material, which may comprise fly ash alone or mixed with cement or a swelling clay such as bentonite, is then pneumatically placed on top of the aggregate layer. Then a cementitious grout is injected into the aggregate layer to close off the water flow path and complete the seal. (Sinha-OEIS)
W77-08896

FLOCCULANT USE ON TANKERS,
Exxon Research and Engineering Co., Florham Park, N.J. Environmental Control and Safety Div.
J. E. Shewmaker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 626, Price codes: A03 in paper copy, A01 in microfiche. Report EE.5TMR.76 to U.S. Maritime Administration, March 1976. 48 p, 5 fig, 9 tab, 10 ref, 4 append. C-1-35049.

Descriptors: *Flocculation, *Water pollution control, *Oil pollution, *Pollution abatement, *Waste water treatment, *Separation techniques.
Identifiers: Tankers.

The results of shipboard studies of flocculants to improve oil-water separation in tanker slop tanks is presented. Experiments were performed in matched pairs of slop tanks. Montmorillonite clay in fresh water and a clay activator were mixed into the slop waters at levels of 100 mg/kg (ppm) and 20 mg/kg (ppm), respectively. Flocculation improved the oil-water separation at a very rapid rate. After the best method of application, flocculant-treated slop water contained about 20-50 mg/kg (ppm) of oil compared to several hundred mg/kg (ppm) in the control tank undergoing unaided gravity separation. Since flocculation would require supplying and handling of additional materials as well as operational effort, other methods of achieving oil-water separation may be preferred. Unanswered questions concerning flocculant use include the fate and effects of the clay and the economic recoverability of flocculated oil. (Sinha-OEIS)
W77-08906

A BIODEGRADATION OF OIL ON WATER SURFACES,
Office of Naval Research, Arlington, Va.
R. Bartha.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-000 722, Price codes: A02 in paper copy, A01 in microfiche. U.S. Patent Application No 558,040, 13 March 1975. 14 p, 1 fig.

Descriptors: *Oil spills, *Oil pollution, *Biodegradation, *Microbial degradation, *Water pollution treatment, Microorganisms, Patents.
Identifiers: *Outer Continental Shelf.

Free-floating oil slicks on bodies of sea and fresh water are disposed of by microbial degradation at a greatly enhanced rate by apply the essential microbial nutrients, nitrogen and phosphorus, to the oil slick in a form that dissolves in or adheres to the oil and thus selectively stimulates the activity of oil-metabolizing microorganisms. (Sinha-OEIS)
W77-08909

AGENTS, METHODS AND DEVICES FOR AMELIORATION OF DISCHARGES OF HAZARDOUS CHEMICALS ON WATER,
Rensselaer Polytechnic Inst., Troy, N.Y.
W. H. Bauer, and J. J. Bulloff.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-024 221, Price codes: A13 in paper copy, A01 in microfiche. U.S. Coast Guard Office of Research and Development Report No CG-D-38-76, August 1975. 285 p, 23 tab, 583 ref, 2 append.

Descriptors: *Oil spills, *Hazards, *Water pollution control, *Pollutant identification, *Water pollution treatment, *Oil pollutants, Waste disposal, Chemical wastes.

Chemical agents and methods advantageous for the amelioration of discharges of 30 representative hazardous chemicals on water were identified and evaluated. Existing devices advantageous for the amelioration of discharges on water of 8 floating hazardous chemicals were identified and evaluated. Sorbents that have a high potential to ameliorate discharges of 13 miscible/soluble representative hazardous chemicals were identified and evaluated. Experimental tests were performed. It was found that very few techniques have been established or tested for amelioration of discharges of hazardous chemical on water. Therefore, the identifications and evaluations of agents were based upon the known physical and chemical properties of the representative hazardous chemicals and of the applicable amelioration agents and upon recorded experience in treatment of polluted water, mill ponds, plant efflux, stream purification and oil pollution control methods. It was concluded that the use of chemical agents is feasible for 29 of the 30 representative hazardous chemicals and, by inference, to most of the CHRIS list of four hundred hazardous chemicals. The types of available agents evaluated to be most advantageous were sorbents, ion exchangers, diluents, neutralizers, collectors, precipitants, reductants, oxidizers and ultrafiltration membranes. It was further concluded that many available off-the-shelf devices with demonstrated capacity for usefulness in containing, gathering and removing oil spilled on water will also be advantageous in amelioration of discharges of floating hazardous chemicals on water. (Sinha-OEIS)
W77-08910

TESTS OF OIL RECOVERY DEVICES IN BROKEN ICE FIELDS. PHASE I,
ARCTEC, Inc., Columbia, Md.
L. A. Schultz, P. C. Deslauriers, R. P. Voelker, O. M. Halstad, and D. E. Abrams.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A016 465, Price codes: A05 in paper copy, A01 in microfiche. U. S. Coast Guard Office of Research and Development Report No. CG-D-130-75, July 1975. 92 p, 5 append.

Descriptors: *Oil spills, *Mechanical equipment, Ice cover, Arctic, Equipment, Oil pollution, Oil wastes.
Identifiers: *Oil recovery devices.

Full size tests of two oil spill recovery devices, the Lockheed Clean Sweep Model R2003 and the Marco Pollution Control Class I Oil Recovery System, operating in a simulated Arctic environment incorporating below freezing temperatures and ice infested waters in given in this final report. Tests were conducted with both devices in broken fresh water ice and salt water ice, with No. 2 diesel oil and a crude oil selected to closely match the properties of Prudhoe Bay crude oil, at temperatures of +25 F and +15 F. These tests demonstrated that with minor hardware modifications

and the proper operating procedures, both devices will successfully recover crude oil and No. 2 diesel oil spilled in a broken ice field of moderate ice-piece size. The unit oil recovery rate ranged from 1 to 10 gpm per foot of device width for the Lockheed device and from 2 to 25 gpm per foot of device width for the Marco device. (Sinha - OEIS)
W77-08915

ANALYTICAL MODELS FOR THE EVALUATION OF SUPPLEMENTAL AERATION IN TEXAS ESTUARIES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08917

OCEAN DUMPING IN THE UNITED STATES - 1975, THIRD ANNUAL REPORT OF THE ENVIRONMENTAL PROTECTION AGENCY ON THE ADMINISTRATION OF TITLE I OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972, AS AMENDED.
Environmental Protection Agency, Washington, D. C. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5B.
W77-08919

PHYSICAL AND CHEMICAL PARAMETERS ASSOCIATED WITH PHYTOPLANKTON ABUNDANCE AND PERIODICITY IN A FERTILIZED FISH POND,
Auburn University, Auburn, Alabama, Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5C.
W77-08922

LAKE-SHORELAND MANAGEMENT PROGRAMS: SELECTED PAPERS,
Massachusetts University, Amherst, Water Resources Research Center.
For primary bibliographic entry see Field 2H.
W77-08924

COMPUTER MODELING FOR THE PREDICTION OF WATER QUALITY FROM AGRICULTURAL DRAINAGE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08934

SECTION 208 AND SECTION 303 WATER QUALITY PLANNING AND MANAGEMENT: WHERE IS IT NOW,
National Resource Defense Council, Washington, D.C.
D. L. Donley, and K. L. Hall.
Environmental Law Reporter, Vol. 6, p 50115-20, 1976.

Descriptors: *Federal Water Pollution Control Act, *Administrative agencies, *Comprehensive planning, *Water quality control, Governmental interrelations, Planning, Management, Legislation, Legal aspects, Regulation, Standards, Water quality, Water quality standards, Discharge(Water), Runoff, Degradation(Stream), Water pollution, Water pollution sources.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Environmental policy, Point sources(Pollution), Administrative regulations, National Pollutant Discharge Elimination System, Non-point sources(Pollution), Best management practices.

The Environmental Protection Agency (EPA) has substantially revised the regulation outlining the elements of water quality planning and management required by sections 208 and 303. The revised regulations call for a continuing planning process with provisions for periodic review and revision. Requirements for reformation of state antidegradation has also been added. Section 208, which addresses water quality problems from nonpoint sources, is being approached by requiring development and implementation of Best Management Practices (BMP). An appropriate BMP strategy would include proposed regulatory plans, management agencies, and projected costs. The water quality standard revisions pertaining to Section 303 have weakened the strong commitment to upgrading water quality standards to meet the 1983 goal. States may now downgrade existing water quality standards based on the concept of attainability which takes into account environmental, technological, social, economic, and institutional factors. However, the new antidegradation policy, if properly implemented, will protect high quality water from pollution and will curb current pollution. Only after public participation can a state qualify this regulation to allow for lower water quality. Public involvement is also seen to play a major role in both the planning and implementation stages of sections 208 and 303. (Petruff-Florida)
W77-08949

MANY CHANGES URGED FOR PL 92-500,
C. W. Heckroth.
Water and Wastes Engineering, Vol 13, No 3, p 34-39, March 1976.

Descriptors: *Federal Water Pollution Control Act, *Water Pollution Control Federation, *Governmental interrelations, *Administrative agencies, Administration, Government finance, Grants, Legal aspects, Water quality standards, Water law, Research priorities, Planning, Training, Effluents, Discharge(Water), Disposal, Oceans, Waste water(Pollution), Pre-treatment(Water).
Identifiers: *National Commission on Water Quality, *Federal Water Pollution Control Act Amendments of 1972, *Non-point sources(Pollution), PL 92-500.

Grievances against PL 92-500 were recently aired before the National Commission on Water Quality (NCWQ). The Water Pollution Control Federation (WPCF) recommended: (1) achieving the goals of the construction grants program through a federal funding commitment for the construction of municipal wastewater treatment facilities; (2) reconsidering the level of long-term federal funding; (3) making funding available on a cost effective basis; (4) emphasizing research to improve plant design and operation; (5) expanding existing training programs; (6) eliminating federal and state duplication in the area of grant applications; (7) delegating more responsibility to the states; (8) defining secondary treatment in more flexible terms; (9) allowing flexibility with respect to section 204b(1) requirements; (10) deleting the industrial cost requirement; (11)extending the 1977 deadline where necessary; (12) building a data basis for assessing nonpoint pollution sources. Another proposal was doing away with the zero discharge requirement, and allowing more flexibility in effluent guidelines by giving consideration to such variables as raw water quality and differences in geologic functions of source streams. The continuation of ocean disposal in the U. S. was also urged. (Petruff-Florida)
W77-08950

NPDES PERMITS AND WATER ANALYSES.
QLM Labs., Inc., Nyack, N. Y.
R. B. Pojasek.
Environmental Science and Technology, Vol 9, No 4, p 320-24 (April 1975). 1 photo, 1 tab.

Descriptors: *Monitoring, *Measurement, *Regulation, *Water analysis, Permits, Control, Data collections, Legal aspects, Administrative agencies, Water pollution control, Water pollution sources, Federal Water Pollution Control Act, Testing procedures, Methodology, Chemical analysis, Sampling, Laboratory tests, Pollutants.
Identifiers: *National Pollutant Discharge Elimination Permits, Variance.

A substantial monitoring program may be necessary to provide required information to be included in mandatory Federal Water Pollution Control Act (FWPCA) permits for individuals discharging pollutants into a waterway from a point source. One of the most important considerations in the permit-granting process is the analytical methodology employed by the permit applicant. Guidelines which establish test procedures for the analysis of pollutants must be compiled with unless a variance is granted. Confusion exists regarding interpretation of these guidelines. It is unclear whether the standard methods must always be used or whether alternative methods are acceptable. The actual selection of a test procedure varies with the application, the precision and accuracy necessary, and an evaluation of cost and available manpower. Good chemical judgment should always be the primary consideration. The only way for the competent environmental chemist to select a method not included on the guideline list, is by following an established procedure, which is described in detail. The author suggests that the Environmental Protection Agency consider revising the variance procedures. (Rieck-Florida)
W77-08953

COMPLYING WITH DISCHARGE REGULATIONS,
Environmental Protection Agency, Washington, D. C. Office of Water Enforcement.
C. J. Schafer, and N. Lailas.
Environmental Science and Technology, Vol 8, No 10, p 903-06 (October 1974). 2 chart.

Descriptors: *Effluents, *Pollutant identification, *Permits, *Industrial wastes, Municipal wastes, Pollutants, Pollution abatement, Regulation, Monitoring, Measurement, Data collections, Navigable waters, Water quality, Water quality, Water quality control, Waste water treatment, Water pollution.
Identifiers: *Effluent limitations, *National Pollution Discharge Elimination System, Federal Water Pollution Control Act Amendments of 1972, Point sources(Pollution), Effluent guidelines.

Under the National Pollutant Discharge Elimination System (NPDES), industrial, municipal and other point source discharges must obtain permits setting forth specific limitations on the discharge of pollutants into the navigable waters of the United States. The Federal Water Pollution Control Act (FWPCA) Amendments delegated the task of publishing regulations providing 'guidelines' for uniform effluent limitations from point sources to the Environmental Protection Agency (EPA) Administrator. The regulations give meaning to the terms 'best practicable' and 'best available' when applied to various categories of industries. The guidelines also establish 'effluent limitations' to be imposed on classes and categories of dischargers. Finally, these regulations identify control measures and practices to eliminate discharge of pollutants. The self-monitoring requirements contained in the permit are developed on an individual basis, with consideration given to the type of treatment, the impact of the proposed treatment facilities on the receiving waters, and the parameters to be measured. In the case of a noncomplying discharge, the permittee must take reasonable steps to minimize adverse impact on navigable waters, while increasing monitoring if necessary. (Rieck-Florida)
W77-08954

EFFLUENT LIMITATIONS AND NPDES: FEDERAL AND STATE IMPLEMENTATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Epstein, Salloway, and Kaplan, Boston, Mass.
T. B. Arnold.
Boston College Industrial and Commercial Law Review, Vol 15, No 4, p 767-93.

Descriptors: *Federal Water Pollution Control Act, *Effluents, *Permits, Water pollution, Legislation, Regulation, Governments, Federal government, State governments, Administrative agencies, Industrial wastes, Water pollution sources, Water quality, Pollution abatement, Water law, Legal aspects, Control systems, Penalties(Legal), Standards, Water quality standards, Governmental interrelations, State jurisdiction.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Point sources(Pollution), *National Pollutant Discharge Elimination System, National Environmental Policy Act, Effluent limitations, Refuse Act of 1899, Congressional hearings, Administrative regulations.

In 1971 Congress surveyed the continuing environmental and economic damage caused by water pollution in the United States, and concluded that the national effort to abate and control water pollution water ineffective. To rectify the situation two major changes were made in the existing law. First, the primary control mechanism was changed from water quality standards to effluent limitations on each point source. Secondly, a national permit system was established to control the discharge of pollutants by each point source. The changes were incorporated in the Federal Water Pollution Control Act Amendments of 1972 (FWPCA). Ambiguities in the language of the FWPCA have diminished its effectiveness. For example, in setting effluent limitations Congress required the 'best practicable control technology currently available'. What factors should determine what is the best practicable control technology. Should there be a single industry standard or should each point source be evaluated separately. Congress conferred the authority to regulate the permit system on the states, or in lieu of state action, upon the Environmental Protection Agency (EPA). However, failure to specify whether states must adopt federal regulations as state law has resulted in lack of uniformity in state administration and enforcement of the FWPCA. (Moorhouse-Florida)
W77-08956

INTERNATIONAL LAW AND RADIOACTIVE POLLUTION BY OCEAN DUMPING: 'WITH ALL THEIR GENIUS AND WITH ALL THEIR SKILL...'
J. W. Hodges.
San Diego Law Review, Vol 11, No 3, p 757-774 (May 1974).

Descriptors: *Radioactive wastes, *International law, *Pollution abatement, *Radioactive waste disposal, Nuclear wastes, Law of the sea, Wastes, Water pollution sources, Waste treatment, Legal aspects, International waters, Water pollution, Disposal, Oceans, Pollutants.
Identifiers: *1972 Ocean Dumping Convention, Radioactive pollution.

The 1972 Ocean Dumping Convention regulates the dumping of all radioactive wastes and materials belonging to ratifying nations. However, nonsignatory nations are not affected by the convention's restrictions. Although the Dumping Convention is a major step toward controlling such pollution, the international law of marine pollution is still a major method of protection. There are four basis for the legal prevention of nuclear pollution of the oceans resulting from the disposal of radioactive waste products. These four principles appear to be exceptionally well suited to nuclear pollution problems. The Freedoms of the Seas principle may reasonably provided a foundation for international law restricting radioactive marine pollution. The right of self protection and the right of self defense may also prove to be viable tools to prevent nuclear dumping. A third concept in international law which lends inself to control of nuclear pollution is the 'Effect Principle' set forth in the Second Restatement of the Foreign Relations Law of the United States. The final, and perhaps most challenging principle may be the protection of certain general interests, or, 'offenses against the Law of Nations'. (Rieck-Florida)
W77-08957

A CONSULTANT'S VIEW OF PL 92-500.
Water and Sewage Works, Vol 122, No 3, p 68-71 (March 1975).

Descriptors: *Engineering, Personnel, *Environmental engineering, *Water pollution control, *Social aspects, *Environmental effects, Financial feasibility, Administration, Administrative decisions, Planning, Decision making, Governments, Project planning, Legislation, Industrial wastes, Water quality, Waste water treatment, Municipal wastes, Treatment facilities, State governments, State jurisdiction, Regions, Regional development, Discharge coefficient, Federal Water Pollution Control Act.
Identifiers: PL 92-500, Federal Water Pollution Control Act Amendments of 1972.

The article presents the view of one consulting engineer of PL 92-500, and of the role of a consultant in the pollution battle. The engineer interviewed, Paul Haney of Block and Veatch, felt that the basic philosophy behind PL 92-500 is good, although the act itself is not. He believed that the act undermined states' rights, and failed to meet public expectations in the clean water cause. He felt the funding must be more stable while the burden of bureaucratic red tape be reduced. The consultant favored deletion of the industrial cost recovery requirement since it actually discourages the formation of regional systems to combine the treatment of industrial and municipal wastes. In his opinion other flaws in the Act are the unrealistic time tables for obtaining permits, the overemphasis on planning, and the impossible goal of zero discharge. The role of the engineering consultant is expanding to encompass environmental, financial, and social aspects of water pollution control. The new regulations' emphasis on cost effectiveness encourages the consultants to be innovative in designing treatment plants. (Rieck-Florida)
W77-08958

PL 92-500: A DOSE OF CHAOS,
Water Pollution Control Federation, Washington, D. C.
J. D. Parkhurst.
Water and Sewage Works, Vol 121, No 9, p cover, 4 (September 1974). 1 photo.

Descriptors: *Pollution abatement, *Water Pollution Control Federation, *Federal Water Pollution Control Act, *Water quality standards, Legislation, Legal aspects, Water pollution, Water quality, Administration, Regulation, Administrative decisions, Water pollution control, Economics, Economic feasibility, Federal government, Costs, Cost sharing.
Identifiers: Environmental policy, Administrative regulations.

The Water Pollution Control Federation workshop comments that the Federal Water Pollution Control Act (FWPCA) is inflexible and cumbersome primarily because it fails to consider local circumstances and constraints. The consensus of member associations criticized the Act's lack of adequate federal funding, unrealistic deadlines and goals, administrative confusion caused by changing guidelines and regulations, the lack of technically competent high-level administrators, and the proliferation of paperwork and red tape. The Water Pollution Control Federation is currently preparing recommendations for proposed amendments to provide for flexibility for the exercise of professional judgment, integrity and fiscal sanity in the FWPCA and its administration. It is imperative that red tape and excessive costs be eliminated if orderly progress is to be achieved toward preservation and enhancement of water quality. (Rieck-Florida)
W77-08959

WHEN YOU THINK ABOUT POLLUTED WATERS, THINK ABOUT YOUR STREAMS AND RIVERS.
The Florida Naturalist, Vol 48, No 4, p 6-11 (1975). 6 photo.

Descriptors: *Federal Water Pollution Control Act, *Pollution abatement, *Water pollution control, *Industrial wastes, *Municipal wastes, Agricultural runoff, Clearcutting, Strip mining, Legal aspects, Regulation, Administrative agencies, Governments, Forest management, Agricultural chemicals, Urban runoff, Pollutants, Streams, Rivers, Abatement, Control.
Identifiers: *Federal Pollution Control Act Amendments of 1972, *Point sources(Poltlution), Non-point sources(Pollution).

Outlined here are steps that concerned citizens can take to insure that the 1972 Amendment to the Water Pollution Control Act work to clean the nation's polluted watercourses. Goals and definitions are provided to aid in understanding the pollution process. Available controls for pollution from industrial and municipal point sources are listed. Remedies for pollution from nonpoint sources such as agriculture, construction sites, logging, mining and urban areas are also discussed. In addition, the steps for water pollution control strategy in Section 208 of the 1972 Water Act are explained. Citizens are urged to pressure local, state and federal water pollution control agencies to carry out federal water quality law. Various routes of citizen action are suggested in demanding that the law be rigorously developed and enforced to clean the nations's rivers and streams. (Rieck-Florida)
W77-08960

BISCAYNE BAY SYMPOSIUM II,
Miami Univ., Fla. Sea Grant Institutional Program.
C. E. B. McKenry.
Sea Grant Special Report No. 6, April 1976. 23 p.

Descriptors: *Bays, *Water utilization, *Water quality, *Preservation, Water management(Applied), Regulation, Legislation, Water policy, Population, Water sports, Economic impact, Permits, Construction, Fishing, Biota, Water pollution, Waste disposal, Marinas, Boating regulations, *Florida.
Identifiers: *Biscayne Bay(Fla), Symposium, Aquatic preserve area.

Legislative concern about the deterioration of Biscayne Bay culminated in a 1974 law designating the Bay as an aquatic preserve. Before any further action can be taken, the public consensus must be assessed. The first Symposium on Biscayne Bay raised several technical issues which Symposium II addressed. The analysis and discussion of the Bay was divided into three major areas: (1) Environmental quality; (2) Utilization; and (3) Bay management. In considering the Environmental quality aspect, it was noted that water quality is the key to the restoration and preservation of a healthy bay. Specific recommendations include: (1) regulation and control of boat discharges into the Bay; (2) encouragement of the county for rules which are more restrictive than State or Federal rules; (3) strict enforcement of regulations on runoff of fertilizers and pesticides; (4) greater care and maintenance of the Bay to be used for both sports and commercial fishing activities. Several recommendations were made on induced mangrove growth in the area. Recommendations made in the Bay utilization area include: (1) regulation for safety and use designation when activities increase in the future; (2) additional public access to the Bay; (3) maintenance and enforcement of appropriate zoning standards. In regard to Bay management, the report urged the creation of a unified Biscayne Bay Authority to coordinate research, create a master plan, control pollution and disseminate information. (Martin-Florida)
W77-08961

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON GLOBAL WATER LAW SYSTEMS, SEPTEMBER 1-9, 1975, VALENCIA, SPAIN.
For primary bibliographic entry see Field 6E.
W77-08966

CHANGES URGED AT NCWQ HEARINGS,
For primary bibliographic entry see Field 6E.
W77-08967

WHAT 208 PLANNING CAN DO: A LOCAL AND FEDERAL VIEW,
For primary bibliographic entry see Field 6E.
W77-08968

SAY GOODBYE TO OCEAN DUMPING,
P. S. Ward.
Journal Water Pollution Control Federation, Vol 48, No 3, p 426-28 (March 1976).

Descriptors: *Alternative costs, *Oceans, *Water quality, *Water pollution control, Disposal, Waste disposal, Municipal wastes, Alternative planning, Incineration, Landfills, Land reclamation, Drying, Soil contamination.
Identifiers: Cropland application, Recalcination, Compost, Metals extraction.

A recent Environmental Protection Agency (EPA) decision involving the disposal of sludge makes the disposal, or use, of sludge a significant issue. The theoretical alternatives include incineration, landfilling, cropland application, land reclamation, recalcination of lime-based sludges, drying and marketing, composting, metals extraction, and the synthesis of useful projects. However, practical limitations eliminate many of these possibilities at the outset. An individual analysis of each possibility included such problems as air pollution, sanitation, lack of access to large tracts of land, pretreatment requirements, water contamination from runoff, and immense capital costs. The abandonment of ocean dumping as a sluge disposal alternative involves real economic sacrifice. Cost data on various disposal alternatives generally reveal that ocean disposal is the cheapest alternative available. This is demonstrated by the table provided, which offers a cost comparison of seven sludge disposal options. The conclusion of rather extensive analysis was that all forms of sea disposal are appreciably more economical than any form of land disposal studied. (Rieck-Florida)
W77-08969

EPA PROPOSES UNTIMELY AMENDMENTS,
A. S. Heid.
Journal Water Pollution Control Federation, Vol 48, No 3, p 424-26 (March 1976).

Descriptors: *Treatment facilities, *Water quality standards, *Economics, *Federal budget, Legislation, Construction, Cities, Facilities, Budgeting, Economic justification, Construction costs, Water pollution, Water quality, Economic feasibility, Grants, Financing, Government finance.

As a result of pressure from the Office of Management and Budget, in an effort to bring spending within budget capacities, Russell Train, head of the Environmental Protection Agency (EPA), has proposed several amendments to the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. These amendments concern the construction grants program for municipal facilities. The first amendment would provide that the federal share of construction grants for certain categories of treatment works could be reduced to less than 75 percent for projects authorized after fiscal year 1976. The next proposed amendment provides limitations on the amount of reserve capacity for treatment plants that is eligible for federal assistance. The third amendment proposes that federal funding would be provided only up to levels necessary to bring projects into compliance with federal effluent limitations based on secondary treatment or best practicable waste treatment technology. The last amendment would amend Section 301 of the FWPCA, and proposes that the current deadline be extended on a case-by-case basis up to Jly 1, 1983, so that publicly owned treatment works would comply with secondary treatment and water quality requirements. (Rieck-Florida)
W77-08970

ENFORCEMENT OF MUNICIPAL PERMITS: PORTENT OF PROBLEMS,
For primary bibliographic entry see Field 6E.
W77-08971

PL 92-500: NEW FEDERALISM OR FEDERAL TAKEOVER,
For primary bibliographic entry see Field 6E.
W77-08972

SPILL PENALTIES DRAW CRITICISM,
For primary bibliographic entry see Field 6E.
W77-08973

RECENT DEVELOPMENT, ENVIRONMENTAL LAW--WATER POLLUTION.
Indiana Law Review, Vol 9, No 3, p 702-10 (1976).

Descriptors: *Illinois, *Indiana, *Interstate rivers, *Interstate, Federal government, State governments, Political aspects, Legal aspects, Water policy, Bodies of water, Lakes, Great Lakes, Lake Michigan, Great Lakes Region, Industrial wastes, Effluents, Industrial water, Social aspects, Water pollution, Water pollution control.
Identifiers: *Inland Steel Company, *Federal Water Pollution Control Act, Nuisance(Legal aspects).

The defendant, Inland Steel Company, was found guilty of interstate water pollution and fined $1,905,000 by a Cook County (Illinois) Circuit Court. Inland Steel is a Chicago-based company operating in Indiana. A short time prior to the filing of the suit, the federal Environmental Protection Agency (EPA) has approved Inland's current and proposed pollution control programs. Additionally, the discharge operations were in conformity with Indiana water quality standards. Defendant objected to the Illinois court's election to apply the Illinois water quality standard rather than either the Indiana statute or the Federal Water Pollution Control Act (FWPCA). The Illinois court rejected the Inland Steel plea, and ruled that a corporation operating outside the forum state is liable to the state in which the trial court sits under the forum state's standards for the pollution of interstate waters. The court reasoned that the Federal Government had not preempted the field of water pollution control, and states could therefore apply their own standards. Additionally, no state was at the mercy of a neighbor state whose water quality standards were less stringent. Hence, although Inland Steel may have been in conformity with both Federal and Indiana law, they were liable under the more stringent Illinois statute. (Moorhouse-Florida)
W77-08975

WETLANDS PROTECTION UNDER THE CORPS OF ENGINEER'S NEW DREDGE AND FILL JURISDICTION,
D. Ratliff.
Hastings Lw Journal, Vol 28, No 1, p 223-45, September, 1976.

Descriptors: *Dredging, *Tidal marshes, *Wetlands, *Protection, Headwaters, Rivers, Streams, Coasts, Navigable waters, Marshes, Bodies of water, Jurisdiction, Legislation, State jurisdiction, Federal jurisdiction, Administrative agencies, Regulations, Legal aspects, Water policy, Permits, Inland waterways, Governmental interrelations.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Coastal wetlands, Fill permits, Administrative regulations.

The delicately balanced marsh ecosystem of the tidal wetlands is extremely vulnerable to the enterprises of modern man. Dredge and fill activities have done disastrous and irrevocable damage to the tidal marsh resource. New Army Corps of Engineers regulations recognize the ecological importance of wetlands. They expand the Corp's jurisdiction under section 404 of the Federal Water Pollution Control Act (FWPCA) of 1972. This broader jurisdiction which includes coastal wetlands contiguous or adjacent to navigable waters, should enable the Corps to defend tidal marshes more effectively. Inland jurisdiction is enlarged to extend in all cases to the 'headwaters' of the river, lake or stream. The move toward joint permit processing with responsible state agencies is an attempt to end bureaucratic delay. The new regulations are, however, replete with vague terms, leaving the precise contours of the new jurisdiction to be decided by future conflict. The overly narrow definition of 'coastal wetlands' and an overly broad disclaimer clause are a few of the major problems with the regulations. These objections aside, the interim final regulations are an encouraging advance for wetlands protection. (Rieck-Florida)
W77-08977

PORTER--COLOGNE WATER QUALITY CONTROL ACT.
For primary bibliographic entry see Field 6E.
W77-08978

UNITED STATES V. GAF CORPORATION: A LEAK IN THE FWPCA,
N. Tauman.
Environment Law, Vol 6, No 2, p 561-81 (1975).

Descriptors: *Groundwater, *Water quality control, *Water quality standards, *Water pollution control, *Water permits, Water pollution, Water pollution sources, Water quality, Water resources, Water law, Waste disposal, Waste disposal wells, Waste dumps, Underground streams, Soil water, Chemical wastes, Judicial decisions, Effluents.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Effluent limitations.

The operation of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972 was at issue in United States v. GAF Corporation. The federal government sought to enjoin the drilling of two deep wells for the disposal of organic chemical wastes without prior approval of the Environmental Protection Agency (EPA). The court held that disposal of chemical wastes into underground waters was not covered by the Act, and alternatively, that EPA's failures to promulgate effluent limitation standards prevented the government's prosecution. While groundwater was specifically excluded from the Act's definition of navigable water, the Act provides that the states have authority to regulate well discharges. The court further interpreted the Act to mean that until effluent limitations standards are set by EPA, pollution discharges cannot be limited; disregarding the interpretation by EPA that the failure to set effluent limitations would preclude the discharging of any wastes at all. The Act itself and legislative history clearly show that a permit is mandatory when effluent limitations have been set. Further, the author states that the court erred in asserting that there was no provision in the Act for interim permits. The Act gives the EPA Administrator power to issue permits and set conditions as he sees fit in order to carry out the provision of the Act in the absence of the necessary standards. The decision of this court gives impetus to industry for the delay in setting effluent limitations, and could

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bring the enforcement power of the 1972 Amendments back to the state of the 1965 Water Quality Act which was consistently ignored by industry. (Welch-Florida)
W77-08979

TO EXTEND THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT (HEARING ON S 3147 TO EXTEND THE ACT 2 YEARS).
For primary bibliographic entry see Field 6E.
W77-08981

AMEND THE MERCHANT MARINE ACT OF 1920 (HEARINGS ON S 2422 TO INCLUDE THE VIRGIN ISLANDS WITHIN THE SCOPE OF THE ACT WITH RESPECT TO TRANSPORTATION OF OIL AND OIL PRODUCTS).
For primary bibliographic entry see Field 6E.
W77-08982

TOXIC POLLUTANT EFFLUENT STANDARDS FOR ALDRIN/DIELDRIN, DDT, ENDRIN, AND TOXAPHENE,
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 42, No 8, p 2588-2617, January 12, 1977.

Descriptors: *Federal Water Pollution Control Act, *Water quality standards, *Regulation, *Toxins, *Chemicals, Chemical industry, Pollution, Standards, Administrative agencies, Aquatic life, Toxicity, Effluents, Water quality control, Public health, Environmental effects, Water pollution control.
Identifiers: Administrative regulations, Aldrin/Dieldrin, DDT(DDD DDE), Endrin, Toxaphene, Ambient water criterion, Effluent limitations.

Pursuant to $307(a) of the Federal Water Pollution Control Act (FWPCA) as amended, the Environmental Protection Agency (EPA) proposed general regulatory provisions and toxic pollutant effluent standards for four toxic substances: aldrin/dieldrin, DDT (DDD, DDE), endrin and toxaphene. Each of the proposed standards provides for maximum average daily and monthly effluent standards (or prohibitions). The standards for endrin and toxaphene also include a monthly average emission limit. In addition, each standard provides an ambient water criterion. If the effluent standards are not sufficient to achieve the ambient water criterion because of local receiving water conditions, the cognizant regulating authority may impose more stringent effluent limitations in order to achieve the required criterion. In developing the standards the EPA considered the effect of the pollutant on organisms in the waters and the effects on human health. All other federal agency comments were reviewed and considered by the EPA. It also summarized comments to the proposed regulations from other interested parties and made necessary changes in the regulations in response to those comments. (Rieck-Florida)
W77-08983

EFFLUENT GUIDELINES AND STANDARDS FOR FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, UREA AND AMMONIUM NITRATE SUBCATEGORY.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 41, No 138, p 29429-32, July 16, 1976.

Descriptors: *Ureas, *Fertilizers, *Ammonium compounds, *Nitrogen compounds, Ammonia, Nitrogen, Regulation, Water pollution sources, Wastes, Water quality, Water law, Water pollution, Legal aspects, Agricultural chemicals, Pollution abatement, Water quality standards, Federal government, Industrial wastes, Water pollution control.
Identifiers: *Effluent limitations, *Administrative regulations, Point source pollution control.

The Environmental Protection Agency (EPA) has proposed to amend the effluent guidelines for urea and ammonium nitrate manufacture in the face of industry charges that inadequate data bases were used in prior determinations. The EPA received data from over 70% of all such manufacturers in response to its latest request. The urea subcategory was divided into plants making solutions only and those producing prilled or granulated urea. The underlying assumption that the additional process of prilling would increase discharges slightly was supported by data from urea manufacturers. However, plants producing prilled ammonium nitrate had equal and even lower discharges than those producing ammonium nitrate solutions. Therefore all forms of ammonium nitrate were combined in establishing the new regulations. Standards based on application of the best practicable control technology currently available and the best available technology economically achievable are presented for both the urea and ammonium nitrate subcategories. Numerous tables are included to illustrate the data used and the new standards. (Moorhouse-Florida)
W77-08984

INTERIM PRIMARY DRINKING WATER REGULATIONS: PROMULGATION OF REGULATIONS ON RADIONUCLIDES.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 133, p 28402-409, July 9, 1976.

Descriptors: *Potable water, *Public health, *Radioisotopes, *Radium radioisotopes, Radioactivity effects, Radiation, Uranium radioisotopes, Water quality, Domestic water, Water pollution sources, Legal aspects, Water law, Water properties, Water pollution, Social aspects, Safety, Regulation.
Identifiers: *Administrative regulations, Radionuclide, Public Health Service Act, Public health service, Health hazards.

The regulations for radioactivity in drinking water promulgated pursuant to the Public Health Service Act are presented by the Environmental Protection Agency (EPA) herein in final form. Estimates reveal that approximately 500 community water systems would exceed the maximum contaminant level for radium of 5 pCi. Furthmore, screening measurements of gross alpha particle activity are permitted for all public water systems that exceed 2 pCi per liter in lieu of radium analysis. 5 pCi/liter was retained as the maximum contaminant level for radium despite requests for a higher limit for small public water systems. Evidence provided by the U.S. Public Health Service indicated that any higher level of contamination presented serious health hazards. In addition, numerous technical changes were made in the proposed regulations to add clarity and delete obsolete methods. For example, a new detection limit of 4 pCi/liter has been established for gross beta particle activity so that gross beta analysis may serve as a substitute radiation measure in some cases. The regulations will become effective in their entirety June 24, 1977. Several tables are used to illustrate the parameters established, substantive technical data is incorporated in the document, and appendices consisting of comments and suggestion received by the EPA in the course of this study are included. (Moorhouse-Florida)
W77-08985

EFFLUENT GUIDELINES AND STANDARDS FOR IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 61, p 12990-13004 March 29, 1976.

Descriptors: *Effluents, *Iron, *Steel, *Regulation, *Administrative agencies, Iron compounds, Federal government, Water pollution, Water pollution sources, Industrial wastes, Liquid wastes, Discharge(Water), Technology, Industrial plants, Industrial production, Industrial water, Economic impact, Industries, Operations, Regional economics.
Identifiers: *Effluent limitations, *Iron and Steel Manufacturing Point Source Category, Subcategories, Effluent guidelines and standards, Administrative regulations.

The Environmental Protection Agency (EPA) promulgated effluent limitations and guidelines for the steel and iron manufacturing industries in 1974. 1976 amendments to the regulations set new limits for various subcategories of the iron and steel manufacturing process. Standards for new sources are also included in these regulations. The principal basis for defining subcategories to which the effluent limitations apply are the inherent manufacturing or production processes associated with several steel products. Plant size and age are not viable factors for subcategorization as previous studies have shown no discernible relationship between these factors and raw waste loads, effluent quality or effluent treatability. Examination of the raw waste characteristics, process water application rates, discharge rates and effluent quality has made land location a non-viable characteristics for subcategorization. The EPA recognizes that the economic impact of the point source regulations would be detrimental to communities mainly of iron and steel works. Some latitude has therefore been granted in the issuance of permits, but such iron and steel works are expected to install new technology at an economically feasible pace. (Moorhouse-Florida)
W77-08986

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.
Coast Guard, Washington, D.C.
Federal Register, Vol 41, No 59, p 12628-34, March 25, 1976.

Descriptors: *Coast Guard regulations, *Oil spills, *Penalties(Legal), *Administrative agencies, Federal government, Regulation, Legal aspects, Oil industry, Administrative decisions, Decision making, Water pollution sources, Disasters, Oil wastes, Chemical wastes, Oil pollution, Offshore platforms, Coastal structures, Law enforcement, Legal review, Judicial decisions, Costs.
Identifiers: *Administrative regulations, Hazardous substances.

The Department of Transportation has promulgated rules concerning notification to the Coast Guard of the discharge of oil or hazardous substances, the removal of a discharge of oil, and the costs or reimbursements that may be imposed or recovered for the removal of a discharge of oil or hazardous substances. Each district commander of the Coast Guard is delegated authority to assess a fine against a vessel or an onshore or off-shore facility owner who illegally discharges proscribed substances. In the event of a discharge, notification must be made to the Coast Guard National Response Center, or to the Cammander of the Coast Guard District in which the discharge occurs. Any person failing to make proper notification is subject to a fine and imprisonment. The removal of discharged oil must be made with mechanical methods and sorbents that most effectively expedite removal and minimize secondary pollution from removal operations. Chemical agents utilized for removal must be in accordance with the National Contingency Plan. Payments to the pollution fund will be required for the use of personnel and equipment necessary to remedy an oil discharge. (Moorhouse-Florida)
W77-08987

PERMIT PROGRAM REGULATIONS FOR CONCENTRATED ANIMAL FEEDING OPERATIONS.
Environmental Protection Agency, Washington, D. C.
Federal Register Vol 41, No 54 p 11458-61, March 18, 1976.

Descriptors: *Permits, *Feed lots, *Farm wastes, *Regulation, Federal Water Pollution Control Act, Cattle, Confinement pens, Feeds, Livestock, Federal government, Administrative agencies, Legal aspects, Water pollution, Control, Water pollution sources, Water pollution control, Legislation, Wastes, Inspection, Poultry.
Identifiers: *Administrative regulations, *National Pollutant Discharge Elimination System(NPDES), Certification.

The Environmental Protection Agency (EPA) has promulgated regulations for applying the National Pollutant Discharge Elimination System (NPDES) permit program to concentrated animal feeding operations. Under the program permits are required for feeding operations with 1,000 or more animals for all feedlots with discharges of pollutants. For those feedlots with less than 1,000 but more than 300, permits will be required only for those operations which discharge pollutants through a man-made conveyance or directly into navigable waters which pass through the confined area. For feedlots with less than 300 animals, the general rule is to require no permit, but one may be required on a case by case basis. The EPA has summarized the comments made by members of the feeding operations industry and has responded thereto. The EPA has emphasized that the feedlot regulations were issued in response to a court order in Natural Resources Defense Council v. Train. The EPA has taken an appeal of this case, and therefore the final status of the promulgated regulations is as yet unknown. (Moorhouse-Florida)
W77-08988

GROUND-WATER USE ACT (REGULATION OF GROUND WATER RESOURCES THRU A PERMIT SYSTEM).
For primary bibliographic entry see Field 6E.
W77-08999

MIANUS RIVER PRESERVATION COMMITTEE V. ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY (JURISDICTION OF FEDERAL APPEALS COURT FOR PERMITS ISSUED BY STATE AGENCY UNDER NPDES).
For primary bibliographic entry see Field 6E.
W77-09001

COMMONWEALTH OF MASSACHUSETTS V. UNITED STATES VETERAN'S ADMINISTRATION (NOTICE OF SUIT PROVISIONS OF THE FWPCA; FEDERAL COMMON LAW NUISANCE ACTIONS).
For primary bibliographic entry see Field 6E.
W77-09002

MODINE MANUFACTURING CO V POLLUTION CONTROL BOARD OF ILLINOIS (STREAM RECLASSIFICATION AND EFFLUENT VARIANCES REQUIRED BY NEW WASTE TREATMENT TECHNOLOGY),
For primary bibliographic entry see Field 6E.
W77-09007

EFFECT OF TEMPERATURE AND HYDROXY ALUMINUM INTERLAYERS ON THE ADSORPTION OF TRACE RADIOACTIVE CESIUM BY SEDIMENTS NEAR WATER-COOLED NUCLEAR REACTORS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Soils and Water.
For primary bibliographic entry see Field 5B.
W77-09024

HYPEROXYGEN CONCENTRATIONS IN THE HYPOLIMNION PRODUCED BY INJECTION OF LIQUID OXYGEN,
Limnological Associates, Ojai, Calif.
A. W. Fast, W. J. Overholtz, and R. A. Tubb.
Water Resources Research, Vol 13, No 2, p 474-476, April 1977. 3 fig, 13 ref.

Descriptors: *Dissolved oxygen, *Oxygenation, *Ponds, *Supersaturation, On-site investigations, Hypolimnion, Oxygen demand, Temperature, Pressure, Lakes, Limnology, *Ohio.
Identifiers: *Liquid oxygen, Liquid-oxygen injection, Oxygen concentrations.

The hypolimnion of a quarry pond at Ottoville, Ohio, was oxygenated during the summers of 1973 and 1974. The highest hypolimnetic oxygen concentrations attained were 8.0 mg/l in 1973 and 21.5 mg/l in 1974; thermal stratification was maintained both years. The 21.5 mg/l oxygen concentration is the highest value yet reported for a hypolimnion and constitutes an upper limit controlled by pressure, temperature, and oxygen demand. Degassing was observed as the high value was reached. Hypolimnion concentrations (of N2) were calculated for different injected mixtures of O2 and N2 gases. (Sims-ISWS)
W77-09028

WETTABILITY OF COAL-MINE SPOILS IN NORTHWESTERN NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Agronomy.
S. Miyamoto, A. Bristol, and W. L. Gould.
Soil Science, Vol 123, No 4, p 258-263, 1977. 1 fig, 5 tab, 8 ref.

Descriptors: *Wettability, *Spoil banks, *Mine wastes, *Land reclamation, *Strip mine wastes, *New Mexico, Analytical techniques, Wetting, Strip mines, Vegetation establishment, Coal mines, Waste dumps, Reclamation, Infiltration, Mining, Physical properties.
Identifiers: *Water infiltration rates, *Infiltration tests, Fruitland formation, Water drop penetration, Capillary rise, Sodicity.

The wettability of coal mine spoils in the Fruitland formation of north-western New Mexico was studied for its effect on water infiltration. Water drop penetration and capillary rise tests were used to evaluate wettability of graded spoils, crushed overburden, and coal samples. Laboratory infiltration tests were used for verification. Results indicate: (1) spoils composed of coal fragments are poorly wettable or water-repellent; (2) organic matter in coal, especially in shiny high-grade coal, is a probable source of poor wettability; and (3) poor wettability reduces water infiltration into coaly spoils. Sodicity and spoil textures also play significant roles governing infiltration into spoils of this formation. (Henley-ISWS)
W77-09041

URBAN STORMWATER POLLUTANT LOADINGS: A STATISTICAL SUMMARY THROUGH 1972,
URS Co., San Mateo, Calif.
For primary bibliographic entry see Field 5B.
W77-09046

EFFECTS OF ECONOMIC DEVELOPMENT ON WATER RESOURCES,
Maryland Univ., College Park. Dept. of Economics.
J. H. Cumberland, and H. W. Herzog, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 096, Price codes: A04 in paper copy, A01 in microfiche.
University of Maryland Water Resources Research Center, Technical Report No 40, April 1977. 59 p. OWRT A-028-MD(1). 14-31-0001-5020.

Descriptors: Water resources development, *Maryland, Costs, *Chesapeake Bay, *Economics, Water pollution sources, Industrial wastes, River basins, Waste water treatment, Cost analysis, Environment, Input-output analysis, Water quality control.

An essential first step in evaluating pollution costs and environmental quality is to derive the relationships between the types and levels of economic activity as they effect the generation of residuals. Methods were developed of extending traditional input-output models to account for the generation of residuals, and to trace the flows through treatment processes and environmental media. Specific technical gross residual coefficients were derived for the output of emissions from 92 types of economic activity into the Chesapeake Bay by 15 major river basins.
W77-09051

ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN THE NORTHEASTERN PLATEAU REGION OF CALIFORNIA,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-09055

ARTIFICIAL RECHARGE TO A FRESH-WATER-SENSITIVE BRACKISH-WATER SAND AQUIFER, NORFOLK, VIRGINIA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09066

HYDROLOGIC CONSIDERATIONS IN DEWATERING AND REFILLING LAKE CARLTON, ORANGE AND LAKE COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
W. Anderson, and G. H. Hughes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 304, Price codes: A03 in paper copy, A01 in microfiche.
Water-Resources Investigations 76-131, February 1977. 31 p, 11 fig, 1 tab, 7 ref.

Descriptors: *Eutrophication, *Lakes, *Algal control, *Dewatering, *Florida, Pumping, Surface-groundwater relationships, Lake beds, Dry beds, Compaction, Nutrients.
Identifiers: *Lake Carlton(Fla), *Orange and Lake Counties(Fla).

Lake Carlton straddles the line between Lake and Orange Counties in central Florida. The 382-acre lake is highly eutrophic and subject to virtually perpetual algal blooms. The Florida Game and Fresh Water Fish Commission has proposed to restore the lake to a less eutrophic state by dewatering the lake long enough to allow the muck on its bottom to dry and compact. Lake Carlton would be permanently sealed off from Lake Carlton. On the assumption that the seasonal rainfall would be normal, and that the dewatering phase would begin on March 1, the predicted time required to dewater the lake at a pumping rate of 50,000 gpm (gallons per minute) is 21 days. The average rate of pumping required to maintain the lake in a dewatered condition is computed to be 2,400 gpm. If pumping is ended May 31, the predicted altitude to which the lake would recover by October 31 as a result of net natural input is 56.2 feet above sea level. Raising the lake level to 63 feet above sea level by October 31 would require that the net natural input be supplemented at an average rate of about 4,860 gpm between May 31 and October 31. (Woodard-USGS)
W77-09080

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SOLID WASTE MANAGEMENT: A TEST OF ALTERNATIVE STRATEGIES USING OPTIMIZATION TECHNIQUES,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geography; and Rutgers - The State Univ., New Brunswick, N.J. Div. of Urban Studies.
For primary bibliographic entry see Field 5E.
W77-08723

PRACTICAL USE OF DECISION THEORY TO ASSESS UNCERTAINTIES ABOUT ACTIONS AFFECTING THE ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 6G.
W77-08927

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, (PARTS I-III),
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-08940

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, PART IV, PROGRAM DOCUMENTATION,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-08941

6B. Evaluation Process

CITIZEN PARTICIPATION IN WATER POLICY FORMATION,
Washington State Water Research Center, Pullman.
J. C. Pierce, and H. R. Doerksen.
Available from the National Technical Information Service, Springfield, VA as PB-268 800, Price codes: A04 in paper copy, A01 in microfiche. 1975, 41 p, Paper presented at annual meeting of Western Political Science Association, March 20-21, 1975, in Seattle, Washington. OWRT A-069-WASH(1).

Descriptors: *Social participation, Political aspects, Social value, *Washington, *Attitudes, *Water policy, Surveys.
Identifiers: *Public participation, Citizen participation.

Based on a survey of 1300 households in the state of Washington, of which more than 60 percent responded, this paper views one portion of the public-to-policy theme by examining the level of public participation among the public and the level of public support in the water resource policy area. Because many are concerned with making government more responsive through public involvement, the actual levels of involvement and the extent to which the public supports that involvement should be among the first issues confronted. The three decision-making locations preferred by the public were experts, groups of citizens advising, and administrators with expert advice. Least preferred were the more 'political' locations--state legislature, interest groups of decision-making locations. The most preferred ways by which the public might influence policy were citizen advisory committees, public hearings, initiative and petitions, and elections. The least preferred processes were contacting state legislators, contacting agency people contacting interest groups and politial parties. The order of priorties ranged from those in which the public has more direct formal control, to those in which the publics influence is more indirect and informal.
W77-08603

RECREATIONAL WATER RESOURCES PROBLEMS.
Bureau of Outdoor Recreation, Washington, D.C.
April 9, 1975. 4 p.

Descriptors: *Recreation, *Environmental effects, *Cost-benefit analysis, *Access routes, Transportation, Economics, Water sports, Aesthetics, Beaches, Camp sites, Fishing, Boating, Natural resources, Water pollution, Recreation demand, Recreation wastes, Recreation facilities, Social aspects, Use rates, Water quality control, Federal government, State governments, Legal aspects, Biology, Institutional constraints.
Identifiers: Recreational water resources problems, Water Resources Research Conference.

The recreational use of water resources and the current lack of available information concerning this topic are discussed. Extensive research is recommended in the following areas of recreational water resources: (1) the relationship between the available supply of outdoor recreation areas and the rate of outdoor recreation participation; (2) conflicts between recreational and non-recreational use of water resources; (3) the distinction patterns of recreationists in order to properly assess recreation potentials of a given study area; (4) the legal, institutional and economic restraints that prevent the private sector from further providing recreational opportunities; (5) the optional biological, physical, and sociological capacity of recreation resources; (6) the environmental impacts of recreational use of water resources, and (7) legal and physical problems which prevent access to existing water areas. Generally, the availability of outdoor recreations areas, facilities and programs is a significant influence upon the extent of outdoor recreation participation. More adequate knowledge about this relationship would greatly assist in planning project areas for public use. (Nursey-Florida)
W77-08711

UTILITY ANALYSIS FOR THE URBAN GROWTH INSIDE THE RECHARGE ZONES OF THE GROUNDWATER RESOURCES OF SAN ANTONIO, TEXAS,
Texas Univ. at San Antonio. Dept. of Environmental Studies.
C. S. Shih, and James W. Ingram.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 788, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, April 1977. 121 p, 6 tab, 60 ref, 2 append. OWRT B-192-TEX(1). 14-31-0001-5117.

Descriptors: *Groundwater resources, Management, Groundwater recharge, *Texas, *Water pollution, *Utilities, Cities, *City planning, *Urbanization, Model studies, Decision making, Social impact.
Identifiers: *San Antonio(Tex), *Edwards aquifer, Recharge zone, *Decision utility theory, *Multiattribute utility function.

With the recent advent of multiattribute utility function development, the decision analysis imbedded with the multiattribute utility measurement has become a powerful tool for analyzing the complex problems normally faced by the water resources planners and managers. The City of San Antonio, Texas, is faced with an agonizing decision of how to protect its sole water source, the Edwards Aquifer, from the threat of pollution resulting from urban sprawl over the recharge zone of the aquifer. Recent urban growth to the north and northwest of San Antonio has intensified the concern for the protection of this pristine, high quality water resource. A decision analysis model has been structured in an effort to facilitate an objective analysis and to coordinate the judgements regarding a degree of satisfaction associated with each alternative available for the protection of San Antonio's groundwater. Multiattribute utility function was used as an integrated measure of the effectiveness for various feasible alternatives. The necessary information was polled from the local water resources decision-makers through a series of cyclic opinions surveys based on the Delphi technique. Sensitivity analysis with varying assumptions was performed on the joint probability that groundwater resources will be polluted due to potential surface developments.
W77-08713

THE MANAGEMENT OF INTERNATIONAL BOUNDARY WATERS OF CANADA AND THE UNITED STATES: A COMPARATIVE STUDY,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 6E.
W77-08720

THE STRUCTURAL ANALYSIS OF ENVIRONMENTAL PERCEPTION AND COGNITION: A MULTIDIMENSIONAL SCALING APPROACH,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Architecture.
T. Garling.
Environment and Behavior, Vol. 8, No. 3, p 385-415, September 1976. 4 fig, 16 tab, 43 ref.

Descriptors: *Behavior, *Psychological aspects, Analytical techniques, Model studies, *Attitudes, Motivation, Social aspects, *Social values, Evaluation, Social participation.
Identifiers: *Multidimensional scaling, Semantic differential analysis, Cluster analysis, Factor analysis, Cognitive structure.

Multidimensional scaling is used to test hypotheses about perceptual/cognitive structure, where perceptual/cognitive structure is defined as the classification and coding of the physical environment. Data were also collected by the ordinary semantic differential technique for purposes of comparing methods and results. Since the area of structural analysis is largely unknown, alternative multidimensional scaling models, including the categorical model and the dimensional models, were used for comparison purposes. The factor analysis and the metric multidimensional scaling analysis suggest a close correspondence between results. It is concluded that the different methods reveal the same underlying structure. The similarity of results from the different methods suggests that similar interpretations of the factors are appropriate. These results are compared with the findings of previous studies. The basis for the evaluative assessments measured by the semantic differential technique is revealed by multidimensional scaling and cluster analysis. These analyses reveal a categorization process to which the individual contributes his systematized knowledge about his everyday physical environment. (Nessa-NC)
W77-08722

THE HYDROGEOLOGIC REGIME OF GLACIAL-TERRAIN LAKES, WITH MANAGEMENT AND PLANNING APPLICATIONS,
Wisconsin Univ. Extension, Madison.
For primary bibliographic entry see Field 2F.
W77-08724

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 1: SUMMARY REPORT,
Wisconsin Univ. Extension, Madison; and Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
S. M. Born, W. B. Lord, F. Alston, W. Bernhagen, and J. Binando.

Inland Lakes Demonstration Project, Funded by the Upper Great Lakes Regional Commission, June, 1972. 155 p, 12 fig, 12 tab.

Descriptors: *Alternative planning, *Project planning, *Institutions, *Methodology, *Water allocation(Policy), *Wisconsin, Economic efficiency, Social aspects, Administration, Land use, Land management.
Identifiers: *Chippewa River(Wis), *Chippewa flowage(Wis), *Inland Lakes Demonstration Project, Citizen participation, Interest groups.

The report contains the factual data necessary for evaluating the environmental aspects of the Chippewa Flowage project. It also defines the nature of the controversy, develops an array of alternatives, and evaluates the monetary and non-monetary consequences of each alternative. The methodology employed involves: (1) a definition of the objectives of resources management; (2) the development of each alternative. Objectives are specific statements describing the end product of policies and programs. Objectives may be contradictory and controversial, but they should be desirable in the eyes of at least some persons or groups. The definition of objectives was based on existing objectives and uses, an evolution of interest group positions, personal interviews and contacts, and press coverage. Alternatives were evaluated by first identifying pure alternatives that maximized the attainment of a single objective. The implications of pure alternatives were evaluated, which led to the refinement of the objective statements and the development of realistic proposals. The consequences of each alternative were evaluated in the context of three factors, including a release policy for the Chippewa Reservoir, a plan for lands surrounding the Flowage, and an institutional configuration that would be responsible for implementation. (See also W77-08726 and W77-08727) (Nessa-NC)
W77-08725

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3A: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
Inland Lakes Demonstration Project, Funded by Upper Great Lakes Regional Commission, June, 1972.

Descriptors: *Multiple purpose projects, *Investigations, *Basic data collections, *Documentation, *Wisconsin, Permits, Environmental effects, Social aspects, Social impacts, Decision making, Water chemistry, Oxygen demand, Reservoir fisheries, Fish populations, Benthic fauna, Zooplankton, Phytoplankton, Aquatic plants.
Identifiers: *Chippewa River(Wis), *Chippewa flowage(Wis), *Inland Lakes Demonstration Project, Citizen participation, Environmental impact statement.

The appendices contain the data used in the analysis described in Chippewa Flowage Investigations Part 1: Summary Report. Although the data were developed in response to a specific controversy, the results of these studies will stand alone and be useful for resource management purposes regardless of the ultimate resolution of this controversy. This document contains nineteen appendices that cover two types of information. One subset of appendices deals with the administrative, legal, and political context of the controversy. The issues addressed include Federal Power Commission licensing procedures, the project's environmental impact statement, National Environmental Policy Act review procedures, U.S. congressional action affecting the project, a chronology of events affecting an Indian tribe on Flowage lands, and selected position statements of interest groups. A second subset of appendices contains scientific data. They discuss the physicochemical characteristics of the water, oxygen depletion during ice cover, fish populations, fisheries, Benthic invertebrates, phytoplankton, and zooplankton. Twenty-three additional appendices are contained in Chippewa Flowage Investigations--Part 3B: Appendixes. (See W77-08725 and W77-08727) (Nessa-NC)
W77-08726

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3B: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
Inland Lakes Demonstration Project, Funded by Upper Great Lakes Regional Commission, June, 1972.

Descriptors: *Multiple purpose projects, *Investigations, *Basic data collections, *Documentation, *Wisconsin, Aquatic plants, Bank erosion, Water pollution effects, Water level fluctuations, Ecosystems, Social aspects, Economic impact, Recreation, Permits, Land management.
Identifiers: *Chippewa River(Wis), *Inland Lakes Demonstration Project, *Chippewa flowage(Wis), *Wilderness preservation, Primitive areas.

The appendices contain the data used in the analysis described in Chippewa Flowage Investigations--Part 1: Summary Report. Although the data were developed in response to a specific controversy, the results of these studies will stand alone and be useful for resource management purposes regardless of the ultimate resolution of this controversy. This document contains twenty-four appendices covering four types of information. One subset of appendices sets forth scientific information on aquatic vegetation, shoreland erosion, downstream water quality considerations, and also includes an annotated bibliography on the effects of water level fluctuations on aquatic ecosystems. A second subset of appendices contain socioeconomic information. A county profile, an Indian tribe profile, and the projected tax impacts of alternatives are included. The third subset of appendices deals with recreation and wilderness preservation issues, including alternatives for preserving and managing national wild land values, primitive area objectives, and the study group's methods and findings. The fourth subset deals with institutional problems such as Federal Power Commission relicensing and alternative land use control mechanisms. (See W77-08725 and W77-08726) (Nessa-NC)
W77-08727

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATION AREA,
Alaska Univ., College. Inst. of Water Resources.
D. W. Smith.
Report No. IWR-64, June 1975. 429 p. OWRT B-026-ALAS(1).

Descriptors: Environmental engineering, *Recreation facilities, *Recreation wastes, *Algae, Nutrients, *Productivity, *Alaska, *Data collections, Lakes, Water pollution effects, Eutrophication.
Identifiers: *Nancy Lake area(Alas), Anchorage(Alas), *Algal production.

This document is a partial completion report and concerns a phase of the project which has been terminated. The principal objective of this study was to detail the procedures, methods, alternatives, and considerations necessary for the development of environmental management programs for Alaska water-oriented recreational areas. Major emphasis was to be placed on the Nancy Lake area near Anchorage. This report is a compilation of the data collected up to September 1, 1974. Contained are: an outline of proposed project reports, a summary of the limnological data collected, a data folder concerning lakes in the study region, a thesis conducted at Nancy Lake, 'Effects of Nutrient Addition on Algal Production and an Evaluation of a Method of Measuring Algal Production,' and a copy of IWR Report No. 63, 'Evaluation of the Trophic Types of Several Alaskan Lakes by Assessment of the Benthic Fauna.'
W77-08805

PROCEEDINGS: THE CONNECTICUT RIVER SYSTEM: A WORKSHOP ON RESEARCH NEEDS AND PRIORITIES.
Massachusetts Univ., Amherst. Inst. for Man and Environment; Massachusetts Univ., Amherst. Water Resources Research Center.
W.R.R.C. Publication No 52, Completion Report FY-75-5, July 1975. 132 p, 4 append. OWRT A-078-MASS(1). 14-31-0001-5021.

Descriptors: *Connecticut River, *Conferences, *Massachusetts, *Research priorities, Regional analysis, Environment, Institutions, Model studies, Water quality, Water supply, Economics, Legal aspects.
Identifiers: *Research needs.

A workshop on research needs and priorities on the Connecticut River system was conducted on April 24-25, 1975 at the University of Massachusetts. The goals were to generate multidisciplinary, inter-institutional interest in a future co-ordinated research program, and define and evaluate the priorities of needed research. The plenary session presentations included: (1) introductory remarks: a research focus on the Connecticut River; (2) future environmental needs and costs; (3) the need to establish research priorities; (4) panel discussion: the need for regional collaboration; (5) an overview of basin research priorities; (6) the Connecticut River system: research and environmental protection priorities; (7) strategies for institutional collaboration; and (8) where do we go from here. Working group activities included: (1) modeling water quality and quantity; (2) floodplain ecosystems; (3) aquatic ecosystems; (4) legal and economic issues; and (5) man/environment relations.
W77-08808

ECONOMIC EVALUATION OF IDAHO'S WATER SUPPLY,
Idaho Univ., Moscow. Dept. of Agricultural Economics.
W. C. Bailey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 811, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, July 1975. 96 p, 19 fig, 5 tab, 31 ref, 3 append. OWRT A-044-IDA(1). 14-31-0001-5012.

Descriptors: *Economic impact, *Water supply, *Economies of scale, *Idaho, *Evaluation, *Costs, Municipal water, Industrial water, Irrigation water, *Regression analysis, Cost analysis.
Identifiers: Snake RIver(Idaho).

This study examined the costs involved in making water available for use in Idaho. The difference between quantity of water and a supply of water was emphasized. To change a quantity of water into a supply of water requires that costs be incurred. In examining the cost for making water available for use in Idaho, the water supply industry was segmented into three categories: municipal, industrial, and irrigation. Primary and secondary sources were used in the collection of data from these three categories. Regression analysis was performed on the data to determine the relationship between total, fixed and variable cost, and water output for each category. The results of the regression analysis showed there is a reasonably high correlation, 0.70 to 0.81, between cost and output. The economic interpretation of the regression results indicated the water industry in Idaho is in Stage I and subject to economies of scale.
W77-08816

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ECONOMICS OF PERMANENT FLOOD-PLAIN EVACUATION,
Atlanta City Dept. of Environment and Streets, Ga. Office of Engineering.
N. L. Johnson, Jr.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 102, No IR3, Proceedings paper No. 12378, p 273-283, September 1976. 6 fig, 2 tab, 10 ref.

Descriptors: *Cost-benefit analysis, *Flood plain insurance, *Flood plains, *Damage, *Annual flood, Average costs, Economic feasibility.
Identifiers: *Economic analysis, House owners.

A method is presented for computation of the average annual damage due to the flooding of structures. The evaluation techniques employed may be used for any area of potential flooding when one seeks to find the benefit/cost ratio of a permanent evacuation from a flood plain area. By using the procedure, the economics of the federally subsidized flood insurance program are evaluated in addition to a permanent evacuation of residents from the flood plain area. The flood insurance is found to be a real economic bargain for the owner of the house. The benefit/cost ratio of certain land-use change plans involving the lower-lying houses is found to be 2.5. Since the benefit/cost ratio of flood insurance is unity, it is concluded that the land use change plan of these lower areas is more feasible than flood insurance. (Bell-Cornell)
W77-08856

RESEARCH BENEFITS IN WATER RESOURCES CONSTRUCTION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
W. P. Simmons, and W. R. Groseclose.
Journal of the Construction Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. C03, Proceedings paper No. 12421, p 527-534, September 1976. 6 fig, 6 ref.

Descriptors: *Water resources, *Reclamation, Arch dams, Penstocks, Concretes, Pipelines, Plastics, Construction, Spillways, Tunnels, Soil mechanics, *Benefits.
Identifiers: *Bending, Monetary savings.

A diversified research program covering engineering materials, design and construction methods, ecological and sociological factors, and electric power and energy problems is described briefly. Emphasis is then placed on specific examples of engineering research which have benefited construction of the Bureau of Reclamation's water resources-related facilites. Among these are savings of $13,000,000 at Grand Coulee Third Powerplant by determining that the penstock bell-mouth entrances could be made much smaller than previous practice allowed, a $25,000,000 savings by using a three-centered arch instead of a circular arch for Auburn Dam, a $2,500,000 savings by reducing the amount of cement at Coulee Third Powerplant by using pozzolans and water-reducing agents, and as yet undetermined savings through a cooperative program with industry in proving the value of and defining working limits for reinforced plastic mortar (RPM) pipe for water distribution systems and of corrugated plastic pipe for drainage systems. (Bell-Cornell)
W77-08858

ECONOMIC ROLE OF THE WATERWAY IN WESTERN EUROPE,
Port of Strasbourg (France).
For primary bibliographic entry see Field 4A.
W77-08860

INTEGRATED EVALUATION PROGRAMS FOR FAIRFAX COUNTY, VA.,
Fairfax County Office of Comprehensive Planning, Va. Director's Office.
J. Reid.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. UP1, Proceedings paper 12332, p 137-145, August 1976. 1 tab.

Descriptors: *Land use, *Planning, *Population, *Zoning, *Evaluation, *Programs, *Virginia, Drainage, Sewers, Transportation.
Identifiers: *County planning.

The growth of Fairfax County, Virginia is examined. County planning must be an accomodation between continued residential demand and the retainment of the historic, scenic, and environmental character of the county. Fairfax County has developed a response to the problem of rapid growth through the organization of a Planning and Land-Use System (PLUS), which will be capable of generating continuously updated data, policy alternatives, flexible responsive plans, implementation programs, and an effective set of regulatory measures for the county. (Bell-Cornell)
W77-08862

WATER SUPPLY ECONOMICS,
Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.
R. M. Clark.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. UP1, Proceedings paper 12357, p 213-224, August 1976. 5 fig, 4 tab, 11 ref.

Descriptors: *Water supply, *Regional analysis, *Costs, Cost analysis, Evaluation, Facilities, Water quality, Economies of scale, *Economics.
Identifiers: *Decentralization, Economic analysis, Economic surveys, Scale effect, Location theory.

Water supply systems are generally composed of: (1) collection works; (2) purification works, where needed; and (3) transportation and distribution systems. There is much controversy over which economic arguments can be applied to water supply; e.g., it is often said that water supply exhibits significant economies of scale, thereby justifying larger and larger systems. This may be true when considering the purification works, but it does not necessarily apply to the total treatment and distribution system. In this paper, representative cost data collected from one of a series of case studies being conducted by the EPA are presented. These data should be useful in evaluating the relative economic impact and importance of the various components in the system. A suggestion is made as to the way in which the cost of water varies throughout the distribution system. (Bell-Cornell)
W77-08863

ANALYSIS OF SUPPLY AND DEMAND OF URBAN ORIENTED NONRESERVOIR RECREATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
IWR Research Report 76-R2, U.S. Army Corps of Engineers, Institute for Water Resources, Fort Belvoir, Virginia, November 1976. 98 p, 4 fig, 17 tab, 45 photos, 13 ref, 2 append.

Descriptors: *Water resources development, *Recreation demand, *Estimating, *Benefits, *Methodology, Supply, Demand, Recreation facilities, Research, Planning, Model studies, Equations, Systems analysis, Flood control, *California.
Identifiers: *Recreation use, *Recreation activities, *American River Parkway(Sacramento California), Use prediction, Data base, Economic value, Travel cost approach, Unit value approach, Urban-oriented recreation, Recreation use models.

This report contains the results of U.S. Army Corps of Engineers research into the supply and demand of urban-oriented nonreservoir recreation. It is an interim report on an initial phase of a comprehensive effort underway within the Corps to develop methodologies, procedures, and guidance for the estimation of recreation use and benefits for nonreservoir water resource development projects. The specific objectives of the researchers were to develop a data base on use and users of urban recreation facilities which are water related but nonreservoir projects and to prepare estimating equations which produce reasonable and supportable estimates of recreation use and demand. Presented is a methodology for estimating recreation use and benefits in planning nonreservoir water resources development. Recreation activity hour-estimating models are developed from data on the American River Parkway, Sacramento, California. A narrative-pictorial and statistical description of the recreation areas is given. Application of the models is illustrated and two approaches to estimating the economic value of a nonreservoir recreation area are demonstrated. It is concluded that the analysis models and methodology for use prediction and benefit estimation developed through the described phase of research need to be duplicated and validated in other locations to insure general applicability in recreational water resources planning. The value of recreation as an economic good can be approximated from activity estimators by using appropriate travel costs as proxy for prices paid by users or by systematically considering the criteria recommended for unit day value determination. (Bell-Cornell)
W77-08871

WATER--AN ELEMENT OF LAND-USE AND URBAN GROWTH POLICIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
W. R. Walker, and W. E. Cox.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol 102, No UP1, Proceedings paper 12339, p 81-94, August 1976. 11 ref.

Descriptors: *Land use, *Water resources, *Planning, Sediments, Water pollution, Water supply, Potable water.
Identifiers: *Regional planning, *Urban growth, Single-purpose planning.

This article reviews the interrelationship between land and water. What is done with our land has a significant impact on what happens to our water. Different types of systems are used to increase the goodness in quality of our drinking water. Chlorination of water supplies is mentioned concerning the problem that adding this chemical to disinfect water supplies does give rise to carcinogenic materials being present in drinking water. The causes of some of our water problems and land use problems have been brought about by single-purpose planning; moreover, planning processes have not been adequately implemented due to a lack of perception of the importance of land management by the public. In conclusion, better land and water management could be facilitated with changes in existing institutional arrangements, modifications in cost-sharing policies, better use of tax incentives, more effort devoted to public education, and the adoption of a new land ethic. (Bell-Cornell)
W77-08872

LAKE-SHORELAND MANAGEMENT PROGRAMS: SELECTED PAPERS,
Massachusetts University, Amherst, Water Resources Research Center.
For primary bibliographic entry see Field 2H.
W77-08924

WATER RESOURCES RESEARCH INTERESTS IN THE COLLEGES AND UNIVERSITIES OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 9A.
W77-08931

POLICY INNOVATION AND INSTITUTIONAL FRAGMENTATION,
Arizona Univ., Tucson. Inst. of Government Research.
For primary bibliographic entry see Field 6E.
W77-09053

ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN THE NORTHEASTERN PLATEAU REGION OF CALIFORNIA,
California Univ., Davis. Dept. of Agricultural Economics.
W. Johnston, L. Jackson, and D. Hansen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 105, Price codes: A03 in paper copy, A01 in microfiche. California Water Resources Center, Davis, Report No. 40, June, 1977. 37 p, 3 tab, 10 ref. (California Water Resources Center Project UCAL-WRC-W-465). OWRT B-164-CAL(1).

Descriptors: *Land use, *Water utilization, *Alternate planning, *Alternate water use, Water resources development, Planning, Management, *California, *Economics, *Environment evaluation, *Recreation, *Administrative agencies.
Identifiers: Modoc County(Calif).

Part I: Evaluating land and water resource use options of alternative development possibilities requires knowledge of regulatory, proprietory and administrative agencies and their functions with respect to local water resources. Modoc County, California is used as a demonstration area to inventory and provide insights into the roles played by more than 70 federal; state, and local agencies as they affect water related aspects of recreational and retirement motivated subdivision developments. Twenty-eight possible functional responsibilities relevant to water resources are evaluated for each agency. Part II: Three northeastern countries in California--Siskiyou, Modoc, and Lassen--have attracted varied and extensive recreational subdivision development. The build out rate for developments, the motivation of the purchasers, and the impact of these developments on local resources are important factors in assessing and planning long run resource development and use programs. A survey of selected remote subdivisions provides the basis for evaluating these influences and provides insights into the types of problems likely to arise regarding impact on water resources resulting from such land development activity.
W77-09055

AN ENERGY ACCOUNTING EVALUATION OF SEVERAL ALTERNATIVES FOR HYDROPOWER AND GEOTHERMAL DEVELOPMENT,
Utah Water Research Lab., Logan.
J. C. Batty, J. P. Riley, W. J. Grenney, and D. A. Bell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 188, Price codes: A03 in paper copy, A01 in microfiche. Report PRJER031-1, June 1976. 36 p, 20 fig, 14 tab, 37 ref. OWRT A-031-UTAH(1), 14-34-0001-6046.

Descriptors: *Power plants, Management, Planning, *Heat exchangers, Mineral water, *Geothermal studies, Evaluation, *Alternative water use, *Energy, Thermal power plants, Design criteria.
Identifiers: Finite resources.

Alternative management strategies for hydropower and geothermal development are myriad. The approach taken in this study is based on the notion of optimum deployment of finite resources. A legitimate question which this study has attempted to address is: Does the construction of large water management facilities, such as hydropower dams, which involve huge amounts of energy, concrete, and steel, constitute an efficient use of basic resources. An energy accounting analysis technique is proposed, and using this procedure energy resource inputs are examined and compared for specific hydropower dams and geothermal power plants. The technique, though promising, still contains certain problems, and further development is needed in order to establish a consistent and uniform methodology. The energy accounting technique indicates that construction of hydropower facilities is a relatively efficient use of basic energy resources. However, because of large evaporation losses from storage reservoirs, water consumption per unit of power produced tends to be high. An analysis subsequent to the energy accounting approach suggests that combining once-through cooling of thermal power plants with pumped storage hydropower facilities could produce large water savings per unit of generated power. Further study of this configuration is recommended. The energy accounting technique also clearly identifies the high efficiency of geothermal power plants in terms of resource deployment. A heat exchanger system design which is capable of utilizing warm and highly mineralized waters is proposed, it is recommended that the design be constructed and tested on a demonstration basis.
W77-09057

LONGITUDINAL ANALYSIS OF CHANGE IN LEVELS OF AFFILIATION AND PARTICIPATION IN VOLUNTARY FORMAL ORGANIZATIONS,
Pennsylvania State Univ., University Park. Dept. of Agricultural Economics and Rural Sociology.
R. G. Harr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 098, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, June 1973. 65 p, 21 tab, 19 ref, append. OWRT A-017-PA(2), 14-31-0001-3238.

Descriptors: *Social change, *Recreational facilities, *Reservoir construction, Social impact, Social aspects, Psychological aspects, Age, Occupations, *Attitudes, *Social participation.
Identifiers: *Community leaders, *Neighborhood awareness, Affiliation, Formal voluntary organization, Sex, Level of participation, *Longitudinal analysis.

This longitudinal analysis of changes in affiliation and participation levels in formal voluntary organizations over the period of 1960-1970 utilized data from all adults in a rural central Pennsylvania community physically bisected in 1968 by the construction of a flood control reservoir. These changes were related to respondents' sex, age, and occupational status. While participation rates were high in both periods the change data did not indicate stability in either affiliation or participation; in fact, a small decline in both measures was observed. Men were found to be less stable than women. Of the < 40 age group 34 percent decreased their affiliation level while in the > 70 category 81 percent decreased. Occupational status was not related to change. The decline in both affiliation and participation levels between 1960 and 1970 could not with these data be attributed to either national or state-wide trends or to other changes set in motion by the reservoir construction. (Sink-Penn State)
W77-09058

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

USER CHARGES IN INLAND NAVIGATION POLICY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Urban Affairs.
C. Cooper-Ruska.
Available from the National Technical Information Service, Springfield, VA as PB-268 798, Price codes: A05 in paper copy, A01 in microfiche. MS thesis, August 1974. 81 p, 82 ref. OWRT B-061-VA(2).

Descriptors: Water policy, *Inland waterways, *Navigation, *Cost sharing, Regulation, Legal aspects, Legislation, Water law.
Identifiers: *User charges.

Policies relative to inland navigation are unique in comparison to those of non-water transport modes. Waterways are considered to be public highways and, historically, one of the advantages of water transportation has been its lower costs due, in part, to a free waterways policy of the Federal Government that is set forth in the Northwest Ordinance and the Constitution. Proposals to impose user chargers on inland navigation therefore must consider the legal basis within which a cost-sharing strategy could be implemented. User charges should foster efficiency, equity, and recovery of costs within the system. Fuel taxes, license fees based on horsepower, segment tolls, lockage fees, and congestion tolls have been recommended. Each of these mechanisms for implementing user chargers is examined to determine if it will pass the legal test of consititutionality.
W77-08604

A CASE FOR GEOTHERMAL ENERGY,
For primary bibliographic entry see Field 8C.
W77-08655

ECONOMICS OF GEOTHERMAL ENERGY DEVELOPMENT (IN IMPERIAL COUNTY, CALIFORNIA),
California Univ., Riverside. Graduate School or Administration.
For primary bibliographic entry see Field 8C.
W77-08657

ECONOMIC EVALUATION OF IDAHO'S WATER SUPPLY,
Idaho Univ., Moscow. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-08816

INCIDENCE OF THE BENEFITS AND COSTS OF ENVIRONMENTAL PROGRAMS,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W77-08870

EFFECTS OF ECONOMIC DEVELOPMENT ON WATER RESOURCES,
Maryland Univ., College Park. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-09051

6D. Water Demand

GROUNDWATER POLICIES NOW LEAN TOWARDS MANAGEMENT.
For primary bibliographic entry see Field 4B.
W77-08660

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN ATTALA, HOLMES, HUMPHREYS, ISSAQUENA, SHARKEY, AND YAZOO COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08748

ANALYSIS OF SUPPLY AND DEMAND OF URBAN ORIENTED NONRESERVOIR RECREATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W77-08871

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, (PARTS I-III),
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-08940

PROTOTYPE SOFTWARE FOR ON-LINE STORAGE FORECASTING SUPPORTED BY LOAD FORECASTING AND REDUCED SYSTEM REPRESENTATION FOR WATER DISTRIBUTION SYSTEMS,
Systems Control, Inc. Palo Alto, Calif.
For primary bibliographic entry see Field 7C.
W77-08942

6E. Water Law and Institutions

USER CHARGES IN INLAND NAVIGATION POLICY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Urban Affairs.
For primary bibliographic entry see Field 6C.
W77-08604

CONTROL OF NON-POINT SOURCES OF WATER POLLUTION WITHIN AN ECOLOGICAL FRAMEWORK: THE CASE OF THE TRI-COUNTY REGION, MICHIGAN,
Michigan State Univ., East Lansing.
P. A. Nortey.
Ph D Thesis, 1976. 189 p.

Descriptors: *Water pollution control, *Water pollution sources, Public health, Ecosystems, Model studies, Legislation, Planning, Water quality control, Environmental control, Administration.
Identifiers: Water Pollution Control Act Amendments(1972).

A study was conducted on the control of non-point water pollution sources within an ecological framework. A second objective was the evaluation of institutions and institutional planning arrangements for pollution control under Section 208 of the 1972 amendments to the Federal Water Pollution Control Act. Four principles were derived from a conceptual ecosystems model, which involved regional considerations, environmental quality, carrying capacities and tolerances, and sound management practices. The Tri-County Region of Michigan was the study area chosen. The Tri-County Planning Commission's approach was judged to be basically sound. It was sugggested that the Commission be made coordinator of all citizen participation activities relative to water pollution. Ecosystem relationships were suggested as a basis for the identification of water pollution control strategies. A close functional relationship was recommended between the planning agency and the implementing agency. Further investigation is necessary to identify the best combination of incentives for public adoption of compatible water management practices. The Section 208 program was judged to be an effective means of solving Tri-County water pollution problems and aiding better land use and economic community growth. Continuance and improvement of the program was seen as the major challenge. (Collins-FIRL)
W77-08625

PLANASA--A NATIONAL PLAN FOR WATER SUPPLY AND SEWERAGE IN BRAZIL,
Banco Nacional da Habitacao, Rio de Janeiro (Brazil).
A. Klumb.
Journal of the American Water Works Association, Vol. 69, No. 4, p 186-187, April, 1977.

Descriptors: *Planning, *Sanitary engineering, *Water supply development, *Sewerage, Public health, Water quality, Sewage treatment, Waste disposal, Construction, Economics, Research and development, Costs, Urban areas, Rural areas, Governments, Foreign countries.
Identifiers: Brazilian National Sanitation Plan(PLANASA), Brazil.

PLANASA (Brazilian National Sanitation Plan) was developed to mobilize national resources in the quickest time possible for the economical provision of basic sanitation to all Brazilian urban areas. All federal agencies involved with social development have been directed to support the effort. The United States and the Pan American Health Organization are making technical assistance available. The plan calls for a rate structure consistent with the consumer's ability to pay and reduction of operational costs by economies of scale to create a permanent balance between revenues and expenditures. A target date of 1980 has been set for the provision of drinking water to more than 80% of the urban population and for adequate sewerage facilities in major metropolitan regions. At the same time, simpler and more basic services are to be provided for towns and villages of lesser size. Meeting these goals will require a vast improvement of water quality for three-fourths of the municipalities and the expansion and construction of sewage systems. Pooling of resources on a national and state basis will be necessary, as will the training of qualified personnel and the strengthening of sanitation authorities. Means for the development and transfer of technology for the provision of the best possible systems must be devised. The major problem of the future will be to provide an impetus for the population to connect to the systems after their completion. (Collins-FIRL)
W77-08646

THE MANAGEMENT OF INTERNATIONAL BOUNDARY WATERS OF CANADA AND THE UNITED STATES: A COMPARATIVE STUDY,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
L. B. Dworsky.
Natural Resources Journal, Vol. 15, No. 1, p. 223-227, January 1975. 10 ref.

Descriptors: *Management, *Administration, *Institutional constraints, *Comprehensive planning, *Great Lakes, *International commissions, *International Joint Commission, Political aspects, Administration, Budgeting, Legislation, *Canada, *United States.
Identifiers: *Boundary waters(Canada-US).

The article discusses improved management of the Great Lakes in order to make it more effective and to meet current and emerging questons. The International Joint Commission (IJC) is seen as the only formal arrangement between the U.S. and Canada that is broad enough to handle this problem. The major conclusions are to strengthen the IJC, and, to establish a new treaty for the Great Lakes apart from the IJC. These suggestions provide for: (1) establishing a joint Canadian-U.S. management body for the Great Lakes having surveillance and mediation functions; (2) joint agency budget and administrative procedures; (3) power to initiate planning, surveys, investigations and research under carefully specified guidelines; (4) program responsiveness by requiring that the activities of the joint management body be subject to program and budget authorization on a regular basis; (5) facilitating joint planning on a multiple purpose basis; (6) stressing intensive regional and transborder collaboration among state and provincial governments; (7) developing a more comprehensive and systematic approach to the management of the Great Lakes; (8) joint information collection and analysis; and (9) public reporting. It is also suggested that the boundary problems are similar to those existing between Mexico and the U.S., and that a Mexican-U.S. boundary commission be set up. (Nessa-NC)
W77-08720

NORTH CAROLINA CONFERENCE ON WATER CONSERVATION.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 3D.
W77-08820

SECTION 208 AND SECTION 303 WATER QUALITY PLANNING AND MANAGEMENT: WHERE IS IT NOW,
National Resource Defense Council, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08949

MANY CHANGES URGED FOR PL 92-500,
For primary bibliographic entry see Field 5G.
W77-08950

FLORIDA'S SOVEREIGNTY SUBMERGED LANDS: WHAT ARE THEY, WHO OWNS THEM AND WHERE IS THE BOUNDARY,
G. J. MacGrady.
Florida State University Law Review, Vol. 1, No. 4, p. 596-644, Fall 1973.

Descriptors: *Florida, *Boundary(Property), *Riparian rights, *Ownership of beds, Riparian land, Tidal waters, Accretion(Legal aspects), Avulsion, Erosion, Navigable waters, Water law, Water rights, Legislation, Common law, Riparian waters, Shores, High water mark, Real property.
Identifiers: *Submerged lands, *Public trust doctrine, Sovereignty lands.

This note discusses the history, definition, ownership, and regulation of Florida's sovereignty lands--those lands beneath navigable fresh and tidal waters--together with the problems involved in demarcating their boundaries from abutting riparian lands. The sovereignty lands are held in public trust by either the state or federal government, whereas riparian lands are usually privately owned. Since the state's shorelines are constantly shifting, it has been difficult to establish a satisfactory method of boundary determination between the sovereignty and riparian lands. The author provides a detailed discussion of the scientific aspects of tidal phenomena, which is helpful to an understanding of the relative merits of ambulatory legal boundaries as opposed to fixed boundaries. Specifically discussed is the use under federal law of the ambulatory mean high tide line as the standard for boundary determination, and whether the use of that standard is mandated under Florida law. Further attention is given to the difficulties caused by Florida's own particular topography in locating such mean high tide line and the effectiveness of judicial and legislative responses thereto. (Jones-Florida)
W77-08951

NPDES PERMITS AND WATER ANALYSES.
QLM Labs., Inc., Nyack, N. Y.
For primary bibliographic entry see Field 5G.

W77-08953

COMPLYING WITH DISCHARGE REGULATIONS,
Environmental Protection Agency, Washington, D. C. Office of Water Enforcement.
For primary bibliographic entry see Field 5G.
W77-08954

EFFLUENT LIMITATIONS AND NPDES: FEDERAL AND STATE IMPLEMENTATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Epstein, Salloway, and Kaplan, Boston, Mass.
For primary bibliographic entry see Field 5G.
W77-08956

INTERNATIONAL LAW AND RADIOACTIVE POLLUTION BY OCEAN DUMPING: 'WITH ALL THEIR GENIUS AND WITH ALL THEIR SKILL...'
For primary bibliographic entry see Field 5G.
W77-08957

A CONSULTANT'S VIEW OF PL 92-500.
For primary bibliographic entry see Field 5G.
W77-08958

PL 92-500: A DOSE OF CHAOS,
Water Pollution Control Federation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-08959

WHEN YOU THINK ABOUT POLLUTED WATERS, THINK ABOUT YOUR STREAMS AND RIVERS.
For primary bibliographic entry see Field 5G.
W77-08960

BISCAYNE BAY SYMPOSIUM II,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 5G.
W77-08961

LEGAL BATTLES ON THE CALIFORNIA COAST: A REVIEW OF THE RULES,
National Oceanic and Atmospheric Administration, Washington, D. C. Office of Sea Grant.
G. Bowden.
Coastal Zone Management Journal, Vol 2, No 3, p 273-295 (1976).

Descriptors: *California, *Legal aspects, *Planning, *Land use, *Land development, Land resources, Condemnation, Condemnation value, State governments, Judicial decisions, Property values, Regulation, Coasts, Shores, Shore protection, Land management, Management.
Identifiers: *Administrative regulations, *Coastal zone management, *California Coastal Act.

The California Coastal Act is bound to arouse heated debate and controversy. The Act contains 183 policies that are designed to enumerate priorities and define planning goals. What is not certain, however, is the coming judicial reaction to this bill. Undoubtedly there will be confrontation; the purpose of this article is to anticipate the outcome of the legislative-judicial clash. The analysis covers three areas: (1) property rights, (2) requirements of a valid regulation, and (3) evolving legal doctrines. Also presented are broad guidelines as to California's stands on each of the above. Where property rights are concerned, ever since Euclid v. Amber Realty in 1926 the state courts have allowed local governments to use a wide range of regulatory devices. California rejects the granting of inverse condemnation, preferring instead to rule that a regulation should be changed or eliminated. Finally, the doctrine of vested rights still plays a major role in determining whether a land-owner has properly relied on an existing set of ground rules. (Frank-Florida)
W77-08963

FLORIDA'S BARGE CANAL PROSPECTS FOR THE FUTURE,
Florida State Univ., Tallahassee. Dept. of Ichthyology.
For primary bibliographic entry see Field 4A.
W77-08964

CONCLUSIONS AND RECOMMENDATIONS FOR THE UNITED NATIONS WATER CONFERENCE (PRELIMINARY OUTLINE),
Food and Agriculture Organization of the United Nations, Rome (Italy); and International Association for Water Law. Executive Council.
D. A. Caponera.
In: Proceedings of the International Conference on Water Law & Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (Coplanarh), Caracas, Venezuela, p 1283-1292, 1976.

Descriptors: *Water resources development, *Technical societies, *United Nations, Conferences, Water law, Organizations, Governments, Legal aspects, Social aspects, Management, Natural resources, Ground water, Planning, Coordination, Dynamic programming, International law, Conservation, Water conservation, Education, Training, Administration.
Identifiers: *United Nations Water Conference, *Second International Conference on Water Law and Administration.

The United Nations Water Conference should, in its consideration of the world's water resources and needs, initially examine the current status and recent tendencies in water law. The most recent data shows a trend toward resource-oriented water management, and an elimination of the private water concept in favor of a public water resources regime. Using a multi-disciplinary approach to water resources law will result in viewing it as an instrument for the implementation of overall water policy. The conference should evaluate the role of planning as a tool in water resources management. The transfer to resource-oriented management calls for basin planning as the essential process in water economy. Aside from its impact on the planning process, resource-oriented water management has created a need for new legal and institutional criteria focusing on politico-administrative necessities. The general decline in water quality, demands concern for environment-oriented legislation. The lack of qualified manpower stands as a major constraint to the effective development of any water resources management program. (Moorhouse-Florida)
W77-08965

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON GLOBAL WATER LAW SYSTEMS, SEPTEMBER 1-9, 1975, VALENCIA, SPAIN.
Proceedings of the International Conference on Global Water Law Systems, September 1-9, 1975, Valencia, Spain, 4 vol, 1451 p. Published by Colorado State University, Ft. Collins, Colorado 80523. $40.00 or $10.00 microfiche. Order from Conference Director, George E. Radosevich, Dept. of Economics.

Descriptors: *Water quality control, *Water allocation(Policy), *Water management(Applied), Water law, Economics, Administration, Social aspects, Adoption of practices, Legal aspects, Comprehensive planning, Coordination, Governments, Leadership, Planning, Political aspects, Water policy, International law, Regulation.
Identifiers: *International conference, *Global water law systems.

The International Conference on Global Water Law Systems which convened in Spain focused upon particular issues basic to analyzing and improving water laws in light of the role and function of the law and its relationship to other disciplines and sectors of socioeconomic activity. The conference was an effort designed to: (1) build upon materials assembled in past meetings and publications while attempting to establish a systematic foundation of knowledge of major water law and administration systems around the globe; (2) to develop an analytical methodology for the interface of interdisciplinary, intersectoral and intergovernmental inputs to new or improved laws and codes. Among the water law systems studied were the Spanish, French, British, Italian, Soviet, Hindu-Bali, Moslem, Latin-American, Israeli and the variations found in the United States and select Asiatic countries. Three key issues or problems identified as an impediment to water resources optimization were discussed in light of needed changes in the law: (1) allocation and reallocation of water supplies; (2) integration of water quality and quantity control; (3) management and conjunctive use of ground and surface waters. (Rieck-Florida)
W77-08966

CHANGES URGED AT NCWQ HEARINGS,
P. S. Ward.
Journal Water Pollution Control Federation, Vol 48, No 2, p 230-33 (February 1976).

Descriptors: *Permits, *Financing, *Water pollution control, *Water Pollution Control Federation, Regulation, Federal government, Federal-state water rights conflicts, State governments, Control, Legislation, Federal jurisdiction, State jurisdiction, Legal aspects, Water quality control, Water pollution, Costs, Loans, Research and development, Benefits, Economic efficiency, Federal Water Pollution Control Act.
Identifiers: *Hearings, National Commission on Water Quality, Point sources(Pollution), Non-point sources(Pollution).

Recent hearings of the National Commission on Water Quality (NCWQ) produced testimony on a number of major issues. The witnesses generally acknowledged the necessity for meeting the technological goals designated by the Federal Water Pollution Control Act (FWPCA), but felt the 1983 deadline was too severe. The Water Pollution Control Federation (WPCF) recommended that Primary Table II and permit responsibilities be delegated to the states on request, but subject to a federal audit. While industry insisted that NCWQ had underestimated the costs associated with water pollution control programs, environmental organizations asserted that benefits accruing from those same programs had been underestimated. WPCF also recommended a flexible federal funding rate 'not to exceed 75 percent' to permit a given amount of federal money to be spent more effectively. Witnesses feared that progress achieved through the control of point source discharges may be nullified by increasing nonpoint pollution. Other issues which emerged concerned dwindling research and manpower training efforts, and the federal government's failure to commit itself to a long-term funding program, in support of water pollution control. (Rieck-Florida)
W77-08967

WHAT 208 PLANNING CAN DO: A LOCAL AND FEDERAL VIEW,
P. S. Ward.
Journal Water Pollution Control Federation, Vol 48, No 7, p 1692-96, July 1976.

Descriptors: *Federal Water Pollution Control Act, *Governmental interrelations, *Government

supports, *Planning, Water law, Regulation, Local governments, Federal government, Legal aspects, Inter-agency cooperation, State governments, Administrative agencies, Methodology, Priorities, Decision making.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *PL 92-500, *Non-point sources(Pollution), Waste water management, Sanctions, Funding, Data base, Water planning.

At the federal level the emphasis of section 208 of PL 92-500 is placed on the production of specific outputs. One such output is expected to result in solutions to problems, such as nonpoint sources, that are not adequately addressed by the permit program or the construction grant program. The federal concept of Section 208 having definite regulatory functions differs from that found at a local level. In the Houston area section 208 is reviewed as a data base and a methodology for decision making. Impediments to section 208 at the local level revolve around time and money. The requirement of extensive review is an important safeguard, but it is a liability in terms of time. The Environmental Protection Agency (EPA) sees the slow paced political process as being a major hindrance. In the area of sanctions, neither level has developed adquate penalties to insure compliance. At the local level the prognosis for section 208 succeeding is good, as a result of high visibility, public participation, thorough review, and input from local officials. At the federal level the prognosis is guarded. The minimum goal is for a plant to produce on thirty percent of its planned output within a two year period. (Petruff-Florida)
W77-08968

SAY GOODBYE TO OCEAN DUMPING,
For primary bibliographic entry see Field 5G.
W77-08969

EPA PROPOSES UNTIMELY AMENDMENTS,
For primary bibliographic entry see Field 5G.
W77-08970

ENFORCEMENT OF MUNICIPAL PERMITS: PORTENT OF PROBLEMS,
J. T. Sliter.
Journal Water Pollution Control Federation, Vol 48, No 3, p 422-24 (March 1976).

Descriptors: *Federal Water Pollution Control Act, *Permits, *Municipalities, Discharge(Water), Industries, Legal aspects, Administrative agencies, Control, Legislation, Regulation, Financing, Treatment facilities, Industrial plants, Water pollution, Education, Penalties(Legal), Law enforcement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972 (FWPCA Amendments of 1972), *Administrative regulations, Dischargers.

A lack of adequate resources coupled with complexities and inconsistencies in the Federal Water Pollution Control Act (FWPCA) Amendments has created a system of negotiations, cooperation and forbearance. The Environmental Protection Agency's (EPA) enforcement efforts of National Pollution Discharge Elimination System (NPDES) permits differs between industry and municipalities. Among the reasons for the discrepancy is the fact that most permits to publicly owned treatment plants have only been issued in the last year or two. The pragmatic impossibility of meeting unrealistic permit requirements is another reason for the EPA's lax enforcement efforts. Another major impediment that shields cities is their political immunity and the nature of local financing. The agency has been more prone to educating the discharger than taking enforcement actions against him. The enforcement program is at a proverbial crossroad. Whether is becomes a major force or simply a farce depends upon the reasonableness of both its actions and the law it must enforce. Perhaps the most pressing issue then, is the need for extending the 1977 deadline. According to the National Commission on Water Quality it may take until 1985 to achieve substantial compliance. (Rieck-Florida)
W77-08971

PL 92-500: NEW FEDERALISM OR FEDERAL TAKEOVER,
A. S. Heid.
Journal Water Pollution Control Federation, Vol 48, No 2, p 238-40 (February 1976).

Descriptors: *Federal-state water rights conflicts, *State governments, *Administrative decisions, Legal aspects, Legislation, Administrative agencies, Coordination, Decision making, Governments, Political aspects, Water policy, Regulation, Federal government, Water law, Governmental interrelations.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, PL 92-500.

The Federal Water Polluton Control Act (FWPCA) Amendments of 1972 are a classic case of federal takeover stemming from Congress' dissatisfaction with cleanup efforts by the states. Examination of the Act's early implementation stages indicates that the Environmental Protection Agency (EPA) initially attempted to direct the entire effort rather than work cooperatively with the states. It has been a case of Congress enacting and the EPA implementing uniform national legislation rather than a flexible federal law. This is demonstrated in the Act's verbosity, its attempt to mandate specific requirements and deadlines for the EPA and the states, and the desire to have something for everbody. In addition, the states have so far been unable to influence many of the EPA's crucial implementation decisions that further erode their freedom of action. The Environmental Protection Agency defines which methods are 'reasonable', 'practical' or 'best available'. It succeeds in controlling the process while failing to stick to the Act's schedule. Many of those involved pay only lip service to the concept of intergovernmental sharing of responsibility and power. Legislators are apparently more concerned with costs of environmental controls rather than governmental power principles. (Rieck-Florida)
W77-08972

SPILL PENALTIES DRAW CRITICISM,
J. T. Sliter.
Journal Water Pollution Control Federation, Vol 48, No 2, p 236-37 (Feb 1976).

Descriptors: *Chemicals, *Penalties(Legal), *Impaired water quality, *Economic impact, Negligence, Legal aspects, Assessments, Law enforcement, Regulation, Water pollution, Federal Water Pollution Control Act, Water pollution control, Water pollution sources, Economic justification, Insurance, Barges, Transportation, Chemical industry, Legislation.
Identifiers: Spills, Misconduct, Administrative regulations, Hazardous substances.

The Environmental Protection Agency (EPA) recently proposed rules to deal with spills of hazardous chemicals and other materials in waterways. It designated more than 300 chemicals as hazardous materials and set fines and penalties that may range from $500 to $5 million in case of a spill. Some people fear the maximum penalty will normally be no more than $5,000 per spill, regardless of its severity. The EPA has 2 options in assessing penalties. It can either charge between $500 and $5,000 per spill or base the fine on the number of units spilled multiplied by a penalty rate established by the agency. The agency recently announced that only when the discharge is the result of gross negligence or misconduct will it apply the more severe penalty. The agency is thus attempting to provide an economic incentive to prevent the spill of hazardous materials while simultaneously trying to reduce adverse economic impact on industry. There are serious questions over whether these proposed minor penalties will be an effective deterent to spills of hazardous chemicals. (Rieck-Florida)
W77-08973

AS AN INCIDENT OF NATIONAL SOVEREIGNTY, THE UNITED STATES HAS PARAMOUNT RIGHTS AND POWER IN THE SEABED AND SUBSOIL OF THE OUTER CONTINENTAL SHELF,
S. O. Spinks.
Georgia Journal of International and Comparative Law, Vol 5, p 580-588 (1975).

Descriptors: *Water resources development, *Submerged Lands Act, *Legislation, *Continental Shelf, *Federal-state water rights conflicts, Judicial decisions, Legal review, Natural resources, Oil wells, Federal government, State governments, Federal jurisdiction, State jurisdiction, Legal aspects, Continental margin, Oceans, Oil fields, Natural gas.

The Supreme Court, in a 1975 case, held that where a conflict existed between the federal government and 13 Atlantic Coast States as to ownership of rights on the Continental Shelf, the federal government should prevail. The practical effect of this decision was to vest in the federal government ownership of the Continental Shelf's rich oil deposits at a point beginning three miles from shore. It is not certain that the federal government really desired this effect; the author points out that Congress may pass legislation mitigating the severity of this decision toward the states by following the Submerged Lands Act of 1953. The effect of that act was to nullify a prior Supreme Court decision that gave ownership of all submerged lands within the three-mile belt seaward of the tidelands to the federal government. Although legally the federal government does have absolute rights to all Continental Shelf deposits, it may be politically impractical for the states to be left out altogether. (Frank-Florida)
W77-08974

RECENT DEVELOPMENT, ENVIRONMENTAL LAW--WATER POLLUTION.
For primary bibliographic entry see Field 5G.
W77-08975

A RATIONAL NATIONAL POLICY ON PUBLIC USE OF THE BEACHES,
House, Washington, D.C.
R. C. Eckhardt.
Syracuse Law Review, Vol 24, No 3, p 967-88 (Summer 1974). 1 append.

Descriptors: *Seashores, *Public rights, *Beaches, *Easements, *Public access, Legal aspects, Legislation, Common law, Civil law, Coasts, Sands, Shores, Federal government, Littoral, State governments, State jurisdiction, Alabama, California, Connecticut, Florida, New Jersey, New York, Oregon, Texas, Washington.
Identifiers: *Coastal waters, *Contiguous zone, *Coastal zone management, *Sovereign immunity, Open Beaches Bill.

Congressman Bob Eckhardt (D-Texas) has proposed national legislation to ensure the American public's right to enjoy front lands. The Eckhardt Bill, H.R. 4932, guarantees, consistent with property rights of littoral landowners, free and unrestricted public use of ocean beaches. In support of the bill Eckhardt compares common law aspects of beach ownership to recent developments in case law in Texas, Oregon, New Jersey and other states. The controversy of public access concerns itself not only with who has title to the land in dispute, but also with the problem of how to define the area of dry sand beach sought to be protected. Different states have used various stan-

dards and rules of common civil law to define who owns title to the areas in question. The passage of this bill would clarify federal public policy and would demonstrate federal recognition of a difference between ownership and the right of public access to the sea. H.R. 4932 would allow the states to protect the use of the beaches and provide funds for the purchase of beaches for the public; the states would retain all control over such beaches acquired by law or by condemnation. (Morse-Florida)
W77-08976

WETLANDS PROTECTION UNDER THE CORPS OF ENGINEER'S NEW DREDGE AND FILL JURISDICTION,
For primary bibliographic entry see Field 5G.
W77-08977

PORTER--COLOGNE WATER QUALITY CONTROL ACT.
Cal Water Code Ann secs 13000 thru 13361 (West 1971), as amended, (Supp 1976).

Descriptors: *California, *Administrative agencies, *Regulation, *Legislation, *Water Quality Act, Water quality control, Waste disposal, Water pollution, Water quality, Water quality standards, Law enforcement, Water policy, Legal aspects, Social aspects, State governments, Political aspects, Penalties(Legal), Permits, Water permits, Control, Management, Water law, Permits.
Identifiers: *Porter-Cologne Water Quality Control Act, Injunctions(Prohibitory), Notice, Administrative regulations.

In order to provide for the health, safety and welfare of its people, California has established state and regional water quality boards. The boards will be composed of gubernatorial appointees who will serve four year terms. The state board shall oversee regional boards and develop comprehensive long range water policy. The state will be divided into nine regions. Each regional board will have nine members drawn from such backgrounds as agriculture, industry, government and environmental organizations. Regional boards will hold public hearings, make investigations and issue policy statements relating to any water quality matter within its jurisdiction. The regional boards will also aid the state board in establishing the overall water quality policy. Additionally, the regional boards will control local waste discharge programs. The boards will assess the impact of the discharge of waste into state waters, and issue permits regulating the amount of discharge. Such permits may be enforced by fine or injunction. The board may also force any permit violator to pay the cost of clean-up. Any person disagreeing with the action of the regional board may appeal to a court of competent jurisdiction. (Moorhouse-Florida)
W77-08978

UNITED STATES V. GAF CORPORATION: A LEAK IN THE FWPCA,
For primary bibliographic entry see Field 5G.
W77-08979

TO EXTEND THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT (HEARING ON S 3147 TO EXTEND THE ACT 2 YEARS).
Hearings---Sub Comm on Oceans and Atmosphere--Comm on Commerce, US Senate, April 12, 1976, Serial No 91-83. 153 p.

Descriptors: *Water pollution sources, *Waste disposal, *Sewage sludge, *Oceans, Legal aspects, Administrative agencies, Administrative costs, Sampling, Sediments, Coasts, Continental shelf, Cost allocation, Dredging, Industrial wastes, Outfall sewers, Permits, Pollutant identification, Pollutants, Sludge disposal, Sludge treatment, Wastes.
Identifiers: *Coastal waters, *Hazardous substances, *Congressional hearings, *Ocean dumping, Funding.

Bill S.3147 proposes to extend the Marine Protection, Research, and Sanctuaries Act for two years and to allocate $4.8 million per year for fiscal years 1977 and 1978. The thrust of the testimony heard on April 12, 1976 was concerned with the problems associated with ocean dumping of sewage sludge, industrial wastes and dredge spoils. Witnesses included representatives from the Environmental Protection Agency (EPA), Maryland Department of Natural Resources, General Accounting Office, University of Southern California, US Army Corps of Engineers, National Wildlife Federation, Ocean City, Maryland, US Coast Guard, and the National Oceanic and Atmospheric Administration. Most of the testimony was concerned with the hazards of the present ocean dumping policy and the need for improved monitoring techniques as well as viable alternatives to this method of waste disposal. The hearing was adjourned without any action by committee. (Morse-Florida)
W77-08981

AMEND THE MERCHANT MARINE ACT OF 1920 (HEARINGS ON S 2422 TO INCLUDE THE VIRGIN ISLANDS WITHIN THE SCOPE OF THE ACT WITH RESPECT TO TRANSPORTATION OF OIL AND OIL PRODUCTS).
Hearings---Sub Comm on Merchant Marine--Comm on Commerce, US Senate, February 25, March 30, 1976. Serial No 94-75. 99 p.

Descriptors: *Virgin Islands, *Oil, *Ships, *Transportation, Costs, Cost comparisons, Legislation, United States, Federal government, Administrative agencies, Water law, Legal aspects, Cost analysis, Economics, Economic feasibility, Foreign countries, Foreign trade.
Identifiers: *Congressional hearings, Vessels, Petroleum products, Merchant Marine Act of 1920.

The proposed bill to amend the Merchant Marine Act of 1920 would apply to the Virgin Islands petroleum trade the provisions of section 883 of title 46 of the United States Code limiting the transportation of merchandise by water between points in the United States to vessels built in and documented under the laws of the United States. The measure is limited to crude oil, residual fuel oil, and refined petroleum products. Other merchandise, commodities or passengers are not affected by the legislation. The United States Department of the Interior opposes the enactment of the bill, since the principal effect of the bill would substitute shipping by American vessels for the substantial volumes of petroleum presently carried by foreign ships. Foreign vessels are considerbly less expensive than American, and oil transported by American ships costs substantially more. The department believes that the enactment of the bill would raise petroleum costs of American consumers and would injure the economic health and development of the Virgin Islands. (Rieck-Florida)
W77-08982

TOXIC POLLUTANT EFFLUENT STANDARDS FOR ALDRIN/DIELDRIN, DDT, ENDRIN, AND TOXAPHENE,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-08983

EFFLUENT GUIDELINES AND STANDARDS FOR FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, UREA AND AMMONIUM NITRATE SUBCATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-08984

INTERIM PRIMARY DRINKING WATER REGULATIONS: PROMULGATION OF REGULATIONS ON RADIONUCLIDES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08985

EFFLUENT GUIDELINES AND STANDARDS FOR IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08986

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08987

PERMIT PROGRAM REGULATIONS FOR CONCENTRATED ANIMAL FEEDING OPERATIONS.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-08988

SITE EVALUATION AND PRECONSTRUCTION TESTING AT POTENTIAL DEEPWATER PORT LOCATIONS.
Coast Guard, Washington, D. C.
Federal Register, Vol 41, No 79, p 16798-801, April 22, 1976.

Descriptors: *Harbors, *Coastal structures, *Port authorities, *Ships, *Oil industry, Deep water, Bodies of water, Engineering structures, Transportation, Navigation, Water pollution sources, Navigable waters, Oceans, Oil, Oil pollution, International waters, Administrative agencies, Regulation, Governments, Administrative decisions.
Identifiers: *Deepwater Port Act of 1974, *Environmental impact statement, *Rulemaking, *Deepwater ports, *Ports, Tankers, Shipping, Coastal zone.

The procedural regulations concerning license applications under the Deepwater Port Act of 1974 have been amended to require that advance notice and site evaluation reports be furnished to the Coast Guard by any individual engaged in deepwater port site evaluation or preconstruction testing, and to establish a mechanism whereby the Commandant may regulate these activities. The regulations as originally proposed had required advance notice, but had not prescribed specific control measures. In response to public comment that the original proposal offered no assurance that such activities would be conducted in a manner consistent with the Act, the Coast Guard developed a second proposal requiring prior approval and expanding the control mechanism governing suspension, revocation, and cancellation of site evaluation authorizations. The response to the second proposal was that the legislative history of the Act itself showed no intent to require prior approval. The Coast Guard agreed and eliminated the requirement from the amendment. In its final form, the rule requires that written notice must be submitted to the Commandant, U.S. Coast Guard, 10 days prior to the commencement of any activity; it specifies the kinds of activities which may be undertaken without submission of additional information; and it delineates conditions under which the Coast Guard may order suspension or prohibition of activies. (Sloan-Florida)
W77-08989

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UNITED STATES V 62.61 ACRES OF LAND, MORE OR LESS, IN CITY OF VIRGINIA BEACH, COMMONWEALTH OF VIRGINIA (A COMPENSABLE PROPERTY RIGHT AS MIGHT EXIST IN A WHARF OR PIER WILL NOT BE FOUND IN A JETTY CONSTRUCTED IN NAVIGABLE WATERS),
547 F2d 818-21 (4th Cir 1977).

Descriptors: *Virginia, *Riparian rights, *Navigable waters, *Jetties, *Condemnation, Real property, Coastal structures, Legal aspects, Banks, Economics, Value, Riparian waters, Bodies of water, Ownership of beds, Piers, Judicial decisions, Water law, Chesapeake Bay, Bays, Compensation, Easements.
Identifiers: *Property interests, *Property rights.

Plaintiff property owners in a United States condemnation suit claimed compensable interest in a stone jetty extending 800 feet from their land into Chesapeake Bay. The jetty had been built by the Pennsylvania Railroad under a federal permit thirty-eight years before plaintiffs acquired the property to which the jetty abutted. The deed granting title to the property had contained a catchall clause conveying rights to any interest the grantor had in 'muds, flats and land under the water of Chesapeake Bay'. The United States District Court and the Fourth Circuit Court of Appeals held that the original interest of the railroad, under federal permit, was a non-conveyable easement and that the land on the bottom of Chesapeake Bay is owned by the State of Virginia. The lower court held, and the appeals court affirmed, that rights 'to extend a wharf or pier are not to be equated to a jetty'. Ownership of a wharf or pier is normally a compensable riparian right, as such structures are bilt from the shore outward for the purpose of reaching navigable waters, and are mere appurtenances to the shore. A jetty is distinguishable both by its primary function, which is to protect a channel entrance, and by its construction, which incorporates it into the water's floor. (Sloan-Florida)
W77-08990

ALMEDA COUNTY WATER DISTRICT V NILES SAND AND GRAVEL COMPANY, INC. (USE OF CORRELATIVE RIGHTS DOCTRINE TO DEFEAT CLAIM OF INVERSE CONDEMNATION),
112 Cal Rptr. 846-55 (Ct App 1974).

Descriptors: *California, *Percolating water, *Eminent domain, *Reasonable use, *Condemnation, Groundwater, Subsurface waters, Competing uses, Relative rights, Excavation, Dewatering, Compensation, Judicial decisions, Water districts, Legal aspects, Water law, Water rights, Water shortages.
Identifiers: *Injunctive relief, *Inverse condemnation, Groundwater management.

Appellants operated sand and gravel quarries overlying the Niles Basin; respondent was a county water district whose water replenishment program raised the underground water table to a level below which appellants' pits had been excavated, causing flooding in the pits. Appellants pumped out and discharged several billion gallons of that water into San Francisco Bay. Evidence that the public's water needs were critical throughout California and the district was in the record. Appellants sued the district for compensation under inverse condemnation, alleging that the flooding of the pits constituted a 'taking' of property for public use. Respondents sought to enjoin the operators from discharging and wasting its water. The appellate court here affirmed the trail court's decision in favor of the district. It held that the doctrine of correlative rights--where the rights of the water of each landowner overlying the basin are limited by his reasonable use thereof--was a public servitude that had existed upon appellants' property; injunctive relief was justified by the finding that appellants' pumpoff and discharge of water amounted to an unreasonable use thereof. (Jones-Florida)
W77-08991

SZELES--NATALE, INC. V BOARD OF COMMISSIONERS OF SWATARA TOWNSHIP, DAUPHIN COUNTY (FLOOD CONTROL AIDED BY LAND DEVELOPMENT RESTRAINTS),
368 A2d 1336-38 (Cwth Ct Pa 1977).

Descriptors: *Administrative decisions, *Supervisory control(Power), *Permits, *Flood control, *Pennsylvania, Administrtive agencies, Building codes, Ponding, Ponds, Legislation, Regulation, Land development, Land use, Land management, Judicial decisions, Flood protection, Local governments, Surface waters.
Identifiers: *Administrative regulations, Plats, Flood retention ponds.

Plaintiff developer sought review of an order dismissing his appeal from the denial of plat approval by defendant township board of commissioners. Plaintiff, relying on an ordinance which established a township planning commission, claimed that the ordinance delegated authority to the commission to grant final plat approval. Defendant claimed that the ordinance gave the commission advisory powers only, and that the defendant retained power of final plat approval. The court held for the defendant, finding that the board had reserved approval power for itself. The court further found that the controverted plat was preliminary in nature, rather than final. Plaintiff also contended that the defendant abused its discretion by relying on testimony of expert witnesses in its decision to deny the permit. Defendant asserted the possibility of flooding and the possible adverse effects of ponds proposed by the plaintiff. The court found that this issue resolved itself into a question of the credibility of experts, thus it refused to declare that the defendant had abused its discretion by giving greater weight to the testimony of one expert over that of another. Nor did the court accept the plaintiff's contention that the denial of this development plan amounted to an unconstitutional deprivation of land. (Petruff-Florida)
W77-08992

IN RE CITY OF WHITE BEAR LAKE (STANDARD FOR GRANTING OF PERMITS UNDER THE MINNESOTA WATER MANAGEMENT LAW).
247 NW2d 901-07 (Minn 1976).

Descriptors: *Minnesota, *Permits, *Water management, *Standards, Judicial decisions, Legislation, Legal aspects, Legal review, Water law, Administrative decisions, Natural resources, Administrative agencies, State governments, Regulation, Land management, Conservation, Construction.
Identifiers: Evidence.

The Commissioner of natural resources appealed from an order and judgment of the Ramsey County District Court reversing the commissioner's order denying respondent city's application for a permit to encroach upon the bay of a lake to construct a roadway. The district court found that a 1973 amendment to the Minnesota Water Management Law, stating that in all permit applications the applicant has the burden of proving that the proposed project is reasonable, practical and will adequately protect the public safety, created a higher standard for granting of permits. The Supreme Court determined that the amendment did not create a higher burden because the amendment was only a restatement of a well-established rule of administrative law. The only other issue in the case was whether there was sufficient evidence before the commissioner to support a denial of the permit. The Supreme Court found that where there was substantial evidence before the commissioner that pollution, impairment, or destruction of natural resources would occur as a result of the granting of the permit, and feasible alternatives were available, the commissioner's denial of the permit was justified. (Hilburn-Florida)
W77-08993

WATER RIGHTS ADJUDICATION ACT.
Tex. Water Code Ann secs 5.301 thru .341 (1972).

Descriptors: *Water utilization, *Water management, *Texas, Water control, Water demand, Water distribution(Applied), Water policy, Water resources, Water supply, Water allocation(Policy), Beneficial use, Consumptive use, Riparian rights, Municipal water, Administration, Water districts, Water law, Legal aspects, Water permits.
Identifiers: Watermaster, Water Rights Adjudication Act.

The stated purpose of this statute is to require recordation of claims of water rights in the state of Texas, to limit such claims to actual use, and to provide for adjudication and administration of such claims. The statute treats existing claims under previous statutory law and common law riparian rights, and establishes a procedure for the filing of new claims. Also provided for is a system for administering water rights and investigating and adjudicating claims. Among the specific provisions are: water divisions, to be created throughout the state; appointment of a watermaster for each water division; duties and regulatory powers of the watermasters; and provision for notice and appeals procedures for parties whose rights are subject to determination under the statute. The statute allows broad discretionary powers to vest in the Water Rights Commission. (Sloan-Florida)
W77-08994

UNLAWFUL USE, DIVERSION OR WASTE OF STATE WATER.
Tex Water Code Ann secs 5.081 thru 5.121 (1972).

Descriptors: *Texas, *Watershed management, *Water management(Applied), *Appropriation, *Water rights, Canals, Irrigation systems, Water utilization, Water sources, Water supply, Water law, Legal aspects, Administration, Water policy, Agriculture, Governments, Regulation.

Subchapter C of the Texas Water Code establishes regulations for taking, appropriation, or diversion of water. Possession of state water when the right to its use was not acquired in accord with the regulations is prima facie evidence of a violation. A separate offense is committed for each day a person takes water in violation of the Code. No permanent water rights may be sold without a previously perfected right or a permit. No person may transfer water from one watershed to another without a permit. No person may interfere with a headgate or water box, or other work which is the property of another without lawful authority. No person may allow water to be impounded in a manner that damages the property of another; any person whose property is so damaged has remedies at law and in equity. The Texas Water Commission may make and enforce regulations in regard to diversion of floodwaters released from a reservoir on an international stream. No person may allow Johnson gross or Russian thistle to go to seed within ten feet of a waterway lying on his land. No person may pollute or allow anything but a beneficial use of, water contiguous to a canal or irrigation system. No person may obstruct a navigable stream. (Sloan-Florida)
W77-08995

SNAKE RIVER INTERSTATE COMPACT.
Idaho Code Ann sec 42-3401 (Supp 1976).

Descriptors: *Idaho, *Wyoming, *Interstate compacts, *Interstate rivers, *Water resources development, Interstate, State jurisdiction, State governments, Water allocation(Policy), Water distribution(Applied), Water resources, Flood control, Drainage programs, Drainage area, Preferences(Water rights), Governmental interrelations.
Identifiers: *Snake River Interstate Compact.

In October of 1949 Idaho and Wyoming approved the Snake River Compact. The agreement sought to: achieve efficient use of the Snake River; provide for the equitable distribution of its waters; eliminate interstate controversies; promote interstate comity; recognize that the development of the drainage area of the Snake River and its tributaries is the most efficient utilization of such waters; and to achieve joint action with the United States in the control of floods and the development and use of such waters. The waters of the Snake River are allocated between the two states for storage or direct diversion. Waters diverted into either state may not be used outside of specified drainage areas without the approval of the other state. The waters of the Snake River may be impounded for the generation of power, but this use shall be subservient to domestic, stock, or irrigation uses. Each state, and the United States, may construct or use works within the compacting states. The failure to fully utilize provided allocations shall not constitute a forfeiture of such rights to use. (Josepher-Florida)
W77-08996

HEADGATES AND MEASURING DEVICES: DISTRIBUTION OF STORED WATER.
Idaho Code Ann secs 42-701 thru 42-802 (1948).

Descriptors: *Idaho, *Water distribution(Applied), *Water measurement, *Water level recorders, *Water management(Applied), Measurement, Water levels, Water delivery, Water transfer, Water level fluctuations, Water conveyance, Streambeds, Diversion dams, Diversion structures, Appropriation, Control structures, Controlled drainage.
Identifiers: Headgates, Measuring devices.

Appropriators or users of the public waters of Idaho must maintain headgates and controlling works at the point where the water is diverted. These works should be constructed so as to allow state officials to regulate the flow of the water at the diversion point. Measuring devices may also be required by the state to determine the amount of water diverted from streams into ditches. Plans for headgates, rating flumes or other measuring devices must be approved by the state. Appropriators or users who refuse to maintain or construct satisfactory controlling works will have their water supply shut off after reasonable notice has been given. Persons using any streams or channels or tributaries thereof, as impounding reservoirs shall place measuring devices at suitable intervals on said waters. Measuring devices shall be installed at a point above and near to the backwater of impounding reservoirs. Owners desiring to use the bed of a stream or a natural water course to convey stored water shall notify the state which will then adjust the headgates of ditches not entitled to such water to insure that the owner will secure his entitled volume. Persons interfering with such adjustments of headgates may be punished by fines and imprisonment. (Josepher-Florida)
W77-08997

DISTRIBUTION OF WATER AMONG APPROPRIATORS.
Idaho Code Ann secs 42-601 thru -607 (1948), as amended, (Supp 1976).

Descriptors: *Idaho, *Water distribution(Applied), *Water management(Applied), *Water districts, *Water allocation(Policy), Water delivery, Prior appropriation, Measurement, Water levels, Canals, Ditches, Water measurement, Local governments, Water sources, Water utilization, Water policy, Appropriation.

Idaho is divided into three geographically determined water divisions to facilitate the administration and control of public waters. The department of reclamation has immediate direction and control of the distribution and diversion of water from all streams to canals and ditches. The distribution of waters is in accordance with rights of prior appropriation. The department shall divide the state into water districts. Each district is to have an independent source of water supply so that separate districts do not compete for uses from a single water source. District meetings and procedures are provided for. The department may request watermasters to file reports containing information regarding the district's present and future water supplies and needs. In times of water scarcity, the watermaster shall distribute waters from the district based on prior rights of appropriation. Persons who do not own adjudicated rights are accorded subsequent rights. (Josepher-Florida)
W77-08998

GROUND-WATER USE ACT (REGULATION OF GROUND WATER RESOURCES THRU A PERMIT SYSTEM).
Hawaii Rev Stat secs 177-1 thru -35 (1968).

Descriptors: *Hawaii, *Groundwater resources, *Groundwater availability, *Groundwater, Legislation, Water management(Applied), Water supply, Water resources development, Recharge, Water utilization, Water pollution, Beneficial use, Domestic water, Prescriptive rights, Permits, Regulation, Water permits, Water law, Competing uses, Water allocation(Policy).
Identifiers: Administrative regulations, Certification, Groundwater management, Domestic use, Preserved use.

The board of land and natural resources of the state of Hawaii is herein authorized to designate ground water areas subject to regulation if any of the following conditions exist: (1) the use of ground water exceeds the rate of recharge; (2) ground water levels are declining excessively; (3) chloride content is materially increasing; (4) excessive preventable waste is occurring; or (5) proposed development would lead to one of the above. No person shall make any use of the water of an area so designated except as provided in this act, nor can any prescriptive rights to water resources accrue therein. Domestic uses of ground water in designated areas may continue and new domestic use may be initiated upon filing a report with the board. Any other existing beneficial uses may be preserved by filing a detailed declaration of use with the board and receiving certification of the same. Such preserved uses will be extinguished if not used for four consecutive or five of seven years. Any other withdrawal of water from a designated area may be made only upon issuance of a permit. Such permits shall be granted for beneficial uses not interfering with preserved and domestic uses or more beneficial uses where there is water available. The act further provides numerous procedural safeguards to insure the proper designation of areas, consideration of permits, and exercise of emergency powers. (Moorhouse-Florida)
W77-08999

MOLOKAI IRRIGATION AND WATER UTILIZATION PROJECT.
Hawaii Rev Stat secs 175-1 thru - 8 (1968).

Descriptors: *Hawaii, *Irrigation programs, *Water supply, *Comprehensive planning, Legislation, Development, Area redevelopment, Governments, State governments, Administrative agencies, Potential water supply, Water allocation(Policy), Competing uses, Water utilization, Multiple-purpose projects, Economics, Financing, Planning, Irrigation, Irrigation districts.
Identifiers: *Molokai Irrigation and Water Utilization Project, *Hawaii board of land and natural resources.

Tkhe state of Hawaii has established a special irrigation and water utilization project for the island of Molokai. The project will be administered by the board of land and natural resources. The board shall have all powers of eminent domain, the power to survey and conduct all necessary studies in relation to the project, and the power to lay and collect assessments from the acreage served. All funds collected from the operation of the project will be segregated into a special fund in the state treasury and will be used exclusively for the Molokai project. No actual construction of the project shall be authorized until all lands and water rights necessary for the project are satisfactorily under the board's control. (Moorhouse-Florida)
W77-09000

MIANUS RIVER PRESERVATION COMMITTEE V. ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY (JURISDICTION OF FEDERAL APPEALS COURT FOR PERMITS ISSUED BY STATE AGENCY UNDER NPDES).
541 F.2d 899-910 (2d Cir. 1976).

Descriptors: *Federal jurisdiction, *Connecticut, *Administrative agencies, *Permits, Legal review, Adjudication procedure, Federal government, State government, State jurisdiction, Regulation, Administrative decisions, Co-ordination, Governmental interrelations, Interagency cooperation, Control, Judicial decisions.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Administrative regulations, State pollution permits.

Petitioner environmental committee sought review in the United States Court of Appeals of a National Pollution Discharge Elimination System (NPDES) permit issued by the Commissioner of the State of Connecticut Department of Environmental Protection. A local water company had for many years discharged chemically treated flocculants into a nearby river. The state agency mandated completion of facilities for reduction of the discharges, and subsequently extended the compliance date. When the 1972 Amendments to the Federal Water Pollution Control Act (FWPCA) became effective, permitting transfer of the responsibility for issuing discharge permits to complying state agencies. Connecticut's program was approved, and the orders pertaining to the water plant apparently transformed into NPDES permits. Petitioner alleged noncompliance with the FWPCA directive for best practicable control technology, and impossibility of compliance. Respondent state agency defended on the merits and alleged lack of jurisdiction, as the review provision provides only for federal review of the federal administrator's action. The court dismissed the action for lack of jurisdiction holding that state permitting programs were not an unconstitutional delegation of the Administrator's authority and that no Administrator's action was involved in the state permit modification. (Molloy-Florida)
W77-09001

COMMONWEALTH OF MASSACHUSETTS V. UNITED STATES VETERAN'S ADMINISTRATION (NOTICE OF SUIT PROVISIONS OF THE FWPCA; FEDERAL COMMON LAW NUISANCE ACTIONS).
541 F.2d 119-23 (1st Cir. 1976).

Descriptors: *Massachusetts, *Federal Water Pollution Control Act (FWPCA), *Permits, *Jurisdiction, Federal government, Administration, State governments, Legal review, Waste treatment, Governmental interrelations, Administrative agencies, Control, Regulation, Water pollution, Abatement, Effluents, Hospitals.

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Identifiers: *National Pollutant Discharge Elimination System, *Notice, *Nuisance(Legal aspects), Federal Water Pollution Control Act Amendments of 1972, Federal common law, Sovereign immunity.

Plaintiff state brought suit in federal district court alleging that Veterans Administration Hospital had violated the conditions of its National Pollution Discharge Elimination System (NPDES) permit issued under the Federal Water Pollution Control Act (FWPCA). The Veterans Administration conceded its failure to comply with the timetable for re-in to the municipal sewage system, and therefore its technical violation of the permit, but denied jurisdiction. The FWPCA provides that no action may be commenced prior to 60 days after the plaintiff has given notice of the alleged violation. Plaintiff gave only 40 days notice, and alleged on appeal that since no amount of administrative action during the post notice period could cure the past violations of the permit conditions, no purpose would be served by deferring recourse to the courts. The United States Court of Appeals for the First Circuit noted that administrative action could still hasten compliance with the permit, and found that sovereign immunity barred action under the difficult issues involved in the federal common law of nuisance. Finding that the FWPCA's waiver of immunity applied only to actions under the FWPCA, the court affirmed dismissal of the action. (Molloy-Florida)
W77-09002

HOMEOWNERS EMERGENCY LIFE PROTECTION COMMITTEE V. LYNN (ENJOINING OF MAJOR FEDERAL ACTIVITY WITH ALLEGED INADEQUATE ENVIRONMENTAL IMPACT STATEMENT).
541 F.2d 814-19 (9th Cir. 1976).

Descriptors: *Dams, *Environmental control, *Administrative agencies, *California, Federal government, Project planning, Water supply, Financing, Government finance, Grants, Governmental interrelations, Water resources development, Projects, Disasters, Earthquakes.
Identifiers: *Environmental impact statement(EIS), *Injunctive relief.

Plaintiff, unincorporated association of homeowners and taxpayers, sought to enjoin the construction of a dam and reservoir project by the City of Los Angeles. City applied for Federal Disaster Relief to replace the dam after an earthquake had destroyed the old one. Before relief was granted, the city elected to go ahead with construction and to ultimately finance the project with local water reserve bonds if federal financing was denied. Plaintiff then alleged that the project was a major federal action requiring the filing of an environmental impact statement (EIS). During the plaintiff's appeal, federal agencies filed the EIS and the federal funding was granted. The court noted that the issuance of the federal grant made the project a major federal action and concluded that the grant was made under a 1970 act and did not contain a 1974 exemption from Environmental Protection Agency requirements. The EIS must consider all reasonable alternatives. The compliance and issue was remanded to the trial court for a factual determination. The trial court was also instructed to reconsider whether construction should be enjoined until that factual determination was made. (Molloy-Florida)
W77-09003

MC CORMICK V LAWRENCE (CONSTITUTIONALITY OF NEW YORK STATUTE AIMED AT PROMOTING GOVERNMENTAL INTEREST IN PRESERVING APPEARANCE OF AN AREA).
387 NYS2d 919-20 (App Div 1976).

Descriptors: *New York, *Parks, *Aesthetics, *Permits, Judicial decisions, Legislation, Legal aspects, Water law, Governments, Preservation, Land use, Natural resources, Land management, State governments, Construction, Administrative agencies, Administrative decisions, Constitutional law.
Identifiers: *Administrative regulations.

Landowners sought review of a decision of the Adirondack Park Agency prohibiting them from constructing boathouses on their property. Petitioners owned property within the boundaries of the Adirondack Park. In order to develop this tract of land, petitioners were required by the Executive Law to apply for an Adirondack Park Permit. The Agency approved development with the condition that no boathouses be constructed on the shores of the lake. Petitioners commenced pleadings to have respondent's determination amended to permit the erection of boathouses. The Supreme Court granted respondent's motion to dismiss the petition and for summary judgment. On appeal petitioners contended that the statute granting the Agency the authority to impose conditions in permits was an overbroad delegation of power. Petitioners also argued that the Agency's determination was arbitrary and capricious. The Appellate Division found that the legislation provides sufficient standards to guide the Agency in its determinations and that the Agency's restriction forbidding construction of boathouses based on adverse aesthetic effect, was not arbitrary, capricious, or an abuse of discretion. (Hilburn-Florida)
W77-09004

RYKAR V GILL (STATE'S REFUSAL TO ALLOW UPLAND OWNER TO FILL ADJACENT MARSHLAND BECAUSE OF OWNER'S ACCESS TO DEEP WATER BY USE OF WHARFING TECHNIQUES),
6 ERC 1333-35 (Conn Super Ct 1973).

Descriptors: *Connecticut, *Deep water, *Constitutional law, *Land forming, Land use, Land development, Dredging, Water rights, Water quality control, Water policy, Water pollution control, Environmental control, Environmental engineering, Marsh management, Marshes, Wetlands, Water law, Water control.
Identifiers: *Fill permits, *Coastal waters.

Plaintiff landowner brought this action seeking a reversal of the state's denial of his application for a dredge and fill permit to allow plaintiff to fill the adjacent marshland and construct a deep harbor facility. Plaintiff contends that the denial of his present application deprives him of his right to access to deep water, which is one of the exclusive yet qualified rights of an upland owner. Plaintiff further contended that such right is deemed a property right and entitled to constitutional protection, including compensation when these rights have been taken by the state. The court upheld the earlier finding that plaintiff was not the owner of a portion of the wetlands. The court further held that if access to deep water could be gained by means other than filling, then it cannot be found to be an unreasonable exercise of the police power for the state to foreclose the marsh destruction and deny the fill permit application. Here the plaintiff could have access to deeper water via wharfing out, and the fact that wharfing out may be more costly is not of constitutional significance. The state's refusal to issue the permit was therefore upheld by the court as a reasonable exercise of its police power. (Welch-Florida)
W77-09005

MC ILRAY V HAMILTON (PERMISSIVE USE OF SPRING OVERFLOW DEFEATS PRESCRIPTIVE RIGHT CLAIM),
539 SW2d 669-78 (Mo Ct App 1976).

Descriptors: *Missouri, *Judicial decisions, *Prescriptive rights, *Spring waters, Water law, Legal aspects, Real property, Easements, Land tenure, Riparian rights, Legal review, Water rights, Farms, Springs, Bodies of water, Overflow, Subsurface waters, Adjacent landowners.
Identifiers: Injunctive relief, Permissive use, Easement by prescription.

Plaintiff, executor of landowner's estate, sought a permanent injunction to restrain adjoining landowners from blocking a roadway across their farm and from diverting natural flow of water from a spring located on their farm. Plaintiff argued that through open, notorious, uninterrupted, and adverse use of the roadway and spring water for over 10 years, decedent had acquired an easement by prescription. Defendants, admitting use by plaintiff, contended that such use had its origin in permission, and thus could not ripen into a prescriptive right. The trial court found defendant's theory supported by the evidence, and denied the injunction. On appeal, the court affirmed the denial of injunctive relief finding the pipe extending onto defendants' land was a permissive intrusion because defendants' predecessor in title determined where the pipe could be located and how the overflow from his trough could be captured. Plaintiff asserted a second theory for relief on appeal claiming riparian rights based upon a reasonable use of natural watercourses. The court of appeals refused to consider the argument stating that an appellant must seek review of the trial court's judgment on the same theory on which the case was tried. (Moorhouse-Florida)
W77-09006

MODINE MANUFACTURING CO V POLLUTION CONTROL BOARD OF ILLINOIS (STREAM RECLASSIFICATION AND EFFLUENT VARIANCES REQUIRED BY NEW WASTE TREATMENT TECHNOLOGY),
351 NE2d 875-79 (Dist Ct App 111 1976). 5p.

Descriptors: *Illinois, *Rivers, *Judicial decisions, *Industrial wastes, *Effluents, Water pollution, Administrative agencies, State governments, Legal review, Permits, Legal aspects, Water law, Wastes, Water pollution sources, Discharge(Water), Sanitary engineering, Waste water(Pollution), Chemical wastes, Industrial plants, Industrial water, Water quality.
Identifiers: *Illinois Pollution Control Board, *Modine Manufacturing Company, *Illinois Environmental Protection Act, Effluent limitations, Administrative regulations.

Plaintiff-manufacturer who discharged his treated effluent into an Illinois river, was developing a new waste water treatment facility which required a temporary variance from state effluents standards and a reclassification of the river to secondary-contact water. Defendant Pollution Control Board of Illinois initially granted both requests, but on rehearing reversed the secondary-contact water classification. Plaintiff appealed, contending that the Control Board was an administrative agency, created by statute, which could only conduct rehearings when specific statutory authority existed. The court pointed out that Section 5(d) and Section 26 of the Environmental Protection Act authorized the Board to establish its own rules. Secondly, plaintiff contended that the river fit the definition of secondary contact water since it was dry at times and therefore unable to support a diversified acquatic biota. The Court ruled that a diversified biota could be preserved in the mud during dry times, and re-occur when the river flowed again. Therefore, a non-continuous river flow would not affect the river's classification. The court upheld the Board's ruling that the river was for general use. (Moorhouse-Florida)
W77-09007

UNITED STATES V HOLMES (WATERS AND SUBAQUEOUS AREAS LOCATED WITHIN PERIMETERS OF A MILITARY POST),
414 F Supp 831-44 (D Md 1976). 102 p.

Descriptors: *Riparian rights, *Ownership of beds, *Prescriptive rights, *Military reservations, Public lands, Maryland, Federal government, State governments, Governmental interrelations, Trespass, Public access, Navigable waters, Legislation, Eminent domain, Preferences(Water rights), Priorities, Public rights.
Identifiers: Public trust doctrine, Subaqueous areas.

Defendant was indicted under federal statute prohibiting persons from entering military reservations for an unlawful purpose. Defendant was given a citation by military police when she was located between the high and low water marks on the shores of the Bush River on Aberdeen Proving Grounds, Maryland. The state of Maryland filed an amicus brief in support of defendant's motion to dismiss. Defendant argued that the public has a right to go on subaqueous areas regardless of who owns title to the adjacent land, and that the state had retained jurisdiction over the inland waters. The court found that Congress intended waters and subaqueous lands to fall under the statute's jurisdiction in view of regulations authorized for navigable waterways in target practice area s. The United States was found to hold title to the land and waters acquired through the eminent domain power. The state may have had a claim to subaqueous lands, but vesting of title in the federal government was not dependent on compensation. Ownership of subaqueous lands on United States Military Reservations vests in the federal government, and the state retains no rights for the public use. (Molloy-Florida)
W77-09008

PROVO-JORDAN RIVER PARKWAY AUTHORITY.
Utah Code Ann secs 65-10-1 thru -7 (Supp 1975).

Descriptors: *Utah, *Water conservation, *Rivers, *Administrative agencies, Legislation, Recreation, Wildlife, Conservation, Flood control, Reclamation, Flood plains, Water conservation, Water policy, Water utilization, Administration, Legal aspects, Regulation, Water law, Institutions, State governments, Water policy, Water resources, Comprehensive planning, Decision making, Project planning, Leadership, Management, Social aspects.
Identifiers: *Provo-Jordan River Parkway Authority(Utah), *Provo River(Utah), *Jordan River(Utah).

The Provo-Jordan River Parkway Authority and Board is hereby created to establish and co-ordinate programs for the development of recreational areas, wildlife resources, water conservation, flood control, and reclamation, restoration and preservation of points of historical interest along the Provo and Jordan Rivers of Utah and their tributaries, and within their present flood plains. The Authority's powers include the right to acquire real and personal property in the name of the state, constructing and maintaining facilities consistent with the purposes of the act, and operating, leasing or renting lawful property concessions. The Board is comprised of thirteen members, appointed as set forth by statute. Six terms of office expire on March 1, 1977, the balance on March 1, 1979. Successors shall be appointed for terms of four years each. Board members shall only receive travel expenses. The Board has power to establish the programs necessary to implement the policies of this Act, and to promulgate the rules and regulations required to effectuate the purposes of the Act. The Authority shall not permit any construction on the Provo or Jordan rivers or within their flood plains which shall be in violation of any ordinance. The Authority shall not be authorized to administer water rights. (Hadoulias-Florida)
W77-09009

WATER-USE LEASING ACT.
NM Stat Ann secs 75-40-1 thru -7 (1968).

Descriptors: *New Mexico, *Water users, *Competing uses, *Leases, *Water rights, Water demand, Water allocation(Policy), Regulation, Permits, Legal aspects, Contracts, Legislation, Water transfer, Water utilization, Water resources, Water contracts, Water control, Water law, Water conservation, Water supply.
Identifiers: Notice.

Any owner of a valid water right in New Mexico may lease to any person all or any part of the water-use due him under his water right. The use by the owner of the water right shall be reduced by the amount of water so leased, but the owner's water right shall not be affected otherwise by the lease of such use. Upon the lease's termination the water-use rights shall revert to the owner's original use and location. The lease may cover immediate or future water-use rights, but shall not be effective to accumulate water from year to year or to injure other water users. The lease shall not toll any forfeiture of water rights for nonuse, and the initial or any renewal term of lease of water-use shall not exceed 10 years. The lessee must apply to the state engineer prior to his use of such water, and the engineer shall aprove the application if the lessee has shown that his proposed use and location will not impair any existing right to a greater degree than such right would have been impaired by continued use by the owner. Provisions are made in the statute for notice of the lease, protest from any user who believes his water rights will be adversely affected, and for hearings and appeals. (Welch-Florida)
W77-09010

WATER RESOURCES AND WATER UTILIZATION IN ISRAEL,
Office of Naval Research, London (England).
R. Dolan.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A011434, Price codes: A02 in paper copy, A01 in microfiche. May 30, 1975. 14 p, 4 map, 2 tab.

Descriptors: *Irrigation water, *Water shortage, *Water management(Applied), *Brackish water, Water utilization, Permits, Saline water, Impaired water quality, Brackish-water fish, Industrial production, Agriculture, Cost-benefit ration, Water costs, Environmental effects, Desalination, Water distribution(Applied), Water demand, Deserts.
Identifiers: License, *Israel.

Israel, classified as one-half desert, one-quarter semi-arid, and one-quarter subhumid, is geographically similar to parts of California. Water management in Israel is tight. A license is required to use water in significant quantities and a permit is called for in water exploration. Water, stored in a lake, provides necessary supplies for long, dry summers. Since no more fresh water is available, efforts are directed toward better utilization of existing sources, especially in the field of agriculture. The use of brackish water (that having a salinity of 2000 or 3000 ppm) is expected to be a significant contribution. Processing the water is rejected as a viable alternative because of the cost involved. Brackish water, when mixed with fresh water, may be used for industrial and agricultural purposes. Currently, its major use is in commercial fish ponds. However, research is underway to determine the slinity tolerance of a variety of plants. Several serious drawbacks in using the brackish water involve the expense incurred in pumping it out of the ground coupled with dangerous side effects of salt build-up in the fields where it is used. (Rieck-Florida)
W77-09011

SELECTED PROBLEMS IN IDAHO GROUND WATER LAW,
Idaho Univ., Moscow. Coll. of Law.
D. L. Grant.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 097. Price codes: A05 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Legal Report, March 1975, 74 p. OWRT B-019IDA(3) and B-031-IDA(2). 14-31-001-3578, 4076.

Descriptors: *Groundwater, Planning, *Legal aspects, Economics, Pumping, Natural recharge, Management, *Idaho, *Institutional constraints, *Water rights, Legislation, Water law.
Identifiers: *Raft River Valley(Idaho), Pumping lift.

This report deals primarily with two questions: (1) How are rights to use groundwater acquired in Idaho. (2) What legal constraints limit the exercise of groundwater rights in Idaho. The main focus is upon the current Idaho Groundwater Act although historical antecedents are also examined. Groundwater rights are aquired under the appropriation doctrine, as supplemented by a mandatory permit system. The two main constraints upon exercise of a groundwater right are that such exercise may not affect a senior water right contrary to the declared policy of the Act, and that total withdrawals from an aquifer may not exceed the reasonably anticipated average natural recharge. There are a number of unresolved ambiguities concerning the scope of the first constraint. (See also W75-02981)
W77-09049

ENERGY PLANT SITING LEGISLATION,
Idaho Univ., Moscow. Dept. of Civil Engineering.
C. C. Warnick, and P. J. Rassier.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 109. Price codes: A04 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, IWRRI information circular No 9, February 1975. 54 p, 2 tab. OWRT A-048-IDA(1).

Descriptors: *Electric powerplants, Powerplants, *Sites, *Legislation, *Idaho, Energy conversion, Legal aspects, Industry, State governmnts.
Identifiers: Idaho energy plants, Siting legislation.

This brief appraisal of energy siting legislation for Idaho presents in part one an analysis and comparison of drafts of two bills that were drafted prior to the beginning of the First Session of the Forty-Third Legislature of the State of Idaho; comments and explanations are presented on particular points of the legislative needs. Part two is a brief survey of other states' legislation with primary emphasis on points that might be worthy of consideration in Idaho. The third part presents two summary tables of comparative information on the legislation, some ideas for alternatives, and reasons for conclusions. This legislation in the draft form will be changing so a caution is made that these studies are still in progress and may change as further study and analysis proceed.
W77-09050

POLICY INNOVATION AND INSTITUTIONAL FRAGMENTATION,
Arizona Univ., Tucson. Inst. of Government Research.
M. Ingram, and J. Ullery.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 078, Price codes: A03 in paper copy, A01 in microfiche. Paper presented at The 1975 National Conference on Public Administration, Chicago, Illinois, April 1-4, 1975, 38 p.

Descriptors: *Water policy, *Political aspects, *Administrative agencies, Decision making, *Legislation, Institutional constraints, Institutions, Social aspects, Social change, Social values.
Identifiers: Innovation(Policy).

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he question of what is the most appropriate poly-making structure for effecting policy change as become increasingly important. The bias ward an integrated and centralized structure as est suited to the task has been and remains a ominant one in the thinking of many who are ositively disposed toward change. This is a istake. The view which associates centralization ith innovation, and fragmentation with stagnaon (or at best only incremental change) is simistic and unwarranted. A part of the difficulty ith the centralist position, is its lack of appreciaon for the complexities of policy and policy ange. Rather than conceive of policy in ideal rms and as a sort of monolithic approach, it has en suggested that more realistic conceptions are policy as a composite of four dimensions of sts and benefits, and of innovation as occurring a disjointed manner. A fragmented system is an propriate mechanism for effecting disjointed inovation. While a fragmented policy-making stem may not facilitate integrated innovation, ch sweeping change is rarely accomplished ithin any type of system. It seems likely that the ed for such change arises in part because of the lative insensitivity from which highly integrated stems suffer. A system which promotes enepreneurship, encourages competition, and inimizes the costs of change tends to increase nsitivity and renders less likely the occurrence debilitating stagnation. (See also W75-03851) 77-09053

F. Nonstructural Alternatives

LOOD PLAIN INFORMATION: ALUQUERQUE ARROYAS, PART V, ALUQUERQUE, NEW MEXICO.
rmy Engineer District, Albuquerque, New Mex.
or primary bibliographic entry see Field 4A.
77-08611

PECIAL FLOOD HAZARD INFORMATION: RKANSAS RIVER, FORT DODGE - WILOADS GARDENS, VICINITY OF DODGE ITY, KANSAS.
rmy Engineer District, Albuquerque, New Mex.
or primary bibliographic entry see Field 4A.
77-08612

PECIAL FLOOD HAZARD INFORMATION EPORT: MISSOURI AND KANSAS RIVERS, ANSAS CITY, KANSAS.
rmy Engineer District, Kansas City, Kans.
or primary bibliographic entry see Field 4A.
77-08613

LOOD PLAIN INFORMATION: OHIO RIVER, AWRENCE COUNTY, OHIO.
rmy Engineer District, Huntington, W. Va.
or primary bibliographic entry see Field 4A.
77-08614

LOOD PLAIN INFORMATION: ASHUELOT IVER, CITY OF KEENE, NEW HAMPSHIRE.
rmy Engineer District, Waltham, Mass. New England Div.
or primary bibliographic entry see Field 4A.
77-08615

PECIAL FLOOD HAZARD REPORT: BUFALO CREEK, MEADOW GROVE, EBRASKA.
rmy Engineer District, Omaha, Nebr.
or primary bibliographic entry see Field 4A.
77-08616

LOOD PLAIN INFORMATION REPORT, INDIN AND DRY CREEKS, LINN COUNTY, IOWA.
rmy Engineer District, Rock Island, Ill.
or primary bibliographic entry see Field 4A.
W77-08617

FLOOD HAZARD INFORMATION: YAMPA RIVER AND TRIBUTARIES, STEAMBOAT SPRINGS, COLORADO.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-08619

FLOOD PLAIN INFORMATION: LLAGAS CREEK UNIT I, INCLUDING EDMUNDSON (LITTLE LLAGAS), CHURCH, SAN MARTIN, NEW, CENTER, CORRALITOS, TENNANT, MAPLE, AND FOOTHILL CREEKS, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W77-08620

ECONOMICS OF PERMANENT FLOOD-PLAIN EVACUATION,
Atlanta City Dept. of Environment and Streets, Ga. Office of Engineering.
For primary bibliographic entry see Field 6B.
W77-08856

STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF GEORGIA,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2L.
W77-08914

6G. Ecologic Impact Of Water Development

RECREATIONAL WATER RESOURCES PROBLEMS.
Bureau of Outdoor Recreation, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-08711

EXPANSION OF THE RANGE OF SOME FISH SPECIES IN CONNECTION WITH HYDRAULIC ENGINEERING CONSTRUCTION ON THE VOLGA AND ACCLIMATIZATION WORKS, (IN RUSSIAN),
For primary bibliographic entry see Field 8I.
W77-08715

WATER AS AN ENVIRONMENTAL CONSTRAINT IN LAND USE PLANNING,
North Carolina State Univ., Raleigh. Dept. of Landscape Architecture.
R. C. Freeman, Jr.
Masters Thesis, November 1976, 83 p., 41 illus., 30 ref.

Descriptors: *Water distribution(Applied), *Land management, *Land use, *Land use planning, *Small watersheds, *Watershed management, *Water supply, Surface runoff, Water yield improvement, Water storage.

Environmental factors affecting the behavior of water are discussed, as well as the dynamics of hydrologic response under varying environmental conditions, and alternative means of controlling the hydrologic response under varying environmental conditions, and alternative means of controlling the hydrologic response characteristics of watersheds. The relationship between these factors and the establishment of an environmentally stable pattern of land uses upon which human communities can be superimposed is explored. A method is developed that would allow stream networks to behave much as they would under natural conditions. It involves infiltrating runoff close to where it is produced in lieuk of sending it somewhere else for surface storage. This method would improve stream quality by utilizing the filtering action of soil, stabilize streamflow, and positively affect ground water supplies where they are important for human consumption. The characteristics of the important elements of water and land use planning are summarized. The systems include watersheds, the hydrologic cycle, soil types, vegetative cover, geomorphology, geology, and land use patterns. The interrelationship of these elements is discussed, and the impact of development on them is explored. (Nessa-NC)
W77-08721

THE STRUCTURAL ANALYSIS OF ENVIRONMENTAL PERCEPTION AND COGNITION: A MULTIDIMENSIONAL SCALING APPROACH,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Architecture.
For primary bibliographic entry see Field 6B.
W77-08722

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 1: SUMMARY REPORT,
Wisconsin Univ. Extension, Madison; and Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
For primary bibliographic entry see Field 6B.
W77-08725

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3A: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6B.
W77-08726

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3B: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6B.
W77-08727

APPLICATION OF TEMPERATURE PREFERENCE STUDIES TO ENVIRONMENTAL IMPACT ASSESSMENT,
Ecological Analysts, Inc., Melville, N.Y.
For primary bibliographic entry see Field 5C.
W77-08768

PROCEEDINGS: THE CONNECTICUT RIVER SYSTEM: A WORKSHOP ON RESEARCH NEEDS AND PRIORITIES.
Massachusetts Univ., Amherst. Inst. for Man and Environment; Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08808

INCIDENCE OF THE BENEFITS AND COSTS OF ENVIRONMENTAL PROGRAMS,
Harvard Univ., Cambridge, Mass.
R. Dorfman.
American Economic Review, Vol 67, No 1 (Proceedings of the Eightyninth Annual Meeting of the American Economic Association, Atlantic City, Sept '76), p 333-340, February 1977. 5 fig, 3 tab.

Descriptors: *Environmental control, *Costs, *Benefits, *Population, *Programs, *Economics, Water pollution control, Water treatment, Air pollution, Pollution abatement, Linear programming, Algorithms, Constraints, Optimization, Systems analysis, Taxes.
Identifiers: Income level, Willingness to pay, Cost minimization, Exactions.

Considered is the distribution among segments of the population of the benefits and costs of programs for protecting the environment. Presented

are some indications of how the benefits and costs of the current program impinge on different segments of the population classified by income level. It is urged that the distribution of costs and benefits be accounted for in selecting and designing programs, and a suggestion is given for doing this. Willingness to pay data can be utilized to calculate the area under each of the demand curves derived, and from that one can compute the average willingness to pay for families in the corresponding income bracket. It is desirable in planning such programs to consider ways of minimizing the amount of redistribution of income which is entailed. Discussed is the problem of figuring out which segments of the population will suffer exactions and which will not. A cost minimizing problem must be solved in which linear programming is used to minimize total exaction from the designated segments, and the constraints are the usual ones plus the requirements that no exactions be imposed on the protected segments and that exactions from designated segments be non-negative. It is concluded that this nation must reconcile itself to highly regressive methods for reducing atmospheric pollution and must redouble its efforts to compensate for them by using methods with progressive incidences for water pollution control. (Bell-Cornell)
W77-08870

AN EXAMINATION OF SOME PHYSICAL AND BIOLOGICAL IMPACTS OF DREDGING IN ESTUARIES,
Oregon State Univ., Corvallis. School of Engineering; and Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08918

EFFECTS OF STREAM CHANNELIZATION ON BOTTOMLAND AND SWAMP FOREST ECOSYSTEMS,
North Carolina State Univ. at Raleigh. School of Forest Resources.
For primary bibliographic entry see Field 4A.
W77-08920

PRACTICAL USE OF DECISION THEORY TO ASSESS UNCERTAINTIES ABOUT ACTIONS AFFECTING THE ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein, M. Fogel, D. Davis, and J. Weber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 011, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, February 1977. 41 p, 2 fig, 27 ref, 3 append. OWRT B-043-ARIZ(16), 14-31-0001-5056.

Descriptors: *Environment, *Risks, Decision making, Evaluation, Environmental effects, Model studies.
Identifiers: *Decision theory, *Bayesian statistics, Systems theory, Case study, *Environmental impact statement, *Indentification of uncertainties, *Multiobjective system framework.

The determination of the environmental impact of man's action has many uncertain components. A conceptual framework has been developed to assess the effect of uncertainty on environmental impact statements. A multiobjective system framework utilizing Bayesian decision Theory was developed as a result of the research. As a result salient feature of an Environmental Impact Statement that properly considers uncertainty are given. Decision theory can be used to advantage in aplying this methodology to assess the effect of natural and informational uncerainty. Even the complexity of computational procedures involving a Bayes analysis can be overcome by use of approximations or by simulation. Multiobjective decision making models are necessary to analyze the non-commensurate objectives found in studying environmental impact. Current procedures used to assess environmental impact do not take proper cognizance of uncertainty and the problems of trade off among multiple objectives in the analysis and evaluation of actions affecting the environment. Some scientific and legal concepts such as proof and model validation must be thought of in terms of probability, if optimal decisions are to be made affecting our future environment. The methodology developed by this project shows how uncertain information and scientific models can be used to advantage in planning the future.
W77-08927

TRAP RESPONSES OF THE GRAY SQUIRREL (SCIURUS CAROLINENSIS CAROLINENSIS), RACCOON (PROCYON LOTOR LOTOR), AND OPOSSUM (DIDELPHIS VIRGINIANA VIRGINIANA) TO ENVIRONMENTAL FACTORS IN TWO SWAMP WATERSHEDS OF NORTHEASTERN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
H. R. Perry, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 998, Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Thesis, 1974. 189 p, 85 fig, 8 tab, 79 ref, append. OWRT B-049-NC(3). 14-31-0001-3626.

Descriptors: *Surveys, Wetlands, Swamps, *Wildlife habitats, *Trapping, *North Carolina, Channeling, Watershed management.
Identifiers: Prechannelization, Unchannelized swamp, Climatological variables, *Trap responses, *Gray squirrel, *Opossum, *Raccoon.

This study represented one part of a prechannelization analysis to assess the effects of stream channelization and wetland drainage on fish and wildlife. The objectives were to identify and quantify some environmental factors that are associated with trap responses of the gray squirrel, raccoon, and opossum relative to age, sex, and capture status. Fifteen climatological variables and 51 physical factors dealing with trap site location were studied during the summer and winter of 1972 and 1973. Evaluations were made utilizing standardized trap lines in two unchannelized swamp watersheds in northeastern North Carolina. High intrinsic variability characterized trap response, although most regression models did not suffer from lack of fit. Adjustments for environmental variation may be required to obtain accurate mark-recapture population statistics for squirrels, raccoons, and opossums, especially when comparing different habitats or areas. (See also W75-09130) (Stewart-NC State)
W77-08936

BISCAYNE BAY SYMPOSIUM II,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 5G.
W77-08961

SITE EVALUATION AND PRECONSTRUCTION TESTING AT POTENTIAL DEEPWATER PORT LOCATIONS.
Coast Guard, Washington, D. C.
For primary bibliographic entry see Field 6E.
W77-08989

HOMEOWNERS EMERGENCY LIFE PROTECTION COMMITTEE V. LYNN (ENJOINING OF MAJOR FEDERAL ACTIVITY WITH ALLEGED INADEQUATE ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 6E.
W77-09003

THE THIRD LONDON AIRPORT STUDY,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 2L.
W77-09037

ENERGY PLANT SITING LEGISLATION,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W77-09050

EFFECTS OF ECONOMIC DEVELOPMENT ON WATER RESOURCES,
Maryland Univ., College Park. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-09051

ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN THE NORTHEASTERN PLATEAU REGION OF CALIFORNIA,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-09055

STUDIES OF THE FISH POPULATIONS IN TWO EASTERN NORTH CAROLINA SWAMP STREAMS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W77-09062

7. RESOURCES DATA

7A. Network Design

DEVELOPMENT OF A HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W77-08609

HISARS - HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM REFERENCE MANUAL,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W77-08610

EVAPORATION FROM SEVEN RESERVOIRS IN THE DENVER WATER-SUPPLY SYSTEM, CENTRAL COLORADO,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 2D.
W77-08736

7B. Data Acquisition

GEOPHYSICAL EXPLORATION FOR POTABLE GROUNDWATER SUPPLIES IN THE KALAHARI GEMSBOK NATIONAL PARK,
Ruker (Richard) and Associates, Bryanston (South Africa).
For primary bibliographic entry see Field 4B.
W77-08654

MULTI-SHOT CAMERA SYSTEM FOR BOREHOLE SURVEYING.
For primary bibliographic entry see Field 8G.
W77-08668

TIME-OF-TRAVEL STUDY, BLACK RIVER FROM LYONS FALLS TO DEXTER, NEW YORK,
Geological Survey, Albany, N. Y. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-08747

PALEOHYDROLOGIC PHENOMENA RECORDED BY LAKE SEDIMENTS,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-08750

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va. Water Resources Div.
E. J. Pluhowski.
Meeting Preprint 2602 presented at the American Society of Civil Engineers National Convention, held in Denver, Colorado, November 3-7, 1975. 28 p, 13 fig, 6 ref.

Descriptors: *Turbidity currents, *Lake Ontario, *Remote sensing, *Satellites(Artificial), *Photography, Littoral drift, Sediments, Thermal stratification.
Identifiers: *LANDSAT images, *Turbidity plumes, Thermal bar.

Space imagery and high-altitude photography provide an effective method of monitoring the dynamics of turbidity plumes in Lake Ontario. The Niagara River plume, as much as 200 square miles (518 sq km) in area, is by far the largest turbidity feature in the lake. Plume analyses corroborate the presence of a prevailing eastward flowing longshore current along the entire south shore of the lake. This current is most persistent at the Oswego River outlet but is quite variable in the Rochester embayment, where rapid shifts in water movement were detected occasionally in LANDSAT images. The position of the spring thermal bar, a zone of maximum density water corresponding to the 4 deg C isotherm, was located near the Niagara River outlet in images obtained during April 1973. (Woodard-USGS)
W77-08752

A PNEUMATIC DOSING APPARATUS FOR FLOW-THROUGH BIOASSAYS,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-08763

A COMPARISON OF METHODS OF HYDROCARBON ANALYSIS OF MARINE BIOTA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5A.
W77-08789

AUXILIARY AIR SYSTEM FOR USE IN LABORATORY EXPERIMENTS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
E. F. Prentice, and K. X. Gores.
The Progressive Fish Culturist, Vol 39, No 2, p 61, April 1977. 1 fig.

Descriptors: *Aquiculture, Methodology, *Laboratory equipment, *Fish hatcheries, Fish farming, *Fish handling facilities, Water quality, *Aeration, Laboratories.
Identifiers: *Auxiliary air system, *Laboratory emergencies, Aquaculture marine station, Manchester, Washington, Scuba air system, *Power failure.

An emergency air system was developed to provide aeration to the laboratories holding facility in the event of a power failure. It is (1) a reliable emergency air supply for a small laboratory, (2) low cost, (3) total automation, (4) operability in areas where internal combustion engines are not practical. (Katz)
W77-08800

NEW SAMPLER FOR SHALLOW-WATER BENTHIC MACROINVERTEBRATES,
Heidelberg Coll. Tiffin, Ohio. River Studies Lab.
B. L. Prater, D. R. Barton, and J. H. Olive.
The Progressive Fish Culturist, Vol 39, No 2, p 57-58, April 1977. 1 fig, 16 ref.

Descriptors: On-site investigation, *Methodology, *Benthic fauna, Benthos, *Sampling, Monitoring, Invertebrates, Investigations, Animal populations, *Depth, Shallow water, Ohio.
Identifiers: *Sampler, Macroinvertebrates, *Benthic macroinvertebrates, *Shallow-water organisms, Quantitative samplers, *Scioto River basin(Ohio), Field equipment.

A sampler has been developed to quantitatively sample aquatic macroinvertebrates in shallow bodies of water. The construction allows an investigator to sample virtually any type of substrate except rock. (Katz)
W77-08801

CURRENT-METER RECORDINGS OF LOW-SPEED TURBIDITY CURRENTS,
Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div.
For primary bibliographic entry see Field 2L.
W77-08847

WAVE HEIGHT MEASURING DEVICE,
Texaco Inc., New York.
G. E. Mott, and R. L. Skaggs.
U.S. Patent No. 4,000,646, 4 p, 6 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 145, January 4, 1977.

Descriptors: *Patents, *Oceanography, *Waves(Water), Ocean waves, Measurement, Monitoring, Instruments.
Identifiers: *Wave height measurement, Wave period.

A wave measuring instrument is used on a dynamically positioned or tethered floating vessel to continuously monitor wave height, wave period and vertical heave of the vessel as the vessel responds to waves, swell and currents. The instrument comprises a measuring device connected to the vessel hull in a submerged position to continuously record the distance between the instrument and the ocean floor as the vessel heaves. A second measuring device automatically gauges and records the normally varying distance between the instrument and the water's surface, which distance results from the usual presence of wave action whether the latter be gradually rolling or relatively turbulent. The respective measurements thus obtained are thereafter integrated and compensated for to provide a relatively accurate record of the actual wave height between trough and crest, the wave period, and the vertical movement or heave of the vessel. (Sinha-OEIS)
W77-08897

HIGH SENSITIVITY FLOWMETER,
Office of the Secretary (Navy), Washington, D.C.
J. R. Olson.
U.S. Patent No. 4,000,648, 7 p, 12 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 146, January 4, 1977.

Descriptors: *Patents, *Oceanography, *Ocean currents, *Ocean circulation, Measurement, Instrumentation.
Identifiers: Sensors, Electromagnetic flowmeters.

This invention utilizes spaced electrodes which are located in an electromagnetic field generated by an elongated electromagnetic coil. This elongated coil by reducing the area within the coil provides a relatively strong field for the amount of the electrical current to excite the coil and the configuration has resulted in sufficient uniformity to provide satisfactory sensitivity such that oceanographic flowmeters may be included in oceanographic station-keeping buoys. Additionally, a method of coil winding and construction has permitted the sharing of mutually perpendicular sensors within a common electromagnetic field. This construction has resulted in an instrument sensor with improved sensitivity over known electromagnetic types and requires only a modest amount of electrical power for energization. (Sinha-OEIS)
W77-08898

TESTING OF A TECHNIQUE FOR REMOTELY MEASURING WATER SALINITY IN AN ESTUARINE ENVIRONMENT,
National Aeronautics and Space Administration, Bay Saint Louis, Mo. Earth Resources Lab.
For primary bibliographic entry see Field 2L.
W77-08903

COMPARISON OF REMOTELY SENSED CONTINENTAL-SHELF WAVE SPECTRA WITH SPECTRA COMPUTED BY USING A WAVE REFRACTION COMPUTER MODEL,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2L.
W77-08911

WAVE REFRACTION DIAGRAMS FOR THE BALTIMORE CANYON REGION OF THE MID-ATLANTIC CONTINENTAL SHELF COMPUTED BY USING THREE BOTTOM TOPOGRAPHY APPROXIMATION TECHNIQUES,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2L.
W77-08912

PROBLEMS OF OPTIMUM SOIL MOISTURE LEVEL: DETERMINATION AND CONTROL, (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 2G.
W77-08952

ESTIMATION OF WINDS OVER THE GREAT LAKES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 2H.
W77-09022

A REVIEW OF VELOCITY-MEASURING DEVICES,
Geological Survey, Reston, Va. Water Resources Div.
G. F. Smoot.
Open-file report, April 1974. 35 p, 11 fig.

Descriptors: *Current meters, *Discharge measurement, *Flow rates, *Stream gages, *Instrumentation, Evaluation, Reviews, Equipment, Rotating meters, *Velocity.
Identifiers: Drag body current meters, Optical current meter, Deep water isotopic current analyzer, Thermo-velocity meters, Eddy-shedding current meter, Acoustic velocity meter, Doppler-shift velocity meter, Electromagnetic current meters, Rotating-element current meters.

In hydrology the list of velocity-measuring devices is quite large and still growing. A complete discussion of all the various instruments that have been accepted for use over the years or that are

presently being developed to measure the velocity of water is not within the scope of this paper. However, this discussion should provide an understanding of the operating principles and the usefulness of the more important instruments or measuring systems which have already been accepted or which hold great promise. The velocity-measuring instruments discussed range from the relatively simple but quite important mechanical devices such as rotating element current meters and deflection vanes to the highly sophisticated electrical systems such as the electromagnetic and the ultrasonic flow meters. Optical, drag-body, thermo-velocity, eddy-shedding, and doppler-shift current meters, as well as the deep water isotopic current analyzer, are discussed also. The discussion focuses on the principle of operation of each measuring device; on the advantages and disadvantages of its use, either as a general field instrument or in special applications; and on any special problems that still need to be resolved before the potential usefulness of these devices can be fully exploited. (Woodard-USGS)
W77-09085

7C. Evaluation, Processing and Publication

DEVELOPMENT OF A HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
E. H. Wiser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 792, Price codes: A03 in paper copy, A01 in microfiche. Paper presented at 1975 Annual Meeting ASCE, University of Cal., Davis, June 22-25, 1975. 28 p, 1 fig, 6 ref. OWRT A-067-NC(2). 14-31-0001-5033.

Descriptors: *Computer programs, Data storage and retrieval, Climatic data, Storage, Streamflow, Rainfall, Temperature, Hydrologic data, *Information retrieval.
Identifiers: *HISARS, *Hydrologic Information Storage and Retrieval System.

Modellers often find that a substantial part of their time is taken up assembling data, storing it in a computer accessible form and retrieving it as required. Faced with these problems, a computer system for storage, retrieval, and processing of hydrologic, climatological, and related data has been developed at North Carolina State University. The system is known as HISARS (Hydrologic Information Storage and Retrieval System). System characteristics and capabilities are outlined. Data stored in the system include daily streamflow records, daily rainfall records, daily temperature records, hydrographic records of streamflow and rainfall, hourly rainfall records, daily evaporation and wind movement records, daily snowfall and snow depth records, daily event ('days with') records, annual flood peak records, dam characteristics, environmental resources, and water temperature records (evaporation pans). (See also W77-08610 and W75-03316) (Stewart-NC State)
W77-08609

HISARS - HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM - REFERENCE MANUAL,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
E. H. Wiser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 802, Price codes: A11 in paper copy, A01 in microfiche. Tech. Bulletin No 215, June 1975. 218 p, 40 fig, 4 append. OWRT A-067-NC(3). 14-31-0001-5033.

Descriptors: Computer programs, *Hydrologic data, Streamflow, Rainfall, Temperature, *Climatic data, *Data storage and retrieval, *Information retrieval.
Identifiers: *HISARS, *Hydrologic Information Storage and Retrieval System(Manual).

A computerized system for storage, retrieval and routine processing of hydrologic data has been developed at North Carolina State University. The system is known as HISARS (Hydrologic Information Storage and Retrieval System). HISARS has been under development for several years, the first version having been operative in July 1969. Although additional features of the system are planned, it is believed that the current version will be useful for a large number of potential users, and this manual is prepared with the intention of making the system more widely available. The system is running on the IBM System/370 Model 165 computer at the Triangle Universities Computation Center, and can be used at any of the remote terminals scattered around the state. Data are stored on magnetic disk packs. By making use of an operating system feature known as the indexed sequential access method together with direct access capabilities of the PL/1 language, HISARS can retrieve any one of approximately 600,000 records directly. This makes it possible to determine weather or streamflow characteristics at any location and at any time for which data are available. It is also possible to compare different locations at the same time and to process records through time at a single location. The following data are now stored by the system: (1) Daily streamflow records; (2) Daily rainfall records; (3) Daily temperature records; (4) Hydrographic records of streamflow and rainfall; (5) Hourly rainfall records; (6) Daily evaporation and wind movement records; (7) Daily snowfall and snow depth records; (8) Daily event ('days with' records; (9) Flood peak records; (10) Dam characteristics; (11) Environmental resources. (See also W77-08609 and W75-03316) (Stewart-NC State)
W77-08610

FLOOD PLAIN INFORMATION: ALBUQUERQUE ARROYAS, PART V, ALBUQUERQUE, NEW MEXICO.
Army Engineer District, Albuquerque, New Mex.
For primary bibliographic entry see Field 4A.
W77-08611

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER, FORT DODGE - WILROADS GARDENS, VICINITY OF DODGE CITY, KANSAS.
Army Engineer District, Albuquerque, New Mex.
For primary bibliographic entry see Field 4A.
W77-08612

SPECIAL FLOOD HAZARD INFORMATION REPORT: MISSOURI AND KANSAS RIVERS, KANSAS CITY, KANSAS.
Army Engineer District, Kansas City, Kans.
For primary bibliographic entry see Field 4A.
W77-08613

FLOOD PLAIN INFORMATION: OHIO RIVER, LAWRENCE COUNTY, OHIO.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W77-08614

FLOOD PLAIN INFORMATION: ASHUELOT RIVER, CITY OF KEENE, NEW HAMPSHIRE.
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-08615

SPECIAL FLOOD HAZARD REPORT: BUFFALO CREEK, MEADOW GROVE, NEBRASKA.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-08616

FLOOD PLAIN INFORMATION REPORT, INDI AN AND DRY CREEKS, LINN COUNTY, IOWA
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-08617

FLOOD HAZARD INFORMATION: YAMP RIVER AND TRIBUTARIES, STEAMBOA SPRINGS, COLORADO.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-08619

FLOOD PLAIN INFORMATION: LLAGA CREEK UNIT I, INCLUDING EDMUNDSO (LITTLE LLAGAS), CHURCH, SAN MARTIN NEW, CENTER, CORRALITOS, TENNANT MAPLE, AND FOOTHILL CREEKS, SANT CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W77-08620

PREDICTING PERFORMANCE OF PIPE CU VERTS BURIED IN SOIL,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 8B.
W77-08622

AN EVALUATION OF THE NATIONA EUTROPHICATION SURVEY DATA,
National Eutrophication Survey, Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-08710

MAKE MONEY BY COMPUTER,
For primary bibliographic entry see Field 5D.
W77-08730

ANNUAL SUMMARY OF GROUND-WATE CONDITIONS IN ARIZONA, SPRING 1975 T SPRING 1976,
Geological Survey, Tucson, Ariz. Wat Resources Div.
H. M. Babcock.
Water-Resources Investigations 77-10, (open-fi report), January 1977. 2 sheets, 20 ref.

Descriptors: *Groundwater resources, *Wat utilization, *Irrigation, *Water level fluctuation *Arizona, Pumping, Drawdown, Aquifers, Wat wells, Groundwater availability, *Maps, Evalu tion.

Two small-scale maps of Arizona show (1) pum age of ground water by areas and (2) the status the ground-water inventory in the State. A larg map of the State at a scale of 1:500,000 show potential well production, depth to water selected wells in spring 1976, and change in wat level in selected wells from 1971 to 1976. The bri text that accompanies the maps summarizes th current ground-water conditions in the State. Th withdrawal of ground water in Arizona was abo 5.6 million acre-feet in 1975, of which about 4 million acre-feet was used for the irrigation crops. The Salt River Valley and the lower San Cruz basin are the largest agricultural areas in th State. For 1971-75, ground-water withdrawal in th two areas was about 8.3 and 4.7 million acre-fee respectively, and, in general, water levels a declining. Other areas in which ground-wat withdrawals have caused large water-lev declines are the Willcox, San Simon, upper San Cruz, Avra Valley, Gila Bend, Harquahala Plain and McMullen Valley areas. (Woodard-USGS)
W77-08732

AVAILABILITY OF GROUND WATER IN THE MIDDLE MERRIMACK RIVER BASIN, CENTRAL AND SOUTHERN NEW HAMPSHIRE,
Geological Survey, Concord, N. H. Water Resources Div.
J. E. Cotton.
Water-Resources Investigations 76-39 (open-file report), 1976. 1 sheet, 3 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Aquifer characteristics, *Water quality, *New Hampshire, Water yield, Water supply, Geologic mapping, Hydrogeology, Planning, Water utilization, Land use, *Maps.
Identifiers: *Middle Merrimack River basin(NH).

Sufficient amounts of water to supply single family homes are available from the bedrock aquifer nearly everywhere in the middle Merrimack River basin in central and southern New Hampshire. Relatively thin and narrow, unconsolidated aquifers of sand or sand and gravel commonly capable of yielding more than 200 gallons per minute to properly located and constructed wells are found only in major stream valleys. The map provides a preliminary assessment of the availability of ground water in the basin, as determined by estimating the capability of the aquifers to store and transmit water. On the map, aquifers are rated as having high, medium, or low potential to yield water. Ground water in the middle Merrimack River basin is generally of good chemical quality. Most of it is clear and colorless, contains no suspended matter and practically no bacteria, water may be affected by land-use practices. Degradation of water quality may occur in unsewered residential and village areas, near solid-waste-disposal sites, agricultural land, and major highways. (Woodard-USGS)
W77-08733

RECORDS OF WELLS, WATER-LEVEL MEASUREMENTS, AND DRILLERS' LOGS, RED RIVER VALLEY, LOUISIANA,
Geological Survey, Little Rock, Ark. Water Resources Div.
J. W. Stephens.
Open-file report 76-759, October 1976. 335 p, 1 fig, 10 plates, 30 tab, 1 ref.

Descriptors: *Water wells, *Water levels, *Well data, *Drillers logs, *Louisiana, Aquifers, Basic data collections, Water utilization, *Data collections.
Identifiers: *Red River Valley(La).

This report is a compilation of hydrogeologic data collected through June 1975 as part of the Red River Waterways project in Louisiana. The study was made by the U.S. Geological Survey in cooperation with the U.S. Army Corps of Engineers, New Orleans District, and the U.S. Soil Conservation Service, Alexandria, La. Included are records of 332 wells and test holes, water levels in 324 wells, and drillers' logs of 316 wells and test holes. Most of the data were collected between July 1968 and June 1975. Well locations are shown. All altitudes given in the tables are referenced to mean sea level. (Woodard-USGS)
W77-08734

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1975.
Geological Survey, Tacoma, Wash. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 197, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report WA-75-1, August 1976. 684 p, 5 fig, 33 ref.

Descriptors: *Washington, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites.
Identifiers: Annual State report(Wash).

Water resources data for the 1975 water year for Washington, consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 250 gaging stations; stage only records for 3 gaging stations; stage and contents for 55 lakes and reservoirs; water quality for 124 stations, 27 lakes, and 35 wells; and water levels for 109 observation wells. Also included are 214 crest-stage partial-record stations. Additional water data were collected at various sites, bot part of the systematic data collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Washington. (Woodard-USGS)
W77-08737

WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1975.
Geological Survey, Helena, Mont. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 198, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report MT-75-1, August 1976. 604 p, 10 fig, 8 tab, 32 ref.

Descriptors: *Montana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites.
Identifiers: Annual State report(Mont).

Water resources data for the 1975 water year for Montana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 213 gaging stations; stage only records for 1 lake station; stage and contents for 9 lakes and reservoirs; water quality for 85 gaging stations, 4 lakes; water levels for 18 observation wells. Also included are 219 crest-stage partial-record stations and 53 smaller reservoirs. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Montana. (Woodard-USGS)
W77-08738

WATER-LEVEL CHANGES IN NORTHWESTERN KANSAS, 1950-76,
Geological Survey, Lawrence, Kans. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08742

SOME COMPUTATIONAL ASPECTS OF ONE- AND TWO-DIMENSIONAL UNSTEADY FLOW SIMULATION BY THE METHOD OF CHARACTERISTICS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08745

GROUND-WATER DATA FOR MICHIGAN, 1975,
Geological Survey, Lansing, Mich. Water Resources Div.
G. C. Huffman.
Michigan Geological Survey Department of Natural Resources, Lansing, 1976. 56 p, 25 fig, 2 tab, 112 ref.

Descriptors: *Groundwater resources, *Water level fluctuations, *Observation wells, *Pumping, *Michigan, Water quality, Water users, Aquifer characteristics, Water yield, Well data, Hydrographs.

This report summarizes data on ground-water levels in 172 observation wells in Michigan, and provides information on well locations, depths, elevations, and aquifers that they tap. Tabulated data include extremes of water levels for 1975 and for the period of record. Also tabulated is the pumpage of most major ground-water users in the State. During 1975, ground-water levels were generally above average in most areas of the State. The high levels are attributed to near or above precipitation for the fourth consecutive year. During the year water levels reached record highs in 22 wells and dropped to record lows in 6 wells. (Woodard-USGS)
W77-08753

INDIANA STREAM-TEMPERATURE CHARACTERISTICS,
Geological Survey, Indianapolis, Ind. Water Resources Div.
W. J. Shampine.
Available from the National Techical Information Service, Springfield, VA 22161 as PB-265 346, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-6, March 1977. 55 p, 6 fig, 7 tab, 23 ref.

Descriptors: *Water temperature, *Streams, *Indiana, *Computer programs, Forecasting, Methodology, Regression analysis, Fourier analysis, Statistical methods, Data processing, Thermal powerplants, *Data collections.
Identifiers: *Thermal studies, Wabash River(Ind), White River(Ind).

Periodic stream-temperature data collected at 280 different sites in Indiana by the U.S. Geological Survey and the Indiana State Board of Health were analyzed by a simple harmonic-curve-fitting procedure. Calculated harmonic coefficients were related to 23 topographic, basin, and climatic characteristics, and were analzyed by multiple-regression analysis techniques. The mean temperature of the White River at Indianapolis was raised 3.5 deg C above expected ambient levels caused by climatic conditions alone, primarily as a result of discharges from powerplants. In general, the harmonic coefficients depicting annual variability in stream temperatures generated from the Indiana State Board of Health data, collected every 2 weeks, are the same as coefficients generated from the U.S. Geological Survey data, collected every 4-6 weeks. (Woodard-USGS)
W77-08755

COMPILATION OF TEMPERATURE PREFERENCE DATA,
Oak Ridge National Lab., Tenn.
C. C. Coutant.
Journal of the Fisheries Research Board of Canada Vol. 34, p. 739-745, 1977. 1 tab., 75 ref.

Descriptors: *Data collections, Fresh water fish, Marine fish, Juvenile fish, *Fish physiology, *Fish behavior, *Thermal pollution, Water pollution effects, *Temperature, Ecological distribution, Habitats, Reviews, Laboratory tests, *Bibliographies.
Identifiers: *Temperature preference data, *Selection, *Preferendum, Avoidance preferences, Orientation.

This report briefly summarizes current information from field and laboratory studies on temperature selection by fishes, with a tabulation of final temperature preferenda and upper and lower

avoidance temperatures. Data are given on 124 species of marine and fresh water fish. Material presented in tabular form includes species, size or age of fish observed, upper avoidance temperature, final preferendum, lower avoidance temperature, geographical local and literature reference. (Katz)
W77-08767

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATION AREA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 6B.
W77-08805

OBSERVATION RECORDS OF GROUND WATER LEVEL, (IN JAPANESE),
Geological Survey of Japan, Kawasaki.
For primary bibliographic entry see Field 4B.
W77-08904

ANALYTICAL MODELS FOR THE EVALUATION OF SUPPLEMENTAL AERATION IN TEXAS ESTUARIES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08917

FINITE ELEMENT SOLUTION OF THE TWO-DIMENSIONAL UNSATURATED FLOW EQUATION,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 2G.
W77-08923

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, (PARTS I-III),
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-08940

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, PART IV, PROGRAM DOCUMENTATION,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-08941

PROTOTYPE SOFTWARE FOR ON-LINE STORAGE FORECASTING SUPPORTED BY LOAD FORECASTING AND REDUCED SYSTEM REPRESENTATION FOR WATER DISTRIBUTION SYSTEMS,
Systems Control, Inc. Palo Alto, Calif.
D. Bree, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 556, Price codes: T06 mag tape. March 1977, mag tape DOI/DF-77/006. Source tape is in EBCDIC character set. Tape(s) can be prepared in most standard 7 or 9 track recording modes for one-half inch tape.

Descriptors: *Water distribution(Applied), Operations, Computer models, Water demand, Forecasting, Estimating, Water control, Documentation, Methodology, *Computer programs.
Identifiers: *Software, Computer tapes, Punched cards.

Ten computer programs have been used in research in Water System Hourly Demand Forecasting (system wide or by pressure zone), Reduced Representation of Pressure Zone Networks, and on line Storage Forecasting. The programs are prototype FORTRAN code for algorithms that a water utility might desire to implement on an advanced distribution control system. The programs will be usable as they are in an off-line study mode, but will require extensive adaptaton to the individual utility's system and control computer, perhaps including rewriting in another language. The program is written in the FORTRAN programming language for implementation on a UNIVAC 1106/1108 computer using the Exec 8 level operating system. 200K bytes of core storage are required to operate the model. (See also W77-08940 and W77-08941).
W77-08942

WATSIM - A FORTRAN PROGRAM FOR 24 HOUR SIMULATION OF FLOWS AND RESERVOIR FLUCTUATIONS IN WATER DISTRIBUTION NETWORKS,
Systems Control, Inc., Palo Alto, Calif.
D. Bree, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 555, Price codes: T05 in Mag tape. March 1977, mag tape DOI/DF-77/007. Source tape is in EBCDIC character set. Tape(s) can be prepared in most standard 7 or 9 track recording modes for one-half inch tape.

Descriptors: *Simulation analysis, *Water distribution(Applied), *Control systems, *Computer programs, *Networks, Model studies, California, *Reservoir operation, Design data, Storage, Municipal water, Pipes, Valves, *Distribution systems.
Identifiers: *Extended period simulation, *Software, San Jose(Calif), Computer tapes, Punched cards.

The WATSIM program simulates the flow of water in water distribution networks consisting of pipes, pumps, pressure reducing valves, one-way valves, reservoirs, storage tanks, and fluctuating loads. It can be used either to solve for instantaneous flow rates in a network, or to simulate the operation of such a network over an extended period (24 plus hours). This simulation includes changes in reservoir or storage tank levels driven by fluctuating demand, and the operation of time or pressure actuated valves. The program is capable of simulating up to a 500 node, 750 line network in its present version, and can be expanded by redimensioning directly proportional to network size. The program is written in the FORTRAN programming language for implementation on a UNIVAC 1106/1108 computer using the Exec 8 level operating system. 200K bytes of core storage are required to operate the model. (See also W74-05533).
W77-08943

URBAN STORMWATER POLLUTANT LOADINGS: A STATISTICAL SUMMARY THROUGH 1972,
URS Co., San Mateo, Calif.
For primary bibliographic entry see Field 5B.
W77-09046

NONLINEAR ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5B.
W77-09047

OPTIMAL ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan, Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5B.
W77-09052

LIMNOLOGICAL INVESTIGATION OF SI LAKES IN SOUTHEAST ALASKA,
Geological Survey, Anchorage, Alaska. Wate Resources Div.; and Alaska Dept. of Fish an Game, Anchorage.
G. A. McCoy, W. W. Wiggins, and A. E. Schmidt. Water-Resources Investigations 76-122, 1976. sheet, 11 ref.

Descriptors: *Limnology, *Alaska, *Lakes *Water quality, *Lake morphometry, Lak morphology, Chemical analysis, Water chemistry Geology, Water temperature, Mixing, Chemica properties, Physical properties, Thermal stratifica tion, Chemical stratification, Nutrients, *Maps.
Identifiers: *Southeast Alaska, Redoubt Lake Blue Lake, Green Lake, Spurt Point Lake, Swa Lake, Osprey Lake.

Limnological data were collected from six lakes i southeast Alaska in 1974. The data include concen trations of major inorganic constituents, nutrients selected trace metals, total organic carbon, an chlorophyll. Vertical profiles of specific con ductance, temperature, dissolved-oxygen satura tion, and pH were drawn. With the exception o Redoubt Lake, all of the lakes are very simila chemically. The small differences in chemica composition probably reflect variations in geolog of the drainage basins, altitudes, and morphomet ric characteristics of the lakes. Productivity is s low in all the lakes that it was not possible to ran the lakes by relative productivity from the recon naissance sampling. Redoubt Lake is meromictic but the others are probably holomictic and dimic tic. (Woodard-USGS)
W77-09069

HYDROLOGIC RECONNAISSANCE OF TH GEOTHERMAL AREA NEAR KLAMATI FALLS, OREGON, WITH A SECTION O PRELIMINARY INTERPRETATION O GEOPHYSICAL DATA,
Geological Survey, Menlo Park, Calif. Wate Resources Div.
For primary bibliographic entry see Field 4B.
W77-09070

FLOOD-PLAIN DELINEATION FOR DI FICULT RUN BASIN, FAIRFAX COUNTY, VI GINIA,
Geological Survey, Reston, Va. Water Resource Div.
For primary bibliographic entry see Field 4C.
W77-09071

REPORT ON PRELIMINARY DATA FO MADISON LIMESTONE TEST WELL NO. NE1/4SE1/4 SEC. 15, T. 57 N., R. 65 W., CROO COUNTY, WYOMING,
Geological Survey, Lakewood, Colo. Wate Resources Div.
For primary bibliographic entry see Field 4B.
W77-09072

GEOLOGIC DATA FROM TEST DRILLING I PALM BEACH COUNTY, FLORIDA SINC 1970,
Geological Survey, Tallahassee, Fla. Wate Resources Div.
J. J. Schneider.
Open-file report 76-713, August 1976. 99 p, 3 fig, tab, 2 ref.

Descriptors: *Test wells, *Borehole geophysics *Groundwater resources, *Lithologic logs *Hydrogeology, *Florida, Aquifer characteristics Planning, Land use, Urbanization.
Identifiers: *Palm Beach County(Fla).

Test hole data, in Palm Beach County, Florida, in clude lithologic logs from 66 test wells and geophysical logs from 54 test wells. The purpose of the study is to provide the geohydrologic infor

nation needed for water management and land use ecisions, with emphasis on the urbanized eastern art of the county and the readily developable area n the central part. (Woodard-USGS)
W77-09073

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1975.
Geological Survey, Jackson, Miss. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 659, Price codes: A23 in paper copy, A01 in microfiche. Water-Data Report MS-75-1, May 1976. 528 p, 4 fig, 3 tab, 10 ref.

Descriptors: Mississippi, *Hydrologic data, Surface waters, *Groundwater, *Water quality, Water resources, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.

Water resources data for the 1975 water year for Mississippi consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels of wells. This report contains discharge records for 78 gaging stations; stage records for 15 of these gaging stations; stage only records for 4 gaging stations; contents for 4 lakes and reservoirs; water quality for 13 gaging stations and 72 miscelaneous sites; and water levels for 47 observation wells. Also included are data for 136 crest-stage partial-record stations and stage records for 5 discharge stations for the period October 1971 to September 1974 and for 4 stage-only stations for the period January 1972 to September 1974 and for 1 stage-only collected at various, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U. S. Geological Survey and cooperating state and Federal agencies in Mississippi. (Woodard-USGS)
W77-09074

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1975.
Geological Survey, Bismarck, N. Dak. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 277, Price codes: A19 in paper copy, A01 in microfiche. Water-Data Report ND-75-1, September 1976. 431 p, 3 fig, 2 plates, 4 tab, 32 ref.

Descriptors: *North Dakota, *Hydrologic data, Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites.
Identifiers: Annual State report(ND).

Water resources data for the 1975 water year for North Dakota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water quality in wells. This report contains discharge records for 146 gaging stations; stage for 13 lakes and reservoirs; water quality for 13 gaging stations, 10 partial-record flow stations, 11 lakes, and 25 wells. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in North Dakota. (Woodard-USGS)
W77-09075

WATER-RESOURCES INVESTIGATIONS IN KENTUCKY, 1976.
Geological Survey, Louisville, Ky. Water Resources Div.
Available from U.S. Geological Survey, Reston, VA 22092. 1976. 1 sheet.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, *Kentucky, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Runoff, Groundwater, Water quality, Flood plains, Precipitation(Atmospheric), On-site investigations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program.

Water-resources studies and investigations made in Kentucky during 1976 by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of surface-water stations, groundwater observation wells, and water quality observation sites. Small State maps give a broad picture of variations in some of the hydrologic characteristics pertaining to Kentucky's water resources. A larger map shows the hydrologic data network and investigations in the State. (Woodard-USGS)
W77-09078

WATER-RESOURCES INVESTIGATIONS IN WISCONSIN, 1976.
Geological Survey, Madison, Wis. Water Resources Div.
Available from U.S. Geological Survey, Reston, VA 22092. 1976. 1 sheet.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, Wisconsin, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Runoff, Groundwater, Water yield, Water quality, On-site investigations, Dissolved solids, Precipitation(Atmospheric), Sediment transport, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program.

Water-resources studies and investigations made in Wisconsin during 1976 by the U. S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include colections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data consists of surface-water stations; groundwater observation wells, and water quality observation sites. Small State maps show principal sources of groundwater mean annual precipitation, suspended-sediment yield, average annual runoff, discharge of the principal rivers, and dissolved solids in ground and surface waters. A larger map shows the hydrologic data network and investigations in the state. (Woodard-USGS)
W77-09079

GROUND-WATER RESOURCES AND GEOLOGY OF WALWORTH COUNTY, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-09081

GROUND-WATER HYDROLOGY OF BERKELEY COUNTY, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09083

ANALYSES OF NATIVE WATER, BED MATERIAL, AND ELUTRIATE SAMPLES OF MAJOR LOUISIANA WATER WATERWAYS, 1975,
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-09084

WATER-LEVEL RECORDS FOR THE SAN LUIS VALLEY OF COLORADO, 1973-77,
Geological survey, Lakewood, Colo. Water Resources Div.
R. D. Penley.
Open-file report 77-265, March 1977. 12 p, 2 fig, 1 tab.

Descriptors: *Groundwater resources, *Water wells, *Water levels, *Aquifers, *Water level fluctuations, Basic data collections, Planning, Irrigation, *Colorado.
Identifiers: *San Luis Valley(Colo).

Water-level measurements were made in 122 wells in San Luis Valley, Colo., during January 1977. Changes in water levels from January 1976 to January 1977 ranged from a rise of 10.0 feet (3.0 meters) to a decline of 8.6 feet (2.6 meters) both of which occurred in Costilla County. Measurements for the three preceeding winters are included to illustrate longer term water-levels changes. These data can be used by well owners for planting their irrigation schedules for the next irrigation season and can be used by water managers for developing plans to manage the ground-water resources. (Woodard-USGS)
W77-09088

COMPUTER APPLICATIONS FOR STEP-BACKWATER AND FLOODWAY ANALYSES,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-09090

8. ENGINEERING WORKS

8A. Structures

RESEARCH BENEFITS IN WATER RESOURCES CONSTRUCTION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 6B.
W77-08858

8B. Hydraulics

PREDICTING PERFORMANCE OF PIPE CULVERTS BURIED IN SOIL,
Purdue Univ., Lafayette, Ind.
M. B. Roy.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 77-1768. PhD Thesis, 1976. 238 p.

Descriptors: *Analytical techniques, *Performance, *Piping, *Culverts, Soil physical properties, Model studies, Construction materials, Soil types, Computer models, Loads(Forces), Computer programs, Simulation analysis.

A simulation model based on the finite element method was developed to analyze the performance of culverts buried in soils. A computer program included curved bar segments with normal, tangential, and rotational degrees of freedom; triangular, isoparametric elements with a curved boundary to fit the pipe shape; three midside nodes which represented soil; and an 'interaction' element to simulate interface between pipe and soil. Nonlinear, anisotropic soil properties were included.

Construction sequences can be simulated and 'no-tension' analysis can be included. The system can be applied to questions of the influence of non-linear soil properties, relative stiffness of pipe and soil, the use of weak materials near the spring line, and construction procedures. Time-dependent soil properties, temporary soil compaction loads, and pipe cracking or yielding were not considered. Only two-dimensional problems transverse to the pipe can be analyzed. The analysis of circular corrugated metal pipe in granular soil showed that the maximum circumferential thrust in pipe depends, primarily, on the pipe diameter and height of the fill, and that it is necessary to determine the non-linear soil properties' effects on culvert performance. Neither construction sequence nor slip at soil-pipe interface were significant when the fill was loaded symmetrically. It was also found that Marston-Spangler soil modulus E' could not be used as a soil parameter for rational predictions of culvert performance. (Collins-FIRL)
W77-08622

THE EFFECT OF SURCHARGING ON DISCHARGE THROUGH A PIPE,
Hydraulics Research Station, Wallingford (England).
P. J. Colyer.
Chartered Municipal Engineer, Vol. 104, No. 4, p 60-62, April, 1977. 3 fig, 4 ref.

Descriptors: *Pipelines, *Flow, *Analytical techniques, Hydraulic models, Hydraulic structures, Performance, Evaluation, Hydraulic engineering, *Drainage, *Hydraulic design, *Storm drains.

A simple method was presented to determine the ratio of pipe discharge under surcharge and pipe-full discharge unaffected by surcharge. This information is useful for the design of drainage systems. Other applications include: determining whether an inadequate pipe should be replaced; assessing drainage system performance under rainfalls higher than design capacity; taking advantage of higher discharge capacities under surcharge in situations with difficult constructional constraints; calculating the effect on capacity of varying tailwater levels; and evaluating the comparative costs of designing for surcharged or non-surcharged conditions. The Darcy equation for flow in pipes was used as the basis of this analysis. The critical factor in increases or decreases of discharge through a surcharged pipe was the ratio of the hydraulic gradient to the pipe slope. (Collins-FIRL)
W77-08644

CEMENT-MUD SPACER SYSTEM IMPROVES ILLINOIS WELLS,
Dow Chemical Co., Los Angeles, Calif. Dowell Div.
For primary bibliographic entry see Field 8F.
W77-08647

GEOTHERMAL ENERGY DEVELOPMENT,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 4B.
W77-08661

AVOIDING THE PERILS OF CAVITATION,
Buffalo Forge Co., N.Y.
For primary bibliographic entry see Field 8C.
W77-08674

TRAP-EFFICIENCY INVESTIGATION BERNALILLO FLOODWATER RETARDING RESERVOIR NO. 1 (PIEDRA LISA ARROYO) NEAR BERNALILLO, NEW MEXICO, WATER YEARS 1956-1974,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 4D.
W77-08741

SURFACE PARTICLE ORBITS IN UNIFORM WAVES,
Liverpool Univ. (England). Dept. of Civil Engineering.
J. R. Chaplin.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW2, Proceedings Paper 12915, p 205-213, May 1977. 5 fig, 7 ref, 2 append.

Descriptors: *Coastal engineering, *Waves(Water), *Model studies, Numerical analysis, Ocean waves, Mathematical models, Wavelength, Hydraulics, Oceans, Velocity, Measurement, Profiles, Gravity waves.
Identifiers: *Velocity measurement, Particle orbits, Surface mass transport.

A numerical method was developed for calculating free-surface particle velocities in steady-state gravity waves of known profile. The method generates a unique solution for the orbit of a particle in the free surface, such that the motion of the particle is compatible with the observed wave profile, wavelength, and surface mass transport velocity and satisfies the dynamic free-surface boundary condition. Velocities of all free-surface particles may be derived from the geometry of the orbit. Velocities computed from the profile of a wave generated in the laboratory were shown to be compatible with simultaneous subsurface velocity measurements by the Laser Doppler Anemometer. The method was proved valuable in calculating impact velocities in wave slamming experiments. In view of the scatter apparent in almost all experimental evaluations of wave force coefficients, it was suggested that the method be applied to check the validity at the free surface of wave theories used in deriving coefficients from measured forces. (Lee-ISWS)
W77-08845

PRESSURE REDUCING VALVES IN PIPE NETWORK ANALYSES,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
R. W. Jeppson, and A. L. Davis.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 102, No HY7, Proceedings paper No. 12252, p 987-1001, July 1976. 5 fig, 4 tab, 12 ref.

Descriptors: *Water distribution(Applied), *Pipes, *Networks, *Computers, *Valves, Hydraulics, Municipal water, Downstream, Equations, Pumping, Reservoirs, Steady flow.
Identifiers: *Pressure reduction, *Waterworks, Municipal engineering, Jacobian matrix, Banding algorithm, Water flow.

The three separate systems of equations that are in common use in solving steady flow problems in pipe networks are described and the method for including pressure reducing valves in each of these systems is given. The emphasis is on use of efficient computer oriented methods. In the method presented, the pressure reducing valves are permitted to operate normally in maintaining a constant downstream pressure, or they are permitted to act as check valves, preventing reverse flow should downstream pressures exceed valve settings. The inclusion of pressure reducing valves as an integral part of the network of pipes, pumps, reservoirs, and minor loss devices causes no appreciable reduction in the performance of computer programs that have been specifically written to carry out the computations for solutions. (Bell-Cornell)
W77-08855

LOAD TRANSFER AND HYDRAULIC FRACTURING IN ZONED DAMS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
F. H. Kulawy, and T. M. Gurtowski.
In: Journal of the Geotechnical Engineering Div sion, Proceedings of the American Society of Civ Engineers, Vol 102, No GT9, Proceedings pap 12400, p 963-974, September 1976. 6 fig, 5 tab, ref.

Descriptors: *Dams, *Embankment *Fractures(Geologic), Stability, Reservoirs, U stream, Analytical techniques, Hydraulics.
Identifiers: *Load transfer, *Zoned emban ments, *Fracturing, Mathematical applicatio Cracking, Poisson's ratio.

Incremental, nonlinear finite element analys were conducted for 14 representative zoned dar of differing geometries and material properties assess the load transfer and potential for cracki by hydraulic fracturing and local overstress. T results of these analyses showed that significa load transfer was observed in all cases; the lo transfer was from the core onto the transitions a shells over most of the height, but it was onto t core near the crest. Tis may be a possib mechanism for longitudinal core cracking in t crest. All other factors being equal, the dar which would exhibit the least transverse cracki potential would have flatter side slopes, would e hibit the least transverse cracking potential wou have have flatter side slopes, thicker cores, slo ing cores, medium dense shells and cores co pacted drier than optimum. The effect of var tions in the transitions properties and thicknesse dam height and core slope in sloping core dar was found to be small with regard to cracki potential. (Bell-Cornell)
W77-08857

SEISMIC DESIGN OF LIQUID-STORAG TANKS,
Connecticut Univ., Storrs. Dept. of Civil E gineering.
For primary bibliographic entry see Field 8D.
W77-08859

SINKAGE AND RESISTANCE FOR SHIPS CHANNELS,
Kansas Univ., Lawrence. Dept. of Civil Enginee ing.
J. S. McNown.
Journal of the Waterways, Harbors, and Coast Engineering Division, Proceedings of the Am ican Society of Civil Engineers, Vol 102, N WW3, Proceedings paper No 12291, p 287-30 August 1976. 7 fig, 19 ref. OWRT A-071-KAN(2)

Descriptors: *Channels, *Barges, *Ships, R sistance, Waterways, Measurement, Equation Canals, Harbors.
Identifiers: *Sinkage, Trapezoidal channe Parabolic channels.

Ships moving in restricted water, as in a canal an inlet to a harbor, sink lower in the water and e perience greater resistance than they do in op water. The ship settles more because the velociti induced in the water by the motion of the ship a greater and the elevation of the water surfa drops correspondingly. The amount of sinkage d pends upon the cross sections of the ship and t channel. The resistance also increases because the constriction of the return flow around the shi Two remarkably good approximations are: (1) t sinkage is the change in potential energy requir to produce the kinetic energy of the return flo and (2) the extra power is that needed to pump t amount of water in the return flow from the low level back to the original level of the quiet water. is concluded that remarkably good predictions the increment of power required for barges mo ing in channels can be made from simple theore cal results. (Bell-Cornell)
W77-08873

MEANS AND METHOD FOR CONTROLLIN BEACH AND SANDBAR EROSION,
C. T. Ziegler.

U.S. Patent No. 4,000,619, 4 p, 8 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 137, January 4, 1977.

Descriptors: *Patents, *Beaches, *Erosion, *Beach erosion, *Shore protection, Waves(Water), Engineering structures.

The invention provides a means and method wherein a series of porous bags are caused by wave action to fill with sand and collect on the bottom underlying the wave action with the result that the sand is immobilized and a region is established against which additional sand is collected to form a groin-like deposit. The porous bags are open at one end sufficiently to receive sand and are tied at close intervals to a feeder line, one end of which is anchored in the wave area and the other end of which extends to the shore area. The wave action is utilized to draw the bags progressively from the shore area into the wave area and effect a build-up of the deposited bags. By placement of a number of multiple bag and feeder line units, effective erosion control over a side area may be accomplished. (Sinha-OEIS)
W77-08894

REMOTE SEALING OF MINE PASSAGES CONTAINING FLOWING WATER,
Department of the Interior, Washington, D.C. Office of the Secretary.
For primary bibliographic entry see Field 5G.
W77-08896

WATSIM - A FORTRAN PROGRAM FOR 24 HOUR SIMULATION OF FLOWS AND RESERVOIR FLUCTUATIONS IN WATER DISTRIBUTION NETWORKS,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 7C.
W77-08943

NUMERICAL SOLUTION FOR FLOW UNDER SLUICE GATES,
Queensland Univ., Brisbane (Australia). Dept. of Civil Engineering.
L. T. Isaacs.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings Paper 12923, p 473-481, May 1977. 4 fig, 1 tab, 14 ref, 3 append.

Descriptors: *Sluice gates, *Finite element analysis, *Analytical techniques, *Hydraulics, *Boundaries(Surfaces), Methodology, Flow, Radial gates, Numerical analysis, Gravity, Energy equation.
Identifiers: *Cubic curved triangular elements, Gauss-Seidel iteration.

A numerical method, based on finite element techniques, was developed for the analysis of gravity-affected flow under a sluice gate of arbitrary geometry. The analysis started with assumed free surface profile and two-dimensional discharge, which were modified systematically to give the final result. A curved cubic triangular element which gives a good representation of the boundary geometry and velocity field was employed. The results obtained for a vertical and a radial sluice gate compared favorably with results obtained by analytical methods. However, there are differences between experimental and theoretical (N numerical results, mostly attributed to the existence of a boundary layer. (Singh-ISWS)
W77-09012

MEAN BEHAVIOR OF BUOYANT JETS IN A CROSSFLOW
California Inst. of Tech. Pasadena.
G. J. Wright.
Journal of the Hydraulics Divisision, American Society of Civil Engineers, Vol 103, No HY5, Proceedings Paper 12944, p 499-513, May 1977. 10 fig, 2 tab, 11 ref, 1 append.

Descriptors: *Buoyancy, *Waste dilution, *Jets, *Dispersion, *Hydraulics, Flow, Dimensional analysis, Model studies, Froude number, Laboratory tests.
Identifiers: *Plumes, Trajectories, Buoyant jets, *Crossflow.

A model of round buoyant jets discharged normal to an ambient crossflow was presented. The time average behavior of the complex flow was derived by making analogies with simples flows whose behavior is better understood. The jet behavior was analyzed by considering it to be a source of kinematic momentum and buoyancy flux. The model considered four different flow regimes involving different trajectory and dilution relations. Assumptions for the entrainment of ambient fluid were not required. The predictions of the proposed model were compared to results presented by other researchers. Experiments were performed to verify the model for each flow regime. the experimental results were in agreement with the model predictions. (Singh-ISWS)
W77-09013

PRINCIPLES OF GRAPHICAL GRADUALLY VARIED FLOW MODEL,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-09015

SHORT JET IMPINGEMENT,
Southern Illinois Univ., Carbondale. Dept. of Engineering, Mechanics and Materials.
T. Davanipour, and S. Sami.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings Paper 12948, p 557-567, May 1977. 16 fig, 13 ref, 1 append.

Descriptors: *Jets, *Turbulence, *Flow, Turbulent flow, Water pressure, Fluid mechanics, Shear stress, Velocity, Hydraulics, Equations, Mathematical studies.
Identifiers: *Jet flow, Impingement, Water speed, Round turbulent jet, Turbulent intensity, Water shear stress.

The characteristics of the velocity and pressure fields of a round turbulent jet impinging onto a plate were studied. Previous studies covered impingement heights that placed the plate in the fully developed flow region of the jet. The present study covered impingement heights between 0 and 20 nozzle radii. Axial and radial variations of velocity and static pressure were determined. Turbulence intensities along the center line within the impingement zone were presented. The energy balance of the mean flow was achieved pointwise along the jet axis within the impingement zone for two different impingement heights (Lee-ISWS)
W77-09016

DRAG AND INERTIA FORCES ON A CYLINDER IN PERIODIC FLOW,
Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
C. J. Garrison, J. B. Field, and M. D. May.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW2, Proceedings Paper No. 12913, p 193-204, May 1977. 6 fig, 6 ref, 2 append.

Descriptors: *Drag, *Hydrodynamics, *Reynolds number, *Laboratory tests, Hydraulic models, Piles(Foundations), Offshore Platforms, Analysis, Equations, Mathematical studies.
Identifiers: *Inertia, *Added mass coefficients, Forces, Amplitude, Displacement, Cylinder drag.

Experimental results for the drag and added mass coefficients for a smooth circular cylinder in oscillatory flow were presented. The test results were correlated with the Reynolds number with the ratio of the amplitude of the motion to cylinder diameter as a parameter. The low Reynolds number results of Keulegan and Carpenter were replotted in the same format, and together with the present high Reynolds number, results give a fairly complete picture of the variation of the drag and added mass coefficients with Reynolds number for fixed values of the relative amplitude parameter. The results showed that generally both the added mass and drag coefficients are highly dependent on the Reynolds number as well as the relative amplitude parameter. Above as Reynolds number of about 20,000, the two coefficients become essentially independent of the Reynolds number. (Adams-ISWS)
W77-09017

ADDED MASS OF PILE GROUP,
Delaware Univ., Newark, Dept. of Civil Engineering.
R. J. Gibson, and H. Wang.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW2, Proceedings Paper 12932, p 215-223, May 1977. 10 fig, 3 ref, 2 append.

Descriptors: *Laboratory tests, *Hydrodynamics, *Piles(Foundations), Drag, Coastal structures, Hydraulic models, Structural design, Model studies, Equations, Mathematical studies.
Identifiers: *Pile groups, *Inertia, *Pile spacing, Forces, Wake interference, Blockage, Solidification.

Through laboratory investigation, its was shown that when a pile group is arranged in a cluster, the added mass (or inertial force) increases sharply after the spacing between piles falls below a certain critical value. Two configurations of pile group arrangement-circular and square shapes of approximately the same base diameter-were tested. The experimental results revealed that when the spacing between piles is smaller than two times the pile diameter, or when the solidification ratio becomes larger than 0.5, the added mass of the pile group increases drastically. For pile groups with individual pile spacing less than the critical value, the volume enclosed, rather than the volume displaced, by the pile cluster should be used as bases for added mass computation. (Adams-ISWS)
W77-09018

BEACH SAND TRANSPORT: DISTRIBUTION AND TOTAL DRIFT,
Oregon State Univ., Corvallis. Estuarine and Coastal Research Program.
For primary bibliographic entry see Field 2L.
W77-09019

EFFECT OF SEDIMENT LOAD ON STABLE SAND CANAL DIMENSIONS,
Roorkee Univ. (India), Dept. of Civil Engineering.
K. G. R. Raju, K. R. Dhandapani, and D. M. Kondap.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 103, No WW2, Proceedings Paper 12931, p 241-249, May 1977. 4 fig, 2 tab, 6 ref, 2 append.

Descriptors: *Bed load, *Canals, *Sediment load, Cross-sections, Dimensions, Sediments, Sedimentation rates, Stability, Hydraulics, Foreign countries, Foreign research.
Identifiers: *Sediment concentration, *India, Sediment deposits.

An experimental study was done with the object of providing a clear picture of the effect of sediment load on the dimensions of stable canals. The experiments were carried out in a recirculating sand tray at a constant discharge using sand of median size of 0.27 mm. Variation in sediment load was achieved by suitable changes in the initial cross section and slope given to the channel; the

equilibrium sediment concentration could thus be varied from 150 ppm to 2500 ppm by weight. It was found that the final stable cross sectional dimensions of the channel were practically insensitive to sediment concentration, whereas the final slope was strongly dependent on it. It was concluded that relations for cross-sectional dimensions of a stable canal may be evolved ignoring the effect of sediment concentration, but the regime slope ought to be related to the sediment concentration apart from the discharge and sediment size. (Lee-ISWS)
W77-09020

ESTIMATING WAVE GENERATION ON RESTRICTED FETCHES,
California State Dept. of Navigation and Ocean Development, Sacramento; and Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-09021

THEORETICAL AND EXPERIMENTAL STUDY OF FLOW SEPARATION AFTER A SUDDEN INCREASE IN THE CROSS-SECTION OF A CIRCULAR PIPE (ETUDE THEORIQUE ET EXPERIMENTALE D' UN ECOULEMENT DECOLLE EN AVAL D'UN ELARGISSEMENT BRUSQUE DE REVOLUTION),
Centre National de la Recherche Scientifique, Toulouse (France). Institut de Mecanique des Fluides.
H. M. Hieu, and P. Hebrand.
Journal of Hydraulic Research, Vol. 15, No. 1, p 1-18, 1977. 14 fig, 16 ref.

Descriptors: *Flow separation, *Theoretical analysis, *Laboratory tests, *Hydraulics, Mathematical studies, Flow, Fluid mechanics, Closed conduit flow, Pipe flow, Flow characteristics, Velocity, Distribution, Measurement, Turbulent flow, Flow resistance, Turbulence, Pressure, Energy transfer.
Identifiers: Velocity profiles.

Methods were developed for calculation of mean velocity and pressure and mean turbulent kinetic energy, Reynolds tension, dissipation, etc., in turbulent incompressible flow after separation at a sudden increase in the cross section of a circular duct. One method, based on the concept of effective turbulent viscosity and elliptical equations (because of the recirculation taking place), allowed prediction of flow conditions from the point of separation to that a long way downstream at which normal flow is restored. Another method is associated more especially with the area in which normal flow is restored after readhesion; as the governing equations in this zone are parabolic, it was possible to apply models containing Reynolds stress transport equations without the turbulent viscosity concept. The overall calculated data were compared with experimental results determined on an aerodynamics model used to study the effect of the initial boundary layer, Reynolds number, and the cross-sectional expansion factor. Turbulent kinetic energy and friction transfer mechanisms were described in terms of the results of the comparison between theoretical and experimental data. (Humphreys-ISWS)
W77-09034

RESISTANCE OF TWO DIMENSIONAL TRIANGULAR ROUGHNESS,
Roorkee Univ. (India). Dept. of Civil Engineering.
N. Vittal, K. G. Ranga Raju, and R. J. Garde.
Journal of Hydraulic Research, Vol. 15, No. 1, p 19-36, 1977. 11 fig, 1 tab, 18 ref.

Descriptors: Hydraulics, *Flow resistance, *Shear, *Flumes, *Dunes, Boundaries(Surfaces), Laboratory tests, Calibrations, Data collections, Reynolds number, Dimensional analysis.
Identifiers: *Triangular roughness, *Form drag, Ripples and dunes, Undulating bed.

Measurements of shear and pressure distributions on smooth and sand coated two-dimensional triangular elements, simulating ripples and dunes, were made in a laboratory tilting flume. Relations were drived for the local and average skin shear coefficients in terms of the geometry of the elements and the Reynolds number of flow. The local pressure coefficient and the form drag coefficient were related to the roughness and the geometry of the elements. Analysis of the available data showed that the grain resistance of undulated beds calculated by the presently available methods was generally greater than the measured average grain resistance of the bed. An analysis of the available alluvial channel data indicated that the observed form drag agreed with the form drag of the two-dimensional triangular roughness. (Singh-ISWS)
W77-09035

A MATHEMATICAL MODEL OF STEADY FLOW IN CURVED SHALLOW CHANNELS,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
H. J. De Vriend.
Journal of Hydraulic Research, Vol. 15, No. 1, p 37-54, 1977.

Descriptors: Hydraulics, *Model studies, *Laboratory tests, *Velocity, *Turbulence, Eddies, Analytical techniques, Interfaces, Mathematics, Shear, *Mathematical models.
Identifiers: *Eddy viscosity, *Curved flow, Perturbation method, Flow distribution.

Starting from a logarithmic main velocity profile, the vertical distribution of the secondary flow in a shallow curved channel was derived. the secondary circulation turned out to have one vertical and two horizontal components. The horizontal component in the main flow direction arises from the longitudinal acceleration of the main flow; the transverse horizontal component is due to the curvature of the main flow. A numerical method for the computation of the depth-averaged flow field and the bed shear stress was developed. The model allows flexibility in channel geometry. The vertical distributions of velocity computed from the model agree satisfactorily with the experimental results of other investigations if the flume or channel bed is not flat. (Singh-ISWS)
W77-09036

THE THIRD LONDON AIRPORT STUDY,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 2L.
W77-09037

ROUGHNESS EFFECTS ON THE FLOW DIRECTION NEAR CURVED STREAM BEDS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
C. Zimmermann.
Journal of Hydraulic Research, Vol. 15, No. 1, p 73-85, 1977. 6 fig, 4 tab, 17 ref.

Descriptors: *Shear stress, *Channel flow, *Roughness(Hydraulics), Sediment transport, Roughness coefficient, Alluvial channels, Hydraulics, Equations, Mathematical studies.
Identifiers: *Curved stream beds, Radial shear stress, Channel beds, Bed roughness, Circular channels.

Radial shear stresses on the surface of curved channel beds due to secondary flow increase with increasing bed roughness and affect the direction of flow of sediment particle motion over a channel bed. By means of an analysis, it was shown that flow direction approaches the tangential direction of the flow with increasing bed roughness, while flow over smooth curved channel beds shows a stronger deviation from the tangential direction. Accordingly, fluid or sediment particles moving at a curved channel bed and originating from the outer wall region reach the inner wall much faster in a flow over a smooth bed than over a rough bed. The analytical result was confirmed by experiments in circular planform channels with fixed beds of varying roughness and also by alluvial bed experiments in circular channels. (Lee-ISWS)
W77-09038

FLOW REGIMES IN DEBRIS FLOW,
State Univ. of New York at Binghamton.
For primary bibliographic entry see Field 2J.
W77-09045

8C. Hydraulic Machinery

DRILL STRING MAKEUP, PAST, PRESENT, FUTURE,
J. L. Foster.
Drilling-DCW, Vol. 38, No. 4, p 81-83, 94, February, 1977. 5 fig.

Descriptors: *Joints(Connections), *Steel pipes, *Rotary drilling, Equipment.
Identifiers: *Drill string makeup, Chain tongs, Catheads, Power tongs, Torque.

Early methods of making and breaking drill pipe threaded joints were based on pure physical labor in keeping with the times. Tools used were originally known as early as 1500 a.d., such as the chain tong and the casing pole and rope, with the assistance of a sledge hammer for final tightening. With the general acceptance of the tool joint and the change to eight pitch round threads in the casing and tubing, initial turning to make up joints became a different proposition. In response, use of the cathead with various combinations of catline, forked line, wire line, and chain became the standard methods of spinning pipe. Further mechanization of the joining process was frequently resisted by drilling crew mechanization of the joining process was frequently resisted by drilling crew members afraid of losing their jobs, however, more sophisticated equipment has come into use nonetheless. Power tongs can now be built into rigs that will spin pipe rapidly and will apply sufficient torque without bending the pipe. The need still exists for further research toward faster and safer makeup equipment. (Eberle-NWWA)
W77-08648

RECENT ADVANCES IN ROTARY DRILL BITS,
Smith International, Inc., Irvine, Calif. Smith Tool Div.
For primary bibliographic entry see Field 8G.
W77-08649

TODAY'S WINDMILLS: A BLEND OF OLD AND NEW,
A. B. Stanley.
Water Well Journal, Vol 31, No 4, p 62-63, April, 1977.

Descriptors: *Energy, *Pumping, Winds, Technology, Water supply, Pumps, Turbines, Generators.
Identifiers: *Windmills, Windmill industry.

Far from being a relic of the past, the windmill industry is bigger today than ever and has never ceased to be essential for maintaining America's rural water supply. Windmill technology developed rapidly in the 1800's as deep wells became more feasible and machinery to pump them more necessary. In the peak year of 1929, more than 100 manufactureres of windmills reaped total sales of nearly 10 million dollars. Today the windmill can be used to directly drive a submersible pump. Dr. Bill Hughes of American Wind Turbine, Inc., has developed a system utilizing a 12-foot turbine, tower, generator, and pump which will draw from wells 350 feet deep using wind as

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the only power source. It is, admittedly, a relatively expensive way to pump water (8 or 9 cents/kolowatt hour) and the times when no wind is blowing still present a problem, but Hughes is confident that his device will become more competitive as energy prices soar, and that the American windmill will continue to thrive in years to come. (Eberle-NWWA)
W77-08650

GROUND WATER - SOLAR HEAT,
B. Cortell.
Water Well Journal, Vol 31, No 5, p 73, May, 1977.

Descriptors: *Solar radiation, *Energy, *Groundwater, Heating, Aquifers, Energy conversion.
Identifiers: *Heat storage(Energy).

Although solar heating has been with us for many years, the unavailability of energy on cloudy days is a disadvantage that still plagues us. Recent research has been done on the possibility of storing heat in undergound aquifers, a means by which the sun's discontinuous energy could be converted into a constant source. For example, if an artificial controlled well field with dimensions of 50 by 50 by 20 feet were installed in an ordinary building lot and the water temperature raised by 50 degrees F, 156 million BTU's of energy would be stored. Important questions concerning surrounding geological conditions still need to be asked, such as: (1) whether heating stored water will result in higher mineral content and pose a threat to solar collectors and well apparatus, and (2) whether heat transfer from the heat sink to the host formation will be a problem. (Eberle-NWWA)
W77-08652

A CASE FOR GEOTHERMAL ENERGY,
R. M. E. Diamant.
Heating and Ventilating Engineer, Vol 50, No 593, p 10-13, December, 1976. 1 fig, 9 ref.

Descriptors: *Thermal power, *Electric power production, *Electric power costs, Thermal power plants, Capital costs, Thermal water, Heating, *Geothermal studies.
Identifiers: *Great Britain, Crustal temperature gradients.

Although geothermal prospects in the United Kingdom are not obvious at first, such areas as Durham, Cornwall, and parts of the North sea show high thermal gradients of anywhere from 30 to 55 degrees C/km. Ways of exploiting these 'hot rock' areas may be devised in the future, while technology for utilizing thermal waters near the surface already exists to some extent. A recent report of the U.K. Department of Energy has estimated costs of both steam-flashing to drive generators and direct piping of hot water to homes and industry. Expenses involved in geothermal energy conversion are virtually all capital cost and very little operating cost. Overall, thermal power is not uneconomical and it will become more cost-effective if fossil fuel prices continue to rise at the present rate. Using a geothermal plant to provide a minimum base of energy and supplementing with coal or oil fired systems during periods of high demand may be a workable setup for certain areas. (Eberle-NWWA)
W77-08655

WATER TURBINE PUMP FAILURE,
Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
For primary bibliographic entry see Field 8G.
W77-08656

ECONOMICS OF GEOTHERMAL ENERGY DEVELOPMENT (IN IMPERIAL COUNTY, CALIFORNIA),
California Univ., Riverside. Graduate School or Administration.
S. Edmunds.
Energy, Vol 2, No 1, p 25-31, March, 1977. 7 tab, 16 ref.

Descriptors: *Thermal power plants, *Electric power production, *Electric power costs, *Comparative costs, Electric power rates, Capital costs, Construction costs, Manpower, *Geothermal studies, *California, Energy.
Identifiers: *Salton Trough(Calif), *Imperial County(Calif).

Geothermal resources in Imperial County (California) appear to have the potential of developing somewhere between 3000 and 6000 mW of power. By the year 2000, geothermal energy might supply about 4-5 percent of California's total generating capacity at that time. Steam flash technology presently available would appear to produce electricity from thermal sources at competitive costs of 38 mills per kWh or less, somewhat below comparative costs of coal, oil, or nuclear fueled systems. Estimates vary, but the combined field investment costs and generating plant investment are thought to be between 500 and 750 dollars per kWh of capacity for the completed installation, based on 1976 prices. Due to the capital-intensive nature of geothermal energy plant construction and operation and the necessity of shipping much of the equipment from outside the County, impact on the local job market will be relatively small. Local tax revenues, however, would amount to over 1 million dollars annually, and would be a major continuing benefit to Imperial County. (Eberle-NWWA)
W77-08657

PUMPING TESTS PROVIDE USEFUL DATA,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8G.
W77-08658

METHODS USED FOR DRILLING WELLS IN THE SOVIET UNION,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
N. G. Sapozhnikov.
Johnson Driller's Journal, Vol 49, No 2, p 8-9, March-April, 1977.

Descriptors: *Drilling, *Drilling equipment, *Well screens, *Well casings, Rotary drilling, Drilling fluids, Water supply.
Identifiers: *USSR, Well development, Cable-tool drilling.

In the Soviet Republics, water wells are widely used for the same purposes as in the United States. Although rotary and cable-tool drilling methods are fairly advanced, dug wells are still common for domestic rural water supply. Hydraulic rotary drilling accounts for about 80% of total new wells drilled for all purposes. High-grade bentonite muds are a standard fluid, however, Soviets frequently drill with clear water alone when penetrating fine sand aquifers. Drilling mud with special starch as a component is sometimes used to prevent clay plugging of water-bearing sands. Pipe-base mesh screens are the most common well filter; perforated pipe screens with conical openings are occasionally used for hydrogeological applications. Vibration together with driving is applied in some cases to increase rate and depth of sinking casing by cable-tool methods. Another means of speeding the driving process is to sink the casing through a guide pipe of slightly larger diamter. Mud is injected into the annulus between the casing string and the guide pipe as a lubricant. (Eberle-NWWA)
W77-08659

GEOTHERMAL ENERGY DEVELOPMENT,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 4B.
W77-08661

ROCK TYPE DECIDES JETTING ECONOMICS,
Koninklijke Shell Exploratie en Productie Laboratorium, Rijswijk (Netherlands).
A. C. Pols.
Oil and Gas Journal, Vol. 75, No. 6, p 71-75, February 7, 1977. 8 fig, 2 tab, 8 ref.

Descriptors: *Rotary drilling, *Rock properties, *Drilling equipment, Drilling fluids, Laboratory tests.
Identifiers: *Jet drilling, *Laminated rock, Isotropic impermeable rock, Drilling penetration rates.

Laminated rock was expected to show different behavior under jetting conditions than isotropic rock in the study under consideration. Tests showed an unsatisfactory performance for jetting a schist sample with water alone, including highly irregular hole walls. Hole shape improved with the use of a clay/water mud, however, penetration rate remained low. Economic comparison of jetting and conventional drilling techniques indicates that the former is not at all feasible at present for hard, impermeable laminated rock. Jetting is, however, cost-effective for permeable and impermeable isotropic sedimentary rock in cases where conventional drilling costs are high. Hybrid jetting/mechanical bits could possibly prove effective for drilling impermeable formations, but much more research on such tools is necessary. (Eberle-NWWA)
W77-08666

TESTS SHOW JET-DRILLING HARD ROCK POTENTIAL,
Koninklijke Shell Exploratie en Productie Laboratorium, Rijswijk (Netherlands).
For primary bibliographic entry see Field 8E.
W77-08667

AIR, MIST AND FOAM DRILLING, A LOOK AT LATEST TECHNIQUES,
R. A. Hook, L. W. Cooper, and B. R. Payne.
World Oil, Vol. 184, No. 5, p 95-103, April, 1977. 6 fig, 3 ref.

Descriptors: *Rotary drilling, *Drilling equipment, Oil wells, Boreholes, Valves.
Identifiers: *Air-rotary drilling, Air-rotary bits, Mist drilling, Foam drilling, Air compressors.

Not only can air drilling techniques reduce drilling time and cut costs, they can also minimize formation damage, prolong bit life, and permit better drilling control in cavernous and lost circulation areas. Their primary disadvantages are poor performance in soft or wet formations. Actual rock removal occurs when the rock face fractures under the weight of the bit and particles are swept out of the hole in the air stream. The bits themselves are generally hard formation insert type roller-cone bits similar to those used in mud drilling. Conversion of a conventional rotary rig to an air drilling operation is relatively simple. Most of the liquid and solids handling equipment is removed, and a valve manifold, air compressor, and booster are added. A rotating drilling head is essential for containing and directing the flow of dust emerging from the hole. Blowout protectors, blooie lines, and other related equipment are added for air drilling for oil or natural gas. (Eberle-NWWA)
W77-08669

LIQUID JET EDUCTORS, THE 'PUMPS' WITH NO MOVING PARTS,
Schutte and Koerting Co., Cornwell Heights, Pa.
H. Stratton.
Plant Engineering, Vol. 123, No. 8, p 215-218, April 29, 1976. 8 fig.

Descriptors: *Pumping, *Hydraulic equipment, *Pumps, Flow, Deep wells, Slurries.
Identifiers: *Liquid jet eductors(Pumps).

Liquid jet eductors are unconventional pumps which operate according to the Bernoulli theorem, i.e., the kinetic energy of one fluid is used to move another fluid. Eductors have no moving parts to wear out, can be made of almost any machineable material, and can be installed in some sorts of remote locations inaccessable to commonly used pumping equipment. Various types of eductors have been designed for mixing or blending, pumping muds and slurries (or even solids), obtaining water from deep wells, and as priming devices for mechanical pumps. Theoretically, maximum performance of eductors can be precisely calculated, however, performance is affected by energy losses associated with mixing the two fluids and by friction losses in the diffuser. (Eberle-NWWA)
W77-08671

SELF-PRESSURIZING SEALS KEEP SUBMERSIBLE MOTORS DRY,
General Electric Co., Schenectady, N.Y.
J. D. McHugh.
Mechanical Engineering, Vol. 98, No. 2, p 20-27, February, 1976. 10 fig, 2 tab, 15 ref.

Descriptors: *Pumps, *Electric motors, *Water wells, *Sealants, Pumping, Electrical design.
Identifiers: *Submersible pumps, *Submersible electric motors, *Electric motor face seals, Pump failure.

For some sorts of water wells, especially deep wells, submersible pumps offer clear advantages. During the early years of pump development and use, however, a small but significant proportion of failures occurred in well installations apparently as a result of water in-pumping around face seals. Three possible causes of water invasion into pump motors were investigated by General Electric: vertical shock during installation, dynamic pressure variations during pumping causing reversed pressures across the seal, and in-pumping at the primary seal surfaces as explained by the theory of eccentric seal operation. Experiments pointed to the latter as the most probable source of trouble. Tests were subsequently run on a new self-pressuring double seal arrangement. The expected advantages of this design were greater protection against water ingress during both pumping and shut down, as well as reduction of wear on primary seal surfaces. Prototype motors showed such excellent performance in all these respects that motors incorporating this design have now been in production for about 4 years. (Eberle-NWWA)
W77-08672

SELECTION OF SLURRY PUMPS FOR SEVERE APPLICATIONS,
Warman International, Inc., Madison, Wis.
R. E. McElvain.
Mining Engineering, Vol. 28, p 26-28, December, 1976. 6 fig, 2 tab.

Descriptors: *Slurries, *Pumps, *Drilling fluids, *Pumping, Flow, Hydraulic design, Hydraulic machinery, Performance.
Identifiers: Pump selection.

As mining and other industries have placed increasing demands on equipment, slurry pumps have thus been developed which can handle greater solids concentrations, higher heads and pressures, and greater flow than pumps of ten years ago. Matching the right pump to its proper application can be done fairly precisely by considering flow-to-resistance relationships and head available against flow resistance. Adjustments usually need to be made in performance curves of slurry pumps to account for slip between fluid and particles as well as higher viscosity of slurry; most performance curves are established for clear water only. The greater the proportion of solids in the slurry mixture, the less the developed head during pumping and the lower the efficiency of the pump. Stable, shock-free flow at a safe carrying velocity is critical for a smoothly operating system and for pump protection. Maintaining slurry of sufficient density is one of the most important ways of keeping a pumping system economical. (Eberle-NWWA)
W77-08673

AVOIDING THE PERILS OF CAVITATION,
Buffalo Forge Co., N.Y.
L. B. Timmerman.
Machine Design, Vol 48, p 99-103, September 23, 1976. 8 fig.

Descriptors: *Pumping, *Damages, *Hydraulic equipment, Pumps, Pipe flow, Fluid friction, Vapor pressure.
Identifiers: *Cavitation, *Net positive suction head(NPSH), Friction losses.

Although the most visible damage from pump cavitation is impeller pitting, the worst damage is actually done to bearings and seals. The extreme, instantaneous, and irregular changes in radial and axial thrust that occur during cavitation cause rapid and uneven pump parts wear. Cavitation can be prevented if the net positive suction head available in a system is greater than the net positive suction head required by the pump. Available head is equal to the sum of atmospheric pressure and static head above the pump minus vapor pressure of the pumped liquid, friction loss from the suction pipe, velocity-head loss, and entrance loss at the pump. It is essential for the pumping system designer to bear in mind that atmospheric pressure fluctuates daily, which can result in occasional cavitation problems should too small a safety margin be allowed. The same holds true for friction loss; deposit build-up on pipe walls can increase friction loss to several times the original manufacturer's specifications as the system ages. (Eberle-NWWA)
W77-08674

PUMP CONSTRUCTION MATERIALS,
Vanton Pump and Equipment Co., Union, N.J.
For primary bibliographic entry see Field 8G.
W77-08675

IRRIGATION DRAIN VALVE,
Ireco Industries, Inc., Eugene, Oreg. (Assignee).
For primary bibliographic entry see Field 3F.
W77-08887

8D. Soil Mechanics

PREDICTING PERFORMANCE OF PIPE CULVERTS BURIED IN SOIL,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 8B.
W77-08622

STRENGTH OF SOIL AGGREGATES: INFLUENCE OF SIZE, DENSITY AND CLAY AND ORGANIC MATTER CONTENT,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2G.
W77-08707

SEEPAGE UNDER STRUCTURE ON N STRATA OF SOIL,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-08843

LOAD TRANSFER AND HYDRAULIC FRACTURING IN ZONED DAMS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 8B.
W77-08857

SEISMIC DESIGN OF LIQUID-STORAGE TANKS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
H. I. Epstein.
Journal of the Structural Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. ST9, Proceedings paper No. 12380, p 1659-1673, September 1976. 7 fig, 2 tab, 22 ref.

Descriptors: *Seismic design, *Storage tanks, Water storage, *Earthquakes, Equations.
Identifiers: *Fluid dynamics, *Oil storage, *Tanks(Containers), Sloshing, Containers.

Cylindrical and rectangular flat-bottomed liquid storage tanks subjected to horizontal earthquake excitations are studied. Formulas and curves that can be used to obtain bending and overturning moments are presented. Certain combinations of earthquake response spectra and tank geometries produce maximum forces and moments when the tank is only partially full. The use of design curves in establishing this situation is illustrated. For slender tanks, an assumption made in present design practice is shown to lead to nonconservative results. The elimination of this assumption is shown to produce simplified expressions for the moments in these cases. Simplified expressions are also presented for use in estimating the maximum free surface displacement. (Bell-Cornell)
W77-08859

8E. Rock Mechanics and Geology

LAND SUBSIDENCE,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 4B.
W77-08653

FAULT CONTROL OF SUBSIDENCE, HOUSTON, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 4B.
W77-08662

ROCK TYPE DECIDES JETTING ECONOMICS,
Koninklijke Shell Exploratie en Productie Laboratorium, Rijswijk (Netherlands).
For primary bibliographic entry see Field 8C.
W77-08666

TESTS SHOW JET-DRILLING HARD ROCK POTENTIAL,
Koninklijke Shell Exploratie en Productie Laboratorium, Rijswijk (Netherlands).
A. C. Pols.
Oil and Gas Journal, Vol. 75, No. 5, p 134-144, January 31, 1977. 11 fig, 2 tab.

Descriptors: *Rotary drilling, *Rock properties, *Drilling equipment, Drilling fluid, Laboratory tests.
Identifiers: *Jet drilling, *Isotropic impermeable rock, Drilling penetration rates.

Although jet drilling in hard, impermeable rock is much more difficult than in permeable rock, evidence indicates that impermeable isotropic rock can be jet-drilled at higher than conventional drilling rates, perhaps making jet drilling profitable for high daily rig cost ranges. In this study, laboratory test of an experimental jet bit were made on several rock samples placed under high axial load during which rotary speed, bit torque, fluid pressure before the swivel, ambient pressure, and depth of penetration were recorded as variables. Generally, penetration rate increased slowly with increasing bit-pressure drop (on the order of 10 millimeters/min. per megapascal), penetration rate

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decreased with increased mud density, and rotary speed had little effect on the isotropic impermeable samples. Significant departures from the norm, however, did occur for a few of the samples , and wide variations in borehole smoothness were evident between samples and with changes in mud density. (Eberle-NWWA)
W77-08667

8F. Concrete

CEMENT-MUD SPACER SYSTEM IMPROVES ILLINOIS WELLS,
Dow Chemical Co., Los Angeles, Calif. Dowell Div.
W. L. Crow, T. J. Griffin, and A. W. Putney.
Drilling-DCW, Vol. 38, No. 5, p 33-34, March, 1977. 2 fig.

Descriptors: *Drilling fluids, *Rotary drilling, *Cements, Well casings, Wells, *Illinois.
Identifiers: *Cement-mud spacers, Zone isolation.

The use of new water-base cement-mud spacer system between drilling mud and cement has proved effective in isolating production zones and obtaining better cement bonding. Designed to prevent intermixing of drilling fluid and cement during cementing operations, the spacer system helps eliminate channels or layers of drilling fluid occurring between the formation and cement, as well as reducing the chance of cement loss to naturally fractured or easily fractured formations. The spacer comes sacked and ready to mix in the field or cement bulk plant. A variety of materials can be used for weighting the spacer from 9.0 ppg up to 20 ppg as needed, or for combating lost circulation. Dramatic zone-isolation results have been obtained when the spacer was applied in more than 100 oil and gas wells in the lower Illinois basin. (Eberle-NWWA)
W77-08647

SPECIALTY CEMENTS CAN SOLVE SPECIAL PROBLEMS,
Western Co., Houston, Tex.
P. N. Parker.
Oil and Gas Journal, Vol. 75, No. 9, p 128-131, February 28, 1977. 4 tab.

Descriptors: *Cements, *Slurries, *Drilling, Pozzolans, Well casings, Cement grouting, Additives, Oil wells.
Identifiers: Thixotropic cements, Calcium aluminate cements.

Specialty cements are formulated by service companies and manufacturers for highly specific drilling needs. Pozzolan cements (blends of cement and fly ash) are of light to moderate density and can be modified for use at all depths. Easy to use and economical, pozzolan slurries are used for casing jobs, and sometimes for squeezes and lost-circulation plugs. Thixotropic cements are valuable for their gel-forming properties, and are employed primarily for cementing in lost-circulation zones. Special retarders and fluid-loss-control additives must be used instead of conventional additives with such cements in order to preserve thixotropic properties. Quick-setting cements can be used to seal off severe lost-circulation zones where other slurries would be absorbed, while expanding cements can be used to improve bonding to casing and formation during primary cementing. Calcium aluminate cement is useful in both cold-weather and geothermal conditions. Various light weight and petroleum-based cements have specific applications to the oil and gas industry. (Eberle-NWWA)
W77-08664

ADDITIVES TAILOR CEMENT TO INDIVIDUAL WELLS,
Western Co., Houston, Tex.
P. N. Parker, and C. Clement.
Oil and Gas Journal, Vol. 75, No. 11, p 54-58, March 14, 1977. 1 tab

Descriptors: *Cements, *Slurries, *Additives, Cement grouting, Drilling, Well casings, Bentonite, Calcium chloride, Sodium chloride, Sands.
Identifiers: Accelerators, Retarders, Density adjustment materials, Fluid loss additives, Lost-circulation additives.

The major classifications of the additives used to change the properties of well cements are: (1) accelerators (2) retarders (3) density adjusters (4) dispersants (5) fluid-loss additives (6) lost-circulation materials (7) auxiliary additives. Accelerators are used in situations where waiting-on-cement time must be minimized, calcium chloride being the most common additive for this purpose. Retarders perform the opposite function in cases where increased well temperature results in rapid setting. Density adjusters and dispersants modify slurry handling properties as required by the specific drilling situation. Fluid loss and auxiliary additives improve bonding and cement strength (and may help prevent formation damage), while lost-circulation materials cover vugs and fractures or seal permeable zones into which unmodified cement would tend to penetrate. (Eberle-NWWA)
W77-08665

POLYMERIZATION OF CONCRETE FIGHTS CAVITATION,
Restruction Corp., Denver, Colo.
M. A. Murray, and V. F. Schultheis.
Civil Engineering-American Society of Civil Engineers, Vol 47, No 4, p 67-70, April 1977. 9 fig.

Descriptors: *Dams, *Concrete, *Polymers, *Idaho, Cavitation, Erosion, Flumes, Hydraulic structures, Repairing, Waterproofing, Plastics, Dam construction, Concrete dams, Settling basins, Construction.
Identifiers: *Dworshak Dam(Idaho), Polymerization.

The techniques and materials used for the repair of concrete are many and varied. The repair at Dworshak Dam utilized epoxy resins, dry pack mortar, fibrous concrete, and a new technique, polymerization, for significantly increasing the strength of concrete at the surface. This paper identified the procedure utilized for the polymerization of vertical concrete surfaces in the outlet structure and horizontal concrete surfaces in the stilling basin. (Sims-ISWS)
W77-09044

8G. Materials

DEVELOPMENT OF A LOW COST ASPHALT-RUBBER MEMBRANE FOR WATER HARVESTING CATCHMENTS AND RESERVOIR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W77-08601

FINE SCREENING OF RAW SEWAGE,
A. McVie.
The Public Health Engineer, Vol. 5, No. 2, p 38-42, March, 1977. 4 fig, 5 tab, 9 ref.

Descriptors: *Fine aggregates, *Screens, Analysis, *Testing, Filtration, Equipment, Sewage treatment, Water quality standards, Solid wastes, Sludge treatment, Design criteria, On-site testing, Hydraulics, Waste water treatment.
Identifiers: *Fine screening(Strainers).

Fine screens, or strainers, were defined as those having multiple individual openings less than 10 millimeters in either face dimension. Bar screens in any form are not covered by this definition. Tests were conducted when fine mesh rotating cup screens failed to meet their hydraulic specifications because of mesh blinding. It was possible to define the strainer's effective open area by using the fabric geometry and Boucher's Law to compute the effective hydraulic capacity. Water temperature played a significant role in the calculation. For each perforation size, there is a head which cannot be exceeded without incurring malfunction and felting. This depends upon the sewage filterability index and the breakthrough point. Because sewage is expected to have a fairly constant general range for the filterability index, and thus consistent straining characteristics, strainer rotation speed should be varied for extreme cases. It was impossible to test for the filterability index with sewage under laboratory conditions. The results of this investigation led to an increased screen capacity of 250% and the cessation of felting. The general approach used here may be applied all types of fabric including fixed bar screens. However, the Boucher hydraulic solution is limited to conditions of streamline or near streamline flow. (Collins-FIRL)
W77-08629

DRILL STRING MAKEUP, PAST, PRESENT, FUTURE,
For primary bibliographic entry see Field 8C.
W77-08648

RECENT ADVANCES IN ROTARY DRILL BITS,
Smith International, Inc., Irvine, Calif. Smith Tool Div.
L. L. Garner, and D. J. Millar.
World Oil, Vol. 184, No. 4, p 52-56, March, 1977. 12 fig.

Descriptors: *Rotary drilling, *Drilling equipment, Oil industry, Offshore platforms.
Identifiers: *Roller cone bits, Bits(Drilling), Bearings, Lubrication.

Increased drilling costs have created greater interest in the economics afforded by longer bit life and faster penetration rates. Advances in journal bearing technology and improved soft formation bits are helping achieve both objectives. Analysis of bearing failures has been the focus of bearing research in recent years. Greater sealing integrity is now possible in bits designed with a minimum number of sealing points, while cone and ball hole cracking are being controlled by better welding and heat treating techniques. Considerations such as bearing length versus hole wall clearance, bearing surface finish, supplemental lubrication, and bit weight and speed parameters are vital areas of future bearing research. Tungsten carbide insert technology has resulted in the evolution of new soft formation bit designed from the original 3-cone insert bit. Extended jet nozzles permit 25 to 50 percent faster penetration through soft formations in holes larger than 9 5/8 inches in diameter. The 2-cone bit, now being used experimentally, allows larger cutter and bearing diameters in proportion to length, as well as increased flexibility for positioning jet nozzles. In addition, improved roller cone core bits and re-entry bits are currently being developed for the oil and gas industries. (Eberle-NWWA)
W77-08649

DIAMOND COMPOSITES USED IN NEW BITS.
Oil and Gas Journal, Vol 75, No 16, p 71-72, April 18, 1977. 2 tab.

Descriptors: *Drilling equipment, Rotary drilling.
Identifiers: *Drill bits, *Polycrystalline diamond, General Electric Stratapax Blanks, Tungsten carbide materials.

Drill bits with inserts made of polycrystalline diamond layers bonded to tungsten carbide have had recently shown success in laboratory and field

tests. The polycrystalline product, manufactured by General Electric's Specialty Materials Department, chips off in minute discrete fragments during drilling, always leaving a fresh cutting edge forward. Lab test results suggest that slug-type bits made with the new material perform best at speeds above 150 rpm on a downhole motor at bit weights between 12,000 and 21,000 lbs. Although four experimental bits failed in field tests due to splashback erosion and consequent nozzle loss, cutting edges were not worn and penetration rates during drilling were much higher than for roller-cone bits in comparable situations. General Electric recommends the new bit for drilling soft to medium-hard formations. (Eberle-NWWA)
W77-08651

WATER TURBINE PUMP FAILURE,
Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
C. R. Schmitt, and F. J. Lambert, Jr.
Materials Performance, Vol 14, No 2, p 29-30, February, 1975. 1 fig, 1 tab, 1 ref.

Descriptors: *Pumps, *Non-destructive tests, Pumping, *Testing, Testing procedures.
Identifiers: *Pump failure, *Deep-well turbine pumps, Gray cast iron, Pump discharge heads.

Recently, the 14 inch diameter cast iron elbow section of the discharge head of a 5500 gpm deep-well turbine pump ruptured at an Oak Ridge, Tennessee, pumping station. Since this was the second such incident in four years time, the matter was taken under study (a third, similar cast iron discharge head rupture occurred shortly after this study was completed). Various non-destructive tests were performed on fragments of the pump casing. Tensile strength results were well below the ASTM specification values for that grade of gray cast iron when newly manufactured. Internal casing cracks were discovered not only in the ruptured discharge head but also in the replacement pump housing sent by the manufacturer. It was recommended to the manufacturer that replacement pump discharge heads in the future because from modular ductile iron or fabricated out of steel plate rather than gray cast iron, in order to better withstand pump vibration and water-hammer stresses. (Eberle-NWWA)
W77-08656

PUMPING TESTS PROVIDE USEFUL DATA,
Universal Oil Products, St. Paul, Minn. Johnson Div.
T. L. Johnson.
Johnson Driller's Journal, Vol 49, No 2, p 4-7, March-April, 1977. 3 fig.

Descriptors: *Pumping, *Aquifer characteristics, *On-site tests, Water table, Electronic equipment, Drawdown, Specified yield, Transmissivity, Storage coefficient.
Identifiers: Orifice weirs, *Pumping test data.

Properly done, a pumping test can provide data by which are calculated the maximum yield of a well, its efficiency potential, interference between wells, and many other properties of wells and aquifers. Accurate measurement of drawdown and strict control of pumping rate are essential in obtaining such data. When testing with an orifice weir, it is good practice to employ a pump which can provide the desired pumping rate at 1/2 to 3/4 its maximum capacity. Similarly, the gate valve on the orifice meter should be between 1/2 to 3/4 open to provide enough back pressure for stable, accurate readings. Test equipment must be set up and checked well in advance of the actual test to ensure that the water level completely recovers. If neighboring wells cannot be shut off for the duration of the tests, they should at least be pumped at a constant rate. To establish the pumping rate for a long-term test, specific capacity of the well should be noted and a pumping rate which uses about 3/4 of the available drawdown should be calculated from that. (Eberle-NWWA)
W77-08658

MULTI-SHOT CAMERA SYSTEM FOR BOREHOLE SURVEYING.
CIM Bulletin, Vol. 69, p 141, June, 1976. 1 fig.

Descriptors: *Borehole cameras, *Logging(Recording), Instrumentation, Photography, Boreholes, Monitoring.

A completely new, self-contained, 1 1/4 inch multi-shot camera unit for borehole surveying, which allows a choice of 0-12 degree, 0-34 degree, or 0-90 degree angle units and features a removable cassette film holder has been made available by Humphrey, Inc. 9212 Balboa Ave., San Diego, CA 92123. This new PH04 Series camera uses interchangeable gyros or magnetic compass directional units. It is furnished with a J-lock or standard thread connection to make it compatible with most systems now used in the field. (Eberle-NWWA)
W77-08668

SELF-PRESSURIZING SEALS KEEP SUBMERSIBLE MOTORS DRY,
General Electric Co., Schenectady, N.Y.
For primary bibliographic entry see Field 8C.
W77-08672

PUMP CONSTRUCTION MATERIALS,
Vanton Pump and Equipment Co., Union, N.J.
E. Margus.
Plant Engineering, Vol 123, No 11, p 123-126, June 10, 1976. 4 fig.

Descriptors: *Pumps, *Materials engineering, Hydraulic design, Iron, Steel, Stainless steel, Copper, Copper alloys, Plastics.
Identifiers: Cast iron, Carbon steel, Alloy steel, Nickel, Thermoplastics, Nonferrous metals.

Because a pump's ability to function in a given environment necessitates certain strength and resistance properties peculiar to that situation, pump construction materials must be chosen with care. Both metals and nonmetals are commonly used. The ferrous metals employed in pump manufacture include cast iron (for housings), carbon steel, allow steel, stainless steel, and special alloys. Nonferrous metals include aluminum, copper, magnesium, nickel, titanium, and various precious and semi-precious metals. Plastics are gaining wider and wider popularity for pump parts. PVC is being used in impellers, casings, and covers. Polyamides (nylons) are used for a wide range of mechanical parts, while pump gaskets, seals and packing are often made of Teflon. Their high resistivities to corrosives make plastics increasingly attractive for harsh environments. (Eberle-NWWA)
W77-08675

TESTS OF OIL RECOVERY DEVICES IN BROKEN ICE FIELDS. PHASE I,
ARCTEC, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W77-08915

POLYMERIZATION OF CONCRETE FIGHTS CAVITATION,
Restruction Corp., Denver, Colo.
For primary bibliographic entry see Field 8F.
W77-09044

8I. Fisheries Engineering

EXPANSION OF THE RANGE OF SOME FISH SPECIES IN CONNECTION WITH HYDRAULIC ENGINEERING CONSTRUCTION ON THE VOLGA AND ACCLIMATIZATION WORKS, (IN RUSSIAN),
E. P. Tsyplakov.
Vopr Ikhtiol. 14(3), p 396-405, 1974.

Descriptors: *Fish, *Ecological distribution, *Nichesm, *Hydraulic engineering, Hydraulic structures, Eels.
Identifiers: Black Sea pipefish, Caspian round goby, Black Sea pugolovka, Caspian kilka, Streamflow control, Stint, Lake white vendace, Peled, Taimen, Anguilla anguilla, Benthophilus stellatus, Clupeonella delicatula caspia m tsch, Coregonus peled, Coregonus sardinella vessicus, Hucho taimen, Neogobius melanostomus affinis, Osmerus eperlanus eperlanus m spirin, Fish species range, Syngnathus nigrolineatus, USSR, Volga.

Streamflow control of the Volga (USSR) has created favorable conditions for the expansion of the ranges of a number of fish species. Some of them, the stint (Osmerus eperlanus eperlanus m. spirinchus), Lake White vendace (Coregonus sardinella vessicus), peled (Coregonus peled), eel (Anguilla anguilla) and taimen (Hucho taimen) are northern immigrants and others, the Caspian kilka (Clupeonella delicatula caspia morpha tscharchalensis), Black Sea pipefish (Syngnathus nigrolineatus), Caspian round goby (Neogobius melanostomus affinis and Black Sea pugolovka (Benthophilus stellatus) are southern immigrants. Free ecological niches have been created which are rapidly being occupied by new sometimes economically worhtless species.--Copyright 1975, Biological Abstracts, Inc.
W77-08715

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES RESEARCH INTERESTS IN THE COLLEGES AND UNIVERSITIES OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 991, Price codes: A04 in paper copy, A01 in microfiche. UNC-WRRI Report No 3 (Revised), Jan 1976. 57 p. OWRT A-999-NC(45). 14-31-0001-5033.

Descriptors: *North Carolina, *Research priorities, Surveys, *University, *Colleges, Education, Training, *Water resources, *Research and development.
Identifiers: *Research interests.

An inventory was assembled of water-related research interests in the following North Carolina colleges and universities: North Carolina State University at Raleigh, University of North Carolina at Asheville, University of North Carolina at Chapel Hill, University of North Carolina at Charlotte, University of North Carolina at Greensboro, University of North Carolina at Wilmington, Appalachian State University, East Carolina University, NC Agricultural and Technical State University, NC Central University, Western Carolina University, Campbell College, Duke University, Guilford College, Livingstone College, Mars Hill College, St. Andrews Presbyterian College, and Warren Wilson College. (Howells-NC State)
W77-08931

INVENTORY OF ACTIVE WATER RESOURCES RESEARCH PROJECTS IN NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.

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Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 977, Price codes: A07 in paper copy, A01 in microfiche. UNC-WRRI Report No 4 (Revised), Jan 1976. 119 p. OWRT A-999-NC(46). 14-31-0001-5033.

Descriptors: *North Carolina, *Projects, *Research and development, Surveys, Contracts, Grants, Programs, Universities, Colleges, Water resources.

This report summarizes all water-related studies and research currently underway in North Carolina. It includes federal and state agencies, private industry, and all of the State's senior colleges and universities. project summaries include organization, investigator (for universities), descriptions, sponsoring agencies, and starting and estimated completion dates. (Howells-NC State)
W77-08938

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES RESEARCH INTERESTS IN THE COLLEGES AND UNIVERSITIES OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 09A.
W77-08931

INVENTORY OF ACTIVE WATER RESOURCES RESEARCH PROJECTS IN NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 09A.
W77-08938

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

WATER-RESOURCES INVESTIGATIONS IN KENTUCKY, 1976.
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 07C.
W77-09078

WATER-RESOURCES INVESTIGATIONS IN WISCONSIN, 1976.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 07C.
W77-09079

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SUBJECT INDEX

1972 OCEAN DUMPING CONVENTION
International Law and Radioactive Pollution by Ocean Dumping: 'With All Their Genius and With All Their Skill...'
W77-08957 5G

ABSORPTION
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

The Accumulation of Polybominated Biphenyls by Fish,
W77-08777 5C

Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connectituct Rivers,
W77-08814 5B

ACCABONAC HARBOR (NY)
Effects of Mercury, Cadmium, and Lead Salts on Regeneration and Ecdysis in the Fiddler Crab, UCA Pugilator,
W77-08702 5C

ACCESS ROUTES
Recreational Water Resources Problems.
W77-08711 6B

ACCLIMATION
Laboratory Methods for Determining Temperature Preference,
W77-08770 5C

ACID-BASE EQUILIBRIUM
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

ACID MINE WATER
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

ACID WASTES
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

ACIDIC WATER
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

Atmospheric Sulfate Additions and Cation Leaching in a Douglas Fir Ecosystem,
W77-08822 2K

ACIDITY
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

ACROLEIN
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

ACTIVATED SLUDGE
High Speed Liquid Chromatographic Analysis of Cobalamin Productivity and Distribution in Activated Sewage Sludge Treatment,
W77-08621 5A

Nitrification and Heavy Metal Removal in the Activated Sludge Treatment Process,
W77-08623 5D

Controlling Sludge Bulking,
W77-08636 5D

Trickling Filter-Activated Sludge Combinations,
W77-08868 5D

Role of Nitrogen in Activated Sludge Process,
W77-08869 5D

Plant Size Influence on Performance in Activated Sludge Systems with Application to Regional Wastewater Treatment Planning,
W77-08928 5D

ADDED MASS COEFFICIENTS
Drag and Inertia Forces on a Cylinder in Periodic Flow,
W77-09017 8B

ADDITIVES
Additives Tailor Cement to Individual Wells,
W77-08665 8F

ADMINISTRATION
The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

ADMINISTRATIVE AGENCIES
Section 208 and Section 303 Water Quality Planning and Management: Where is it Now,
W77-08949 5G

Many Changes Urged for PL 92-500,
W77-08950 5G

Porter--Cologne Water Quality Control Act.
W77-08978 6E

Effluent Guidelines and Standards for Iron and Steel Manufacturing Point Source Category.
W77-08986 5G

Control of Pollution by Oil and Hazardous Substances, Discharge Removal.
W77-08987 5G

Mianus River Preservation Committee V. Administrator, Environmental Protection Agency (Jurisdiction of Federal Appeals Court for Permits Issued by State Agency Under NPDES).
W77-09001 6E

Homeowners Emergency Life Protection Committee V. Lynn (Enjoining of Major Federal Activity with Alleged Inadequate Environmental Impact Statement).
W77-09003 6E

Provo-Jordan River Parkway Authority.
W77-09009 6E

Policy Innovation and Institutional Fragmentation,
W77-09053 6E

Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

ADMINISTRATIVE DECISIONS
PL 92-500: New Federalism or Federal Takeover,
W77-08972 6E

Szeles--Natale, Inc. V Board of Commissioners of Swatara Township, Dauphin County (Flood Control Aided by Land Development Restraints),
W77-08992 6E

ADMINISTRATIVE REGULATIONS
Legal Battles on the California Coast: A Review of the Rules,
W77-08963 6E

Enforcement of Municipal Permits: Portent of Problems,
W77-08971 6E

Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Urea and Ammonium Nitrate Subcategory.
W77-08984 5G

Interim Primary Drinking Water Regulations: Promulgation of Regulations on Radionuclides.
W77-08985 5G

Control of Pollution by Oil and Hazardous Substances, Discharge Removal.
W77-08987 5G

Permit Program Regulations For Concentrated Animal Feeding Operations.
W77-08988 5G

Szeles--Natale, Inc. V Board of Commissioners of Swatara Township, Dauphin County (Flood Control Aided by Land Development Restraints),
W77-08992 6E

Mc Cormick V Lawrence (Constitutionality of New York Statute Aimed at Promoting Governmental Interest in Preserving Appearance of an Area).
W77-09004 6E

ADSORPTION
Adsorption and Vertical Movement of the Zinc and Manganese Ions in Three Types of Soil,
W77-09054 5B

AERATION
Waste Water Aeration System Produces Small Bubbles.
W77-08630 5D

Auxiliary Air System for Use in Laboratory Experiments,
W77-08800 7B

Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

Analytical Models for the Evaluation of Supplemental Aeration in Texas Estuaries,
W77-08917 5B

AEROBIC DIGESTION
Rational Design of Aerobic Digestion Systems,
W77-08643 5D

AEROBIC TREATMENT
Composting Destroys Pathogens in Sewage Solids,
W77-08641 5E

Rational Design of Aerobic Digestion Systems,
W77-08643 5D

AESTHETICS
Mc Cormick V Lawrence (Constitutionality of New York Statute Aimed at Promoting Governmental Interest in Preserving Appearance of an Area).
W77-09004 6E

AGRICULTURAL RUNOFF
Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

Computer Modeling for the Prediction of Water Quality from Agricultural Drainage,
W77-08934 5B

Qualitative and Quantitative Changes in the Benthic Fauna of a Trout Stream, the Couze Pavin Puy-De-Dome, Caused by Agricultural and Urban Pollution, (In French),
W77-08955 5C

AGRICULTURAL WATERSHEDS
Computer Modeling for the Prediction of Water Quality from Agricultural Drainage,
W77-08934 5B

AGRICULTURE
Effect of Agricultural and Silvicultural Practices on the Runoff from Drainage Basins of the Nizhnedevitskaya Hydrologic Station,
W77-08835 4C

AIR-ROTARY DRILLING
Air, Mist and Foam Drilling, A Look at Latest Techniques,
W77-08669 8C

ALASKA
Environmental Planning for an Alaskan Water-Oriented Recreation Area,
W77-08805 6B

Limnological Investigation of Six Lakes in Southeast Alaska,
W77-09069 7C

ALBUQUERQUE ARROYOS (NM)
Flood Plain Information: Albuquerque Arroyas, Part V, Albuquerque, New Mexico.
W77-08611 4A

ALGAE
Biologically Active Metabolites of Blue-Green Algae and Their Effect on Experimental Animals, (In Russian),
W77-08749 5C

A Certain Marine Catenate Dinoflagellate Tentatively Applied for Detecting Carcinogens,
W77-08795 5A

Environmental Planning for an Alaskan Water-Oriented Recreation Area,
W77-08805 6B

Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

The Effect of Secondarily Treated Sewage on the Algal Populations of the Willimantic/Shetucket Rivers,
W77-09096 5C

ALGAE EXTRACELLULAR PRODUCTS
Behavioral Studies on Chemoreception in Balanus hameri,
W77-08799 5C

ALGAL CONTROL
Hydrologic Considerations in Dewatering and Refilling Lake Carlton, Orange and Lake Counties, Florida,
W77-09080 5G

ALGAL COPPER UPTAKE
Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

ALGAL GROWTH
Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

ALGAL POISONING
Biologically Active Metabolites of Blue-Green Algae and Their Effect on Experimental Animals, (In Russian),
W77-08749 5C

ALGAL PRODUCTION
Environmental Planning for an Alaskan Water-Oriented Recreation Area,
W77-08805 6B

ALGICIDES
Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

A Certain Marine Catenate Dinoflagellate Tentatively Applied for Detecting Carcinogens,
W77-08795 5A

ALGORITHMS
Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

Nonlinear Estimation in Stream Quality Modeling,
W77-09047 5B

ALKALINITY
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

ALPINE GLACIERS
Study of an Ice Core to the Bedrock in the Accumulation Zone of an Alpine Glacier,
W77-08846 2C

ALTERNATE PLANNING
Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

ALTERNATE WATER USE
Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

ALTERNATIVE COSTS
Say Goodbye to Ocean Dumping,
W77-08969 5C

ALTERNATIVE PLANNING
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

ALTERNATIVE WATER USE
An Energy Accounting Evaluation of Several Alternatives for Hydropower and Geothermal Development,
W77-09057 6B

ALUMS
Dewatering Chemical-Primary Sludges,
W77-08865 5D

AMERICAN RIVER PARKWAY (SACRAMENTO CALIFORNIA)
Analysis of Supply and Demand of Urban Oriented Nonreservoir Recreation.
W77-08871 6B

AMMONIA
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

Kinetic Response of Perturbed Marine Nitrification Systems,
W77-08946 5C

AMMONIUM CHLORIDE
Kinetic Response of Perturbed Marine Nitrification Systems,
W77-08946 5C

AMMONIUM COMPOUNDS
Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Urea and Ammonium Nitrate Subcategory.
W77-08984 5G

AMMONIUM SALTS
Kinetic Response of Perturbed Marine Nitrification Systems,
W77-08946 5C

ANABAENA
Biologically Active Metabolites of Blue-Green Algae and Their Effect on Experimental Animals, (In Russian),
W77-08749 5C

ANABAENA CIRCINALIS
Physical and Chemical Parameters Associated with Phytoplankton Abundance and Periodicity in a Fertilized Fish Pond,
W77-08922 5C

ANAEROBIC CONDITIONS
Mineral Distribution Within the Sediments of Pearl Harbor,
W77-08815 2L

ANALOG MODELS
Analog Simulation of the Ground-Water System, Yuma, Arizona,
W77-09067 2F

ANALYTICAL TECHNIQUES
Predicting Performance of Pipe Culverts Buried in Soil,
W77-08622 8B

The Effect of Surcharging on Discharge Through a Pipe,
W77-08644 8B

The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

A Comparison of Methods of Hydrocarbon Analysis of Marine Biota,
W77-08789 5A

Finite Element Solution of the Two-Dimensional Unsaturated Flow Equation,
W77-08923 2G

Numerical Solution for Flow Under Sluice Gates,
W77-09012 8B

ANHOLT ISLAND (DENMARK)
Ground Water Model for the Island of Anholt, Denmark,
W77-09030 2F

ANIMAL BEHAVIOUR
Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

Behavioral Studies on Chemoreception in Balanus hameri,
W77-08799 5C

ANION EXCHANGE
The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

ANNUAL FLOOD
Economics of Permanent Flood-Plain Evacuation,
W77-08856 6B

ANTARCTIC
Was There a Late-Wurm Arctic Ice Sheet,
W77-08839 2C

ANTHROPOGENIC PROCESSES
Present-Day Slumping and Erosion Phenomena on Irrigated Lands (Exemplified by Southeastern Ciscaucasia), (In Russian),
W77-08885 2J

APPROPRIATION
Unlawful Use, Diversion or Waste of State Water.
W77-08995 6E

AQUATIC ALGAE
Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

AQUATIC BACTERIA
Results of a Microbiological Investigation of the Danube River by One Point Profile (1969-1971), (In German),
W77-08694 5B

AQUATIC ENVIRONMENT
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem: I. An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W77-08695 5C

AQUATIC FUNGI
Effects of Primary Sewage Effluent from the City of Willimantic on the Benthic Invertebrate Fauna of the Willimantic/Shetucket Rivers,
W77-09093 5C

AQUATIC INSECTS
Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

AQUATIC MICROBIOLOGY
Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

AQUATIC MICROORGANISMS
Results of a Microbiological Investigation of the Danube River by One Point Profile (1969-1971), (In German),
W77-08694 5B

The Effect of the Willimantic Sewage Treatment Plant on the Microflora and Metabolism of the Shetucket River,
W77-09094 5C

AQUATIC NITROGEN
Real-Time Measurements of Aquatic Nitrogen,
W77-09095 5D

AQUATIC PLANTS
Effects of Dipotassium Endothall on Rooted Aquatics and Adult and First Generation Bluegills,
W77-08785 5C

Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connectituct Rivers,
W77-08814 5B

AQUATIC WEED CONTROL
Effects of Dipotassium Endothall on Rooted Aquatics and Adult and First Generation Bluegills,
W77-08785 5C

AQUEOUS SOLUTIONS
Reactions in the Aqueous Environment of Low Molecular Weight Organic Molecules,
W77-08754 5B

Retention and Flow Characteristics of Polymer Solutions in Porous Media,
W77-08850 2G

AQUICULTURE
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

Optimal Temperature for Growth of Juvenile Bluegills,
W77-08798 5C

Auxiliary Air System for Use in Laboratory Experiments,
W77-08800 7B

AQUIERS
Simulations of Water-Level Drawdowns in Proposed Well-Field Areas, Dade County, Florida,
W77-08739 4B

AQUIFER CHARACTERISTICS
Pumping Tests Provide Useful Data,
W77-08658 8G

Availability of Ground Water in the Middle Merrimack River Basin, Central and Southern New Hampshire,
W77-08733 7C

Outline of the Water Resources of the Satus Creek Basin, Yakima Indian Reservation, Washington,
W77-08740 4B

Hydrologic Reconnaissance of the Geothermal Area Near Klamath Falls, Oregon, with a Section on Preliminary Interpretation of Geophysical Data,
W77-09070 4B

Report on Preliminary Data for Madison Limestone Test Well No. 1, NE1/4SE1/4 Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming,
W77-09072 4B

Ground-Water Resources and Geology of Walworth County, Wisconsin,
W77-09081 2F

AQUIFERS
Simulation of Pollutant Movement in Groundwater Aquifers,
W77-08807 5B

Surface-Groundwater Interactions and the Conjunctive Use of the Water Resources of the Mullica River Basin, New Jersey,
W77-08810 4B

Soil and Rock Strata to Trap, Filter and Store Water for Rural Domestic use,
W77-08821 3B

A 'Rough Cut' Model of a South Florida Water Supply Plan,
W77-08980 4B

Transient Analysis of Phreatic Aquifers Lying Between Two Open Channels,
W77-09026 2F

Artificial Recharge to a Freshwater-Sensitive Brackish-Water Sand Aquifer, Norfolk, Virginia,
W77-09066 4B

Water-Level Records for the San Luis Valley of Colorado, 1973-77,
W77-09088 7C

ARCTIC
Some Hydrochemical Characteristics of the Mouth Reaches of the Anabar, Lena, Yana, and Indigirka Rivers,
W77-08833 2L

Was There a Late-Wurm Arctic Ice Sheet,
W77-08839 2C

ARGON
N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

ARIZONA
Annual Summary of Ground-Water Conditions in Arizona, Spring 1975 to Spring 1976,
W77-08732 7C

An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W77-08933 3B

Analog Simulation of the Ground-Water System, Yuma, Arizona,
W77-09067 2F

ARKANSAS RIVER (KS)
Special Flood Hazard Information: Arkansas River, Fort Dodge - Wilroads Gardens, Vicinity of Dodge City, Kansas.
W77-08612 4A

AROCLOR
Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

AROMATIC COMPOUNDS
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

ARROYOS
Flood Plain Information: Albuquerque Arroyas, Part V, Albuquerque, New Mexico.
W77-08611 4A

ARSENIC
Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

ARSENIC COMPOUNDS
A Study of Heavy Metals in Lake Abbaya, Ethiopia, and the Incidence of Non-Parasitic Elephantiasis,
W77-08774 5A

ARSENICALS (PESTICIDES)
Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

ARTESIAN WELLS
Molybdenum Content in the Subsurface Waters of the Vinnitsa Oblast, (In Russian),
W77-08882 2K

ARTIFICIAL RECHARGE
Artificial Recharge for Subsidence Abatement at the NASA-Johnson Space Center, Phase I,
W77-08744 4B

Soil and Rock Strata to Trap, Filter and Store Water for Rural Domestic use,
W77-08821 3B

Artificial Recharge to a Freshwater-Sensitive Brackish-Water Sand Aquifer, Norfolk, Virginia,
W77-09066 4B

ARTIFICIAL STREAMS
Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

ASHEPOO ESTUARY (SC)
A Reconnaissance of the Hydrology of the Edisto and Ashepoo Estuaries, South Carolina,
W77-09076 2L

ASHUELOT RIVER (NH)
Flood Plain Information: Ashuelot River, City of Keene, New Hampshire.
W77-08615 4A

ASPHALT
Development of a Low Cost Asphalt-Rubber Membrane for Water Harvesting Catchments and Reservoir Seepage Control,
W77-08601 3B

ASPHALT RUBBER MEMBRANES
Development of a Low Cost Asphalt-Rubber Membrane for Water Harvesting Catchments and Reservoir Seepage Control,
W77-08601 3B

ATLANTIC OCEAN
Hydrothermal Processes in the Atlantic Ocean Crust, 26 Degrees N,
W77-08681 2K

Preliminary Summary of the 1976 Atlantic Margin Coring Project of the U.S. Geological Survey,
W77-09089 2L

ATRAZIN
Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

ATTACHED ALGAE
The Effect of Secondarily Treated Sewage on the Algal Populations of the Willimantic/Shetucket Rivers,
W77-09096 5C

ATTITUDES
Citizen Participation in Water Policy Formation,
W77-08603 6B

The Structural Analysis of Environmental Perception and Cognition: A Multidimensional Scaling Approach,
W77-08722 6B

Longitudinal Analysis of Change in Levels of Affiliation and Participation in Voluntary Formal Organizations,
W77-09058 6B

AUSTRALIA
Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

Natural Stream Temperature Variations in a Catchment,
W77-09039 5B

AUSTRIA
Results of a Microbiological Investigation of the Danube River by One Point Profile (1969-1971), (In German),
W77-08694 5B

AUTOMATION
Philadelphia's Water System Automation Plan,
W77-08864 5

AUXILIARY AIR SYSTEM
Auxiliary Air System for Use in Laborator Experiments,
W77-08800 7

AVAILABLE WATER
Outline of the Water Resources of the Satu Creek Basin, Yakima Indian Reservation Washington,
W77-08740 4

AVOIDANCE
Application of Temperature Preference Studie to Environmental Impact Assessment,
W77-08768 5

Avoidance of Bleached Kraft Pulpmill Effluen by Pinfish (Lagodon Rhomboides) and Gul Killifish (Fundulus Grandis),
W77-08780 5

AVOIDANCE RESPONSE
Avoidance of Bleached Kraft Pulpmill Effluen by Pinfish (Lagodon Rhomboides) and Gul Killifish (Fundulus Grandis),
W77-08780 5

BACKWATER
Principles of Graphical Gradually Varied Flow Model,
W77-09015 2

Computer Applications for Step-Backwater and Floodway Analyses,
W77-09090 4A

BACKWATER MODELS
Principles of Graphical Gradually Varied Flow Model,
W77-09015 2

BACTERIA
Parasites and Diseases of Cultured Catfish fo the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

BACTERIA SURVIVAL RATE
Survival of Bacteria in Turbid and Polluted Waters,
W77-08606 5C

BALTIMORE CANYON
Wave Refraction Diagrams for the Baltimore Canyon Region of the Mid-Atlantic Continental Shelf Computed by Using Three Bottom Topography Approximation Techniques,
W77-08912 2L

BALTIMORE HARBOR (MD)
Trace Element Inventory for the Northern Chesapeake Bay with Emphasis on the Influence of Man,
W77-08704 5C

BARCELONETA (PUERTO RICO)
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

BARGES
Sinkage and Resistance for Ships in Channels,
W77-08873 8B

BARNACLES
Methylmercury Induced Injury of Single Barnacle Muscle Fibers,
W77-08700 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

Behavioral Studies on Chemoreception in Balanus hameri,
W77-08799 5C

BARRIERS
Barrier for Water Carried Pollutants,
W77-08878 5G

Skimmer Fence,
W77-08893 5G

BASAL SLIDING
An Experimental Study of the Motion of Ice Past Obstacles by the Process of Regelation,
W77-09033 2C

BASE FLOW
Ground Water Budget of the Mountainous Regions of Hungary, (In Hungarian),
W77-08663 2F

BASELINE STUDIES
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

A Conceptual Representation of the New York Bight Ecosystem,
W77-08900 5B

N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

Cooperative Gulf of Mexico Estuarine Inventory and Study--Texas: Area Description,
W77-08916 2L

An Examination of Some Physical and Biological Impacts of Dredging in Estuaries,
W77-08918 5C

Ocean Dumping in the United States - 1975, Third Annual Report of the Environmental Protection Agency on the Administration of Title I of the Marine Protection, Research, and Sanctuaries Act of 1972, as Amended.
W77-08919 5B

BASIC DATA COLLECTIONS
Chippewa Flowage Investigations. Part 3A: Appendixes.
W77-08726 6B

Chippewa Flowage Investigations. Part 3B: Appendixes.
W77-08727 6B

BAYESIAN STATISTICS
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6G

BAYS
Biscayne Bay Symposium II,
W77-08961 5G

BEACH EROSION
Means and Method for Controlling Beach and Sandbar Erosion,
W77-08894 8B

BEACHES
Grain-Size Parameters of Insoluble Residues in Mixxed Terrigenous-Skeletal Carbonate Sediments and Sedimentary Rocks: Some New Zealand Examples,
W77-08848 2L

Means and Method for Controlling Beach and Sandbar Erosion,
W77-08894 8B

A Rational National Policy on Public Use of the Beaches,
W77-08976 6E

Beach Sand Transport: Distribution and Total Drift,
W77-09019 2L

BED LOAD
Effect of Sediment Load on Stable Sand Canal Dimensions,
W77-09020 8B

BEHAVIOR
The Structural Analysis of Environmental Perception and Cognition: A Multidimensional Scaling Approach,
W77-08722 6B

BEHAVIORAL RESPONSES
Physiological and Behavioral Reactions of Fishes to Temperature Change,
W77-08802 5C

BEHAVIORAL TOXICOLOGY
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

BENDING
Research Benefits in Water Resources Construction,
W77-08858 6B

BENEFITS
Research Benefits in Water Resources Construction,
W77-08858 6B

Incidence of the Benefits and Costs of Environmental Programs,
W77-08870 6G

Analysis of Supply and Demand of Urban Oriented Nonreservoir Recreation.
W77-08871 6B

BENTHIC FAUNA
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

Qualitative and Quantitative Changes in the Benthic Fauna of a Trout Stream, the Couze Pavin Puy-De-Dome, Caused by Agricultural and Urban Pollution, (In French),
W77-08955 5C

Effects of Primary Sewage Effluent from the City of Willimantic on the Benthic Invertebrate Fauna of the Willimantic/Shetucket Rivers,
W77-09093 5C

BENTHIC INSECT COMMUNITIES
Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

BENTHIC MACROINVERTEBRATES
New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

BENTHOS
Density and Distribution of Benthos in Lake Keowee, South Carolina,
W77-08818 5C

Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

Benthic Macroinvertebrates as Indexes of Water Quality in the Scioto River Basin, Ohio,
W77-08925 5A

BENZIMIDAZOLE
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

BERKELEY COUNTY (W VA)
Ground-Water Hydrology of Berkeley County, West Virginia,
W77-09083 4B

BERMUDA GRASS
Performance Characteristics of a Grassed-Waterway Transition,
W77-08849 4D

BERNALILLO AREA (N MEX)
Trap-Efficiency Investigation Bernalillo Floodwater Retarding Reservoir No. 1 (Piedra Lisa Arroyo) Near Bernalillo, New Mexico, Water Years 1956-1974,
W77-08741 4D

BIBLIOGRAPHIES
Compilation of Temperature Preference Data,
W77-08767 7C

BICARBONATES
The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

BIG CREEK BASIN
Floods in the Big Creek Basin, Linn County, Iowa,
W77-08731 2E

BINGHAM NUMBER
Flow Regimes in Debris Flow,
W77-09045 2J

BIOACCUMULATION
Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

BIOASSAY
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

BIOASSAY

Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

The Accumulation of Polybominated Biphenyls by Fish,
W77-08777 5C

Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichtys olivaceus, (In Japanese),
W77-08782 5C

Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

Effects of Temperature and Kelthane on Grass Shrimp,
W77-08874 5C

Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

BIOASSAYS

A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

BIOCHEMICAL OXYGEN DEMAND

Systematic Identification of DO-BOD Model Structure,
W77-08866 5B

Role of Nitrogen in Activated Sludge Process,
W77-08869 5D

Enzymatic Treatment of Dairy Effluents,
W77-08937 5D

BIOCHEMISTRY

A Certain Marine Catenate Dinoflagellate Tentatively Applied for Detecting Carcinogens,
W77-08795 5A

BIOCIDES

Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

BIOCONCENTRATION

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

BIODEGRADATION

Rational Design of Aerobic Digestion Systems,
W77-08643 5D

The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

A Biodegradation of Oil on Water Surfaces,
W77-08909 5G

BIOINDICATORS

Mussels (Mytilus Sp.) as an Indicator of Lead Pollution,
W77-08693 5C

The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connectituct Rivers,
W77-08814 5B

Benthic Macroinvertebrates as Indexes of Water Quality in the Scioto River Basin, Ohio,
W77-08925 5A

BIOLOGICAL COMMUNITIES

Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

BIOLOGICAL STRESSORS

Effects of a Parasite, Eubothrium salvelini (Cestoda: Pseudophyllidea), on the Resistance of Juvenile Sockeye Salmon, Oncorhynchus nerka, to Zinc,
W77-08791 5C

BIOLOGICAL TREATMENT

The Use of Packed Beds in Water Pollution Control,
W77-08637 5D

Sludge Treatment: Problems and Solutions, Part 1,
W77-08640 5D

BIOMASS

Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

The Effect of Warm Effluent from the Novorossiysk Thermal Power Plan on Zooplankton,
W77-08804 5C

Effects of Primary Treated and Biologically Stabilized Kraft Mill Effluents on the Production, Biomass and Growth Rates of Juvenile Salmonids in Three Stream Channels,
W77-08921 5C

Zooplankton Development in Intensively Exploited Fishery Ponds, (In Russian),
W77-08945 2I

BIOTA

A Comparison of Methods of Hydrocarbon Analysis of Marine Biota,
W77-08789 5A

BISCAYNE AQUIFER (FLA)

Simulations of Water-Level Drawdowns in Proposed Well-Field Areas, Dade County, Florida,
W77-08739 4B

BISCAYNE BAY (FLA)

Biscayne Bay Symposium II,
W77-08961 5G

BITUMINOIDS

Bituminoid Formation in the Mud Sediments of Domestic Sewage, (In Russian),
W77-08618 5A

BLACK RIVER (NY)

Time-of-Travel Study, Black River from Lyons Falls to Dexter, New York,
W77-08747 4A

BLACK SEA

The Effect of Warm Effluent from the Novorossiysk Thermal Power Plan on Zooplankton,
W77-08804 5C

BLACKFLY LARVICIDE

Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

BLEACHED KRAFT MILL EFFLUENT

Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

BLEACHED KRAFT PULPMILL EFFLUENT

Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

BLOOD SUGAR BIOASSAY

Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

LIBRARY U. OF I. URBANA-CHAMPAIGN

BLOOD SUGAR LEVELS
Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

BOREHOLE CAMERAS
Multi-Shot Camera System for Borehole Surveying.
W77-08668 8G

BOREHOLE GEOPHYSICS
Geologic Data from Test Drilling in Palm Beach County, Florida Since 1970,
W77-09073 7C

BOTTOM SEDIMENTS
Bituminoid Formation in the Mud Sediments of Domestic Sewage, (In Russian),
W77-08618 5A

Reactions in the Aqueous Environment of Low Molecular Weight Organic Molecules,
W77-08754 5B

BOUNDARIES (SURFACES)
Numerical Solution for Flow Under Sluice Gates,
W77-09012 8B

Shape of a Streamline Water Table Near Inflow and Outflow Boundaries,
W77-09023 2F

Flood-Plain Delineation for Difficult Run Basin, Fairfax County, Virginia,
W77-09071 4C

BOUNDARY LAYERS
Flow Regimes in Debris Flow,
W77-09045 2J

BOUNDARY (PROPERTY)
Florida's Sovereignty Submerged Lands: What Are They, Who Owns Them and Where is the Boundary,
W77-08951 6E

BOUNDARY WATERS (CANADA-US)
The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

BP 1100X
Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

BRACKISH WATER
Water Resources and Water Utilization in Israel,
W77-09011 6E

Artificial Recharge to a Freshwater-Sensitive Brackish-Water Sand Aquifer, Norfolk, Virginia,
W77-09066 4B

BRAZOS-LITTLE RIVER SYSTEM (TEXAS)
Coupled Dynamic Streamflow-Temperature Models,
W77-09014 2E

BREAM
Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

BROMINE
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

The Accumulation of Polybominated Biphenyls by Fish,
W77-08777 5C

BUFFALO CREEK (NB)
Special Flood Hazard Report: Buffalo Creek, Meadow Grove, Nebraska.
W77-08616 4A

BUOYANCY
Mean Behavior of Buoyant Jets in a Crossflow
W77-09013 8B

CABOT STRAIT (CANADA)
Oceanographic Features, Currents, and Transport in Cabot Strait,
W77-08851 2L

CADMIUM
Effects of Mercury, Cadmium, and Lead Salts on Regeneration and Ecdysis in the Fiddler Crab, UCA Pugilator,
W77-08702 5C

The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

CALCIUM COMPOUNDS
Removal of Fluorine from Waste Waters. III. Fundamental Tests with Chemical Reagents (Haisuichu no fusso jokyo nikansuru kenkyu. III. Shiyaku kei niyoru kisoshiken),
W77-08626 5D

CALIFORNIA
Flood Plain Information: Llagas Creek Unit I, Including Edmundson (Little Llagas), Church, San Martin, New, Center, Corralitos, Tennant, Maple, and Foothill Creeks, Santa Clara County, California.
W77-08620 4A

Economics of Geothermal Energy Development (In Imperial County, California),
W77-08657 8C

Guide for Data Collection to Calibrate a Predictive Digital Ground-Water Model of the Unconfined Aquifer in and Near the City of Modesto, California,
W77-08735 2F

Analysis of Supply and Demand of Urban Oriented Nonreservoir Recreation.
W77-08871 6B

N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

Legal Battles on the California Coast: A Review of the Rules,
W77-08963 6E

Porter--Cologne Water Quality Control Act.
W77-08978 6E

Almeda County Water District V Niles Sand and Gravel Company, Inc. (Use of Correlative Rights Doctrine to Defeat Claim of Inverse Condemnation),
W77-08991 6E

Homeowners Emergency Life Protection Committee V. Lynn (Enjoining of Major Federal Activity with Alleged Inadequate Environmental Impact Statement).
W77-09003 6E

Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

CALIFORNIA COASTAL ACT
Legal Battles on the California Coast: A Review of the Rules,
W77-08963 6E

CALLINECTES
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

CANADA
Sewage Sludge Incineration Should Be Improved by Addition of Newsprint Pulp.
W77-08639 5E

The Distribution of Trace Metals in the Western North Atlantic Off Nova Scotia,
W77-08703 5B

The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

Seasonal Variations in the Impact of Suburban Development on Runoff Response: Peterborough, Ontario,
W77-08831 4C

Oceanographic Features, Currents, and Transport in Cabot Strait,
W77-08851 2L

CANAL CONSTRUCTION
Florida's Barge Canal Prospects for the Future,
W77-08964 4A

CANAL DESIGN
Florida's Barge Canal Prospects for the Future,
W77-08964 4A

CANALS
Florida's Barge Canal Prospects for the Future,
W77-08964 4A

Effect of Sediment Load on Stable Sand Canal Dimensions,
W77-09020 8B

CARASSIUS
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

CARBON
Carbon Isotopic Study of the Fate of Landfill Leachate in Groundwater,
W77-08670 5B

CARCINOGENS
A Certain Marine Catenate Dinoflagellate Tentatively Applied for Detecting Carcinogens,
W77-08795 5A

CARIBBEAN SEA
A Mathematical Model Study of Fresh-Water Lenses,
W77-08837 2F

CARRYING CAPACITY
Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

CASPIAN SEA
Role of River Runoff and of Water Exchange in the Salinity of the Northern Caspian Sea,
W77-08836 2H

CATFISH
Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

CATION ADSORPTION
Experimental Study of Multi-Cation Diffusion in an Artifical Quartz Sandstone,
W77-08811 2K

CAVITATION
Avoiding the Perils of Cavitation,
W77-08674 8C

CEDAR RAPIDS (IA)
Flood Plain Information Report, Indian and Dry Creeks, Linn County, Iowa.
W77-08617 4A

CEMENT-MUD SPACERS
Cement-Mud Spacer System Improves Illinois Wells,
W77-08647 8F

CEMENTS
Cement-Mud Spacer System Improves Illinois Wells,
W77-08647 8F

Specialty Cements Can Solve Special Problems,
W77-08664 8F

Additives Tailor Cement to Individual Wells,
W77-08665 8F

CENTRIFUGATION
Dewatering Chemical-Primary Sludges,
W77-08865 5D

CESIUM
Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

CHANNEL CATFISH
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

CHANNEL EROSION
Designing for Sediment Transport,
W77-08962 4D

CHANNEL FLOW
Performance Characteristics of a Grassed-Waterway Transition,
W77-08849 4D

Roughness Effects on the Flow Direction Near Curved Stream Beds,
W77-09038 8B

CHANNEL IMPROVEMENT
Special Flood Hazard Report: Buffalo Creek, Meadow Grove, Nebraska.
W77-08616 4A

Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

Seasonal Patterns of Dissolved Oxygen, Nutrients, and Metals in Natural and Channelized Swamp Streams,
W77-08932 5B

CHANNELING
Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

CHANNELIZED STREAMS
Seasonal Patterns of Dissolved Oxygen, Nutrients, and Metals in Natural and Channelized Swamp Streams,
W77-08932 5B

CHANNELS
Economic Role of the Waterway in Western Europe,
W77-08860 4A

Sinkage and Resistance for Ships in Channels,
W77-08873 8B

CHEMICAL ANALYSIS
A Comparison of Methods of Hydrocarbon Analysis of Marine Biota,
W77-08789 5A

Chemical and Isotopic Investigations of Groundwater in Potential Geothermal Areas in Hawaii,
W77-09082 2K

CHEMICAL COMPOUNDS
Frequency of Organic Compounds Identified in Water,
W77-08944 5A

CHEMICAL OXYGEN DEMAND
Role of Nitrogen in Activated Sludge Process,
W77-08869 5D

CHEMICAL PROPERTIES
Chemical Character of Headwater Streams in Vermont and New Hampshire,
W77-09027 2K

Transjoen, A Groundwater Influenced Lake with Special Redox and Sulphate Conditions,
W77-09031 2H

CHEMICALS
Spill Penalties Draw Criticism,
W77-08973 6E

Toxic Pollutant Effluent Standards for Aldrin/Dieldrin, DDT, Endrin, and Toxaphene,
W77-08983 5G

CHEMISTRY OF PRECIPITATION
Atmospheric Sulfate Additions and Cation Leaching in a Douglas Fir Ecosystem,
W77-08822 2K

CHEMORECEPTION
Behavioral Studies on Chemoreception in Balanus hameri,
W77-08799 5C

CHESAPEAKE BAY
Trace Element Inventory for the Northern Chesapeake Bay with Emphasis on the Influence of Man,
W77-08704 5C

Effects of Economic Development on Water Resources,
W77-09051 5G

CHESTNUT CREEK (VIRGINIA)
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

CHIPPEWA FLOWAGE (WIS)
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

Chippewa Flowage Investigations. Part 3A: Appendixes.
W77-08726 6B

Chippewa Flowage Investigations. Part 3B: Appendixes.
W77-08727 6B

CHIPPEWA RIVER (WIS)
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

Chippewa Flowage Investigations. Part 3A: Appendixes.
W77-08726 6B

Chippewa Flowage Investigations. Part 3B: Appendixes.
W77-08727 6B

CHLORINATED HYDROCARBON PESTICIDES
Reactions in the Aqueous Environment of Low Molecular Weight Organic Molecules,
W77-08754 5B

Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

CHLORINATION
Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

The Effect of the Willimantic Sewage Treatment Plant on the Microflora and Metabolism of the Shetucket River,
W77-09094 5C

CHLORINE
Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

Photochemical Dechlorination of Water Supply for Fish Tanks with Commercial Water Sterilizers,
W77-08842 5F

CHLOROBIPHENYL
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

CHLOROPHYLL
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

LESKAN U. OF I. URBANA-CHAMPAIGN

CHROMATOGRAPHY
High Speed Liquid Chromatographic Analysis of Cobalamin Productivity and Distribution in Activated Sewage Sludge Treatment,
W77-08621 5A

CITY PLANNING
Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

CLAMS
Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

CLEAR-CUTTING
Clearcutting in Pennsylvania,
W77-08712 4C

Hydrologic Changes After Logging in Two Small Oregon Coastal Watersheds,
W77-08746 4C

CLIMATIC DATA
HISARS - Hydrologic Information Storage and Retrieval System - Reference Manual,
W77-08610 7C

COAST GUARD REGULATIONS
Control of Pollution by Oil and Hazardous Substances, Discharge Removal.
W77-08987 5G

COASTAL ENGINEERING
Surface Particle Orbits in Uniform Waves,
W77-08845 8B

Estimating Wave Generation on Restricted Fetches,
W77-09021 2L

Estimation of Winds Over the Great Lakes,
W77-09022 2H

COASTAL STRUCTURES
Site Evaluation and Preconstruction Testing at Potential Deepwater Port Locations.
W77-08989 6E

COASTAL WATERS
A Rational National Policy on Public Use of the Beaches,
W77-08976 6E

To Extend the Marine Protection, Research, and Sanctuaries Act (Hearing on S 3147 to Extend the Act 2 Years).
W77-08981 6E

Rykar V Gill (State's Refusal to Allow Upland Owner to Fill Adjacent Marshland Because of Owner's Access to Deep Water by Use of Wharfing Techniques),
W77-09005 6E

COASTAL WETLANDS
Wetlands Protection Under the Corps of Engineer's New Dredge and Fill Jurisdiction,
W77-08977 5G

COASTAL ZONE MANAGEMENT
Legal Battles on the California Coast: A Review of the Rules,
W77-08963 6E

A Rational National Policy on Public Use of the Beaches,
W77-08976 6E

COASTS
A Reconnaissance of the Hydrology of the Intracoastal Waterway from Bucksport to Little River Inlet, South Carolina,
W77-09077 2L

COBALT
The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

COD
Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

COHO SALMON
Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

COLIFORMS
Survival of Bacteria in Turbid and Polluted Waters,
W77-08606 5C

The Effect of the Willimantic Sewage Treatment Plant on the Microflora and Metabolism of the Shetucket River,
W77-09094 5C

COLLEGES
Water Resources Research Interests in the Colleges and Universities of North Carolina.
W77-08931 9A

COLORADO
Flood Hazard Information: Yampa River and Tributaries, Steamboat Springs, Colorado.
W77-08619 4A

Transport of Molybdenum in Mountainous Streams, Colorado,
W77-08705 5B

Evaporation from Seven Reservoirs in the Denver Water-Supply System, Central Colorado,
W77-08736 2D

Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

Segregation and Reclamation of Household Wastewater at an Individual Residence,
W77-08806 5D

Water-Level Records for the San Luis Valley of Colorado, 1973-77,
W77-09088 7C

COMMERCIAL FISH
Fish Fauna of Lakes of the Lower Reaches of the Zarafshan River and its Fishery Use, (In Russian),
W77-08708 2H

COMMUNITY LEADERS
Longitudinal Analysis of Change in Levels of Affiliation and Participation in Voluntary Formal Organizations,
W77-09058 6B

COMPARATIVE COSTS
Economics of Geothermal Energy Development (In Imperial County, California),
W77-08657 8C

COMPETING USES
Water-Use Leasing Act.
W77-09010 6E

COMPETITION
The Effect of Secondarily Treated Sewage on the Algal Populations of the Willimantic/Shetucket Rivers,
W77-09096 5C

COMPETITIVE BALANCE
The Effect of Secondarily Treated Sewage on the Algal Populations of the Willimantic/Shetucket Rivers,
W77-09096 5C

COMPOSTING
Composting Destroys Pathogens in Sewage Solids,
W77-08641 5E

COMPREHENSIVE PLANNING
The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

Section 208 and Section 303 Water Quality Planning and Management: Where is it Now,
W77-08949 5G

Molokai Irrigation and Water Utilization Project.
W77-09000 6E

COMPUTER MODELS
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

Some Computational Aspects of One- and Two-Dimensional Unsteady Flow Simulation by the Method of Characteristics,
W77-08745 2E

Reaeration and Velocity Prediction for Small Streams,
W77-08867 5B

Comparison of Remotely Sensed Continental-Shelf Wave Spectra with Spectra Computed by Using a Wave Refraction Computer Model,
W77-08911 2L

Wave Refraction Diagrams for the Baltimore Canyon Region of the Mid-Atlantic Continental Shelf Computed by Using Three Bottom Topography Approximation Techniques,
W77-08912 2L

Computer Modeling for the Prediction of Water Quality from Agricultural Drainage,
W77-08934 5B

Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

Coupled Dynamic Streamflow-Temperature Models,
W77-09014 2E

Ground Water Model for the Island of Anholt, Denmark,
W77-09030 2F

Computer Applications for Step-Backwater and Floodway Analyses,
W77-09090 4A

COMPUTER PROGRAMS
Development of a Hydrologic Information Storage and Retrieval System,
W77-08609 7C

Indiana Stream-Temperature Characteristics,
W77-08755 7C

Improved Methodology for Design and Operation of Water Distribution Systems, Part IV, Program Documentation,
W77-08941 4A

Prototype Software for On-Line Storage Forecasting Supported by Load Forecasting and Reduced System Representation for Water Distribution Systems,
W77-08942 7C

WATSIM - A Fortran Program for 24 Hour Simulation of Flows and Reservoir Fluctuations in Water Distribution Networks,
W77-08943 7C

Computer Applications for Step-Backwater and Floodway Analyses,
W77-09090 4A

COMPUTERS
Make Money by Computer,
W77-08730 5D

Pressure Reducing Valves in Pipe Network Analyses,
W77-08855 8B

CONCRETE
Polymerization of Concrete Fights Cavitation,
W77-09044 8F

CONDEMNATION
United States V 62.61 Acres of Land, More or Less, In City of Virginia Beach, Commonwealth of Virginia (A Compensable Property Right as Might Exist in a Wharf or Pier will not be Found in a Jetty Constructed in Navigable Waters),
W77-08990 6E

Almeda County Water District V Niles Sand and Gravel Company, Inc. (Use of Correlative Rights Doctrine to Defeat Claim of Inverse Condemnation),
W77-08991 6E

CONFERENCES
Thermal and Chemical Problems of Thermal Waters, Symposium.
W77-08677 2K

Proceedings: The Connecticut River System: A Workshop on Research Needs and Priorities.
W77-08808 6B

Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

CONGRESSIONAL HEARINGS
To Extend the Marine Protection, Research, and Sanctuaries Act (Hearing on S 3147 to Extend the Act 2 Years).
W77-08981 6E

Amend the Merchant Marine Act of 1920 (Hearings on S 2422 to Include the Virgin Islands Within the Scope of the Act With Respect to Transportation of Oil and Oil Products).
W77-08982 6E

CONJUNCTIVE USE
Surface-Groundwater Interactions and the Conjunctive Use of the Water Resources of the Mullica River Basin, New Jersey,
W77-08810 4B

CONNECTICUT
Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connectituct Rivers,
W77-08814 5B

Mianus River Preservation Committee V. Administrator, Environmental Protection Agency (Jurisdiction of Federal Appeals Court for Permits Issued by State Agency Under NPDES).
W77-09001 6E

Rykar V Gill (State's Refusal to Allow Upland Owner to Fill Adjacent Marshland Because of Owner's Access to Deep Water by Use of Wharfing Techniques),
W77-09005 6E

Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

Effects of Primary Sewage Effluent from the City of Willimantic on the Benthic Invertebrate Fauna of the Willimantic/Shetucket Rivers,
W77-09093 5C

The Effect of the Willimantic Sewage Treatment Plant on the Microflora and Metabolism of the Shetucket River,
W77-09094 5C

The Effect of Secondarily Treated Sewage on the Algal Populations of the Willimantic/Shetucket Rivers,
W77-09096 5C

CONNECTICUT RIVER
Proceedings: The Connecticut River System: A Workshop on Research Needs and Priorities.
W77-08808 6B

CONSTANT TEMPERATURE TEST
Optimal Temperature for Growth of Juvenile Bluegills,
W77-08798 5C

CONSTITUTIONAL LAW
Rykar V Gill (State's Refusal to Allow Upland Owner to Fill Adjacent Marshland Because of Owner's Access to Deep Water by Use of Wharfing Techniques),
W77-09005 6E

CONTIGUOUS ZONE
A Rational National Policy on Public Use of the Beaches,
W77-08976 6E

CONTINENTAL SHELF
Comparison of Remotely Sensed Continental-Shelf Wave Spectra with Spectra Computed by Using a Wave Refraction Computer Model,
W77-08911 2L

Wave Refraction Diagrams for the Baltimore Canyon Region of the Mid-Atlantic Continental Shelf Computed by Using Three Bottom Topography Approximation Techniques,
W77-08912 2L

As an Incident of National Sovereignty, th United States Has Paramount Rights an Power in the Seabed and Subsoil of the Out Continental Shelf,
W77-08974 6

Preliminary Summary of the 1976 Atlantic Ma gin Coring Project of the U.S. Geological Su vey,
W77-09089 2

CONTINUITY EQUATION
Surface-Groundwater Interactions and the Co junctive Use of the Water Resources of th Mullica River Basin, New Jersey,
W77-08810 4

CONTINUOUS FLOW
Effects of Temperature and Kelthane on Gra Shrimp,
W77-08874 5

CONTROL STRUCTURES
Flood Plain Information: Albuquerque A royas, Part V, Albuquerque, New Mexico.
W77-08611 4

CONTROL SYSTEMS
WATSIM - A Fortran Program for 24 Hou Simulation of Flows and Reservoir Fluctu tions in Water Distribution Networks,
W77-08943 7

COOLING WATER
Harbor and Nearshore Currents, Oswego Ha bor, New York,
W77-08913 2

COOPERATIVE WATER-STUDIES PROGRAM
Water-Resources Investigations in Kentucky 1976.
W77-09078 7

Water-Resources Investigations in Wisconsi 1976.
W77-09079 7

COPEPODS
Effects of a Spill of Marine Diesel Oil on th Meiofauna of a Sandy Beach at Picnic Bay Hong Kong,
W77-08760 5

The Effect of Warm Effluent from th Novorossiysk Thermal Power Plan o Zooplankton,
W77-08804 5

COPPER
Algal Uptake of Copper from Compounds an Its Effect on Salt Metabolism in Algae,
W77-08792 5

Production and Heavy Metal Concentration o Vascular Aquatic Macrophytes in Three Eas ern Connectituct Rivers,
W77-08814 5

CORE ANALYSES
Report on Preliminary Data for Madiso Limestone Test Well No. 1, NE1/4SE1/4 Se 15, T. 57 N., R. 65 W., Crook County, Wyom ing,
W77-09072 4

CORE DRILLING
Preliminary Summary of the 1976 Atlantic Ma gin Coring Project of the U.S. Geological Su vey,
W77-09089 2

LIBRARY OF THE UNIVERSITY OF ILLINOIS

CORE LOGGING
Preliminary Summary of the 1976 Atlantic Margin Coring Project of the U.S. Geological Survey,
W77-09089 2L

CORES
Study of an Ice Core to the Bedrock in the Accumulation Zone of an Alpine Glacier,
W77-08846 2C

COST-BENEFIT ANALYSIS
Recreational Water Resources Problems.
W77-08711 6B

Economics of Permanent Flood-Plain Evacuation,
W77-08856 6B

COST SHARING
User Charges in Inland Navigation Policy,
W77-08604 6C

COSTS
Pretreatment Helps Niagara Cut Costs,
W77-08633 5D

Make Money by Computer,
W77-08730 5D

Economic Evaluation of Idaho's Water Supply,
W77-08816 6B

Water Supply Economics,
W77-08863 6B

Incidence of the Benefits and Costs of Environmental Programs,
W77-08870 6G

COTTONTAIL RABBITS
Population Response and Heavy Metal Concentrations in Cottontail Rabbits and Small Mammals in Wastewater Irrigated Habitats,
W77-09097 5B

COUNTY PLANNING
Integrated Evaluation Programs for Fairfax County, Va.,
W77-08862 6B

CRABS
Effects of Mercury, Cadmium, and Lead Salts on Regeneration and Ecdysis in the Fiddler Crab, UCA Pugilator,
W77-08702 5C

Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

CROP PRODUCTION
Evaluation of Wheat Plants with Regard to Drought- and Heat-Resistance Under Field Conditions, (In Russian),
W77-08877 3F

CROP RESPONSE
Distribution of Corn Roots in Sandy Soil with a Declining Water Table,
W77-08676 2I

Effects of Treated Municipal Wastewater and Commercial Fertilizer on Growth, Fiber, Acid-Soluble Nucleotides, Protein and Amino Acid Content in Wheat Hay,
W77-08876 5C

CROSSFLOW
Mean Behavior of Buoyant Jets in a Crossflow
W77-09013 8B

CRUDE OIL
Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

CRUSTACEANS
Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

CUBIC CURVED TRIANGULAR ELEMENTS
Numerical Solution for Flow Under Sluice Gates,
W77-09012 8B

CULTURES
Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

CULVERTS
Predicting Performance of Pipe Culverts Buried in Soil,
W77-08622 8B

CURDE OIL
Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

CURRENT METERS
Current-Meter Recordings of Low-Speed Turbidity Currents,
W77-08847 2L

A Review of Velocity-Measuring Devices,
W77-09085 7B

CURRENTS (WATER)
Current-Meter Recordings of Low-Speed Turbidity Currents,
W77-08847 2L

Oceanographic Features, Currents, and Transport in Cabot Strait,
W77-08851 2L

The Third London Airport Study,
W77-09037 2L

CURRENTS (WATER WAVES)
Harbor and Nearshore Currents, Oswego Harbor, New York,
W77-08913 2L

CURVED FLOW
A Mathematical Model of Steady Flow in Curved Shallow Channels,
W77-09036 8B

CURVED STREAM BEDS
Roughness Effects on the Flow Direction Near Curved Stream Beds,
W77-09038 8B

CYANOPHYTA
Biologically Active Metabolites of Blue-Green Algae and Their Effect on Experimental Animals, (In Russian),
W77-08749 5C

Physical and Chemical Parameters Associated with Phytoplankton Abundance and Periodicity in a Fertilized Fish Pond,
W77-08922 5C

CYCLICITY
Point Stochastic Analysis of Daily Rainfall Occurrence with Application to Indiana,
W77-08935 2B

CYPRUS
Hydrothermal Fluids of Seawater Salinity in Ophiolitic Sulphide Ore Deposits in Cyprus,
W77-08854 2L

CYTOLOGICAL STUDIES
Neoplastic and Possibly Related Skin Lesions in Neotenic Tiger Salamanders from a Sewage Lagoon,
W77-08729 5C

CZECHOSLOVAKIA
Results of a Microbiological Investigation of the Danube River by One Point Profile (1969-1971), (In German),
W77-08694 5B

DAIRY INDUSTRY
Enzymatic Treatment of Dairy Effluents,
W77-08937 5D

DAMAGE
Economics of Permanent Flood-Plain Evacuation,
W77-08856 6B

DAMAGES
Avoiding the Perils of Cavitation,
W77-08674 8C

DAMS
Flood Plain Information: Ohio River, Lawrence County, Ohio.
W77-08614 4A

Flood Plain Information: Ashuelot River, City of Keene, New Hampshire.
W77-08615 4A

Load Transfer and Hydraulic Fracturing in Zoned Dams,
W77-08857 8B

Homeowners Emergency Life Protection Committee V. Lynn (Enjoining of Major Federal Activity with Alleged Inadequate Environmental Impact Statement).
W77-09003 6E

Polymerization of Concrete Fights Cavitation,
W77-09044 8F

DANUBE RIVER
Results of a Microbiological Investigation of the Danube River by One Point Profile (1969-1971), (In German),
W77-08694 5B

Dispersion Measurement on the Danube,
W77-09040 5B

DAPHNIA ZOOPLANKTON
Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

DARCYS LAW
Surface-Groundwater Interactions and the Conjunctive Use of the Water Resources of the Mullica River Basin, New Jersey,
W77-08810 4B

DATA COLLECTION
Observation Records of Ground Water Level, (In Japanese),
W77-08904 4B

DATA COLLECTIONS
Records of Wells, Water-Level Measurements, and Drillers' Logs, Red River Valley, Louisiana,
W77-08734 7C

Indiana Stream-Temperature Characteristics,
W77-08755 7C

Compilation of Temperature Preference Data,
W77-08767 7C

Environmental Planning for an Alaskan Water-Oriented Recreation Area,
W77-08805 6B

Frequency of Organic Compounds Identified in Water,
W77-08944 5A

DATA STORAGE AND RETRIEVAL
HISARS - Hydrologic Information Storage and Retrieval System - Reference Manual,
W77-08610 7C

Frequency of Organic Compounds Identified in Water,
W77-08944 5A

DDT
Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

DEBRIS FLOW
Flow Regimes in Debris Flow,
W77-09045 2J

DECENTRALIZATION
Water Supply Economics,
W77-08863 6B

DECHLORINATION
Photochemical Dechlorination of Water Supply for Fish Tanks with Commercial Water Sterilizers,
W77-08842 5F

DECISION THEORY
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6G

DECISION UTILITY THEORY
Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

DECOMPOSING ORGANIC MATTER
Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

Species Differences in Breakdown of Tree Leaves in Streams--Significance for Composition of Stream Communities,
W77-09056 5B

DEEP WATER
Rykar V Gill (State's Refusal to Allow Upland Owner to Fill Adjacent Marshland Because of Owner's Access to Deep Water by Use of Wharfing Techniques),
W77-09005 6E

DEEP-WELL TURBINE PUMPS
Water Turbine Pump Failure,
W77-08656 8G

DEEPWATER PORT ACT OF 1974
Site Evaluation and Preconstruction Testing at Potential Deepwater Port Locations.
W77-08989 6E

DEEPWATER PORTS
Site Evaluation and Preconstruction Testing at Potential Deepwater Port Locations.
W77-08989 6E

DEER
Deer Habitat Response to Irrigation with Municipal Wastewater,
W77-09099 5C

DEER HABITAT
Deer Habitat Response to Irrigation with Municipal Wastewater,
W77-09099 5C

DEFOLIANTS
Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

DENITRIFICATION
N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

DENMARK
Ground Water Model for the Island of Anholt, Denmark,
W77-09030 2F

DENSITY CURRENTS
Density Currents and Their Applications,
W77-08844 5B

DEPOSITION (SEDIMENTS)
Grain-Size Parameters of Insoluble Residues in Mixxed Terrigenous-Skeletal Carbonate Sediments and Sedimentary Rocks: Some New Zealand Examples,
W77-08848 2L

DEPTH
New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

DESIGN
A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

DESIGN CRITERIA
The Use of Packed Beds in Water Pollution Control,
W77-08637 5D

Rational Design of Aerobic Digestion Systems,
W77-08643 5D

Designing for Sediment Transport,
W77-08962 4D

DETENTION BASINS
Design Efficiency of Stormwater Detention Basins,
W77-08841 4D

DETENTION RESERVOIRS
Design Efficiency of Stormwater Detention Basins,
W77-08841 4D

DEVELOPING NATIONS
Sewage Treatment in Developing Countries,
W77-08635 5D

DEWATERING
Dewatering Chemical-Primary Sludges,
W77-08865 5

Hydrologic Considerations in Dewatering an Refilling Lake Carlton, Orange and Lake Cou ties, Florida,
W77-09080 5

DIBROMOPROPANE
Experimental Data on the Regulation of 1, Dibromopropane in Reservoir Water, (In Ru sian),
W77-08718 5

DIELDRIN
Concentrations of PCBs, Dieldrin and DD Residues in Marine Animals from Liverpo Bay,
W77-08788 5

DIFFUSION
Snowmelt: A Two-Dimensional Turbulent Di fusion Model,
W77-08823 2

Thermal Loading of Natural Streams,
W77-09068 5

DIFFUSIVITY
Flow Characteristics During Infiltration into Horizontal Sand Column,
W77-08826 2

DIPTERA
Density and Distribution of Benthos in Lak Keowee, South Carolina,
W77-08818 5

Chironomid Fauna of the Upper Course of th Iseti River, (In Russian),
W77-09048 5

DIRECT FILTRATION
Influence of Initial Mixing on Direct Filtration
W77-08809 5

Direct Filtration of Lake Michigan Water,
W77-08812 5

DISCHARGE MEASUREMENT
A Review of Velocity-Measuring Devices,
W77-09085 7

DISEASES
A Study of Heavy Metals in Lake Abbaya Ethiopia, and the Incidence of Non-Parasiti Elephantiasis,
W77-08774 5A

DISINFECTION
Ozone Disinfection of Secondary Effluent,
W77-08638 5

DISPERSION
Simulation of Pollutant Movement in Ground water Aquifers,
W77-08807 5

Detergent Composition for Dispersing Oi Spills,
W77-08884 5

Mean Behavior of Buoyant Jets in a Crossflow
W77-09013 8

Dispersion Measurement on the Danube,
W77-09040 5

DISSOLVED CONSTITUENTS
Chemical Character of Headwater Streams in Vermont and New Hampshire,
W77-09027 2K

DISSOLVED ORGANIC CARBON
The Effect of the Willimantic Sewage Treatment Plant on the Microflora and Metabolism of the Shetucket River,
W77-09094 5C

DISSOLVED OXYGEN
Effect of the Boundary Surface Between Sea and Fresh Waters on the Distribution of Dissolved Oxygen in the Mouth Region of the Dnieper River,
W77-08832 5B

Systematic Identification of DO-BOD Model Structure,
W77-08866 5B

Reaeration and Velocity Prediction for Small Streams,
W77-08867 5B

Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

Seasonal Patterns of Dissolved Oxygen, Nutrients, and Metals in Natural and Channelized Swamp Streams,
W77-08932 5B

Hyperoxygen Concentrations in the Hypolimnion Produced by Injection of Liquid Oxygen,
W77-09028 5G

DISSOLVED SOLIDS
The Behaviour of Dissolved Iron, Manganese and Zinc in the Beaulieu Estuary, S. England,
W77-08701 5B

DISTRIBUTION
Thermal and Chemical Problems of Thermal Waters, Symposium.
W77-08677 2K

Temperature and Chemism of Ground Waters in the Western Areas of the East European Platform,
W77-08683 2K

The Distribution of Trace Metals in the Western North Atlantic Off Nova Scotia,
W77-08703 5B

Density and Distribution of Benthos in Lake Keowee, South Carolina,
W77-08818 5C

DISTRIBUTION PATTERNS
Multivariate Distributions in Hydrology and River Regulation,
W77-09029 2E

DISTRIBUTION SYSTEMS
Irrigation Sprinkling Apparatus with Adjustable Ground Contacting Elements,
W77-08886 3F

Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

WATSIM - A Fortran Program for 24 Hour Simulation of Flows and Reservoir Fluctuations in Water Distribution Networks,
W77-08943 7C

DIURNAL DISTRIBUTION
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

DNIEPER RIVER
Effect of the Boundary Surface Between Sea and Fresh Waters on the Distribution of Dissolved Oxygen in the Mouth Region of the Dnieper River,
W77-08832 5B

DOCUMENTATION
Chippewa Flowage Investigations. Part 3A: Appendixes.
W77-08726 6B

Chippewa Flowage Investigations. Part 3B: Appendixes.
W77-08727 6B

DOMESTIC WASTES
Solid Waste Management: A Test of Alternative Strategies Using Optimization Techniques,
W77-08723 5E

Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

DOMESTIC WATER
Get Ready for Dual Water Systems,
W77-08645 5G

The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

Segregation and Reclamation of Household Wastewater at an Individual Residence,
W77-08806 5D

Soil and Rock Strata to Trap, Filter and Store Water for Rural Domestic use,
W77-08821 3B

DRAG
Drag and Inertia Forces on a Cylinder in Periodic Flow,
W77-09017 8B

DRAINAGE
The Effect of Surcharging on Discharge Through a Pipe,
W77-08644 8B

Network Characteristics in Suburbanizing Streams,
W77-08830 4C

Computer Modeling for the Prediction of Water Quality from Agricultural Drainage,
W77-08934 5B

DRAINAGE EFFECTS
Seasonal Variations in the Impact of Suburban Development on Runoff Response: Peterborough, Ontario,
W77-08831 4C

DRAWDOWN
Simulations of Water-Level Drawdowns in Proposed Well-Field Areas, Dade County, Florida,
W77-08739 4B

DREDGING
Wetlands Protection Under the Corps of Engineer's New Dredge and Fill Jurisdiction,
W77-08977 5G

Analyses of Native Water, Bed Material, and Elutriate Samples of Major Louisiana Water Waterways, 1975,
W77-09084 5A

DRILL BITS
Diamond Composites Used in New Bits.
W77-08651 8G

DRILL STRING MAKEUP
Drill String Makeup, Past, Present, Future,
W77-08648 8C

DRILLERS LOGS
Records of Wells, Water-Level Measurements, and Drillers' Logs, Red River Valley, Louisiana,
W77-08734 7C

DRILLING
Methods Used for Drilling Wells in the Soviet Union,
W77-08659 8C

Geothermal Energy Development,
W77-08661 4B

Specialty Cements Can Solve Special Problems,
W77-08664 8F

DRILLING EQUIPMENT
Recent Advances in Rotary Drill Bits,
W77-08649 8G

Diamond Composites Used in New Bits.
W77-08651 8G

Methods Used for Drilling Wells in the Soviet Union,
W77-08659 8C

Rock Type Decides Jetting Economics,
W77-08666 8C

Tests Show Jet-Drilling Hard Rock Potential,
W77-08667 8E

Air, Mist and Foam Drilling, A Look at Latest Techniques,
W77-08669 8C

DRILLING FLUIDS
Cement-Mud Spacer System Improves Illinois Wells,
W77-08647 8F

Selection of Slurry Pumps for Severe Applications,
W77-08673 8C

DROUGHT RESISTANCE
Evaluation of Wheat Plants with Regard to Drought- and Heat-Resistance Under Field Conditions, (In Russian),
W77-08877 3F

DROUGHT TOLERANCE
Evaluation of Wheat Plants with Regard to Drought- and Heat-Resistance Under Field Conditions, (In Russian),
W77-08877 3F

DRY AGGREGATE STRENGTH
Strength of Soil Aggregates: Influence of Size, Density and Clay and Organic Matter Content,
W77-08707 2G

DUAL WATER SUPPLY SYSTEMS
Get Ready for Dual Water Systems,
W77-08645 5G

DUKE SWAMP (NC)
Studies of the Fish Populations in Two Eastern North Carolina Swamp Streams,
W77-09062 2I

DUNE STABILIZATION
Dune Stabilization with Panicum Amarum Along the North Carolina Coast,
W77-08908 2L

DUNES
Dune Stabilization with Panicum Amarum Along the North Carolina Coast,
W77-08908 2L

Resistance of Two Dimensional Triangular Roughness,
W77-09035 8B

DWORSHAK DAM (IDAHO)
Polymerization of Concrete Fights Cavitation,
W77-09044 8F

DYE RELEASES
Time-of-Travel Study, Black River from Lyons Falls to Dexter, New York,
W77-08747 4A

Dispersion Measurement on the Danube,
W77-09040 5B

DYNAMIC STREAMFLOW
Coupled Dynamic Streamflow-Temperature Models,
W77-09014 2E

DYNAMICS
Systematic Identification of DO-BOD Model Structure,
W77-08866 5B

E COLI
Survival of Bacteria in Turbid and Polluted Waters,
W77-08606 5C

Results of a Microbiological Investigation of the Danube River by One Point Profile (1969-1971), (In German),
W77-08694 5B

EAGLE RIVER BASIN (COLO)
Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

EARTHQUAKES
Seismic Design of Liquid-Storage Tanks,
W77-08859 8D

EASEMENTS
A Rational National Policy on Public Use of the Beaches,
W77-08976 6E

ECOLOGICAL DISTRIBUTION
Expansion of the Range of Some Fish Species in Connection with Hydraulic Engineering Construction on the Volga and Acclimatization Works, (In Russian),
W77-08715 8I

ECONOMIC ANALYSIS
Economics of Permanent Flood-Plain Evacuation,
W77-08856 6B

Economic Role of the Waterway in Western Europe,
W77-08860 4A

ECONOMIC EFFICIENCY
Plant Size Influence on Performance in Activated Sludge Systems with Application to Regional Wastewater Treatment Planning,
W77-08928 5D

ECONOMIC IMPACT
Economic Evaluation of Idaho's Water Supply,
W77-08816 6B

Spill Penalties Draw Criticism,
W77-08973 6E

ECONOMICS
Water Supply Economics,
W77-08863 6B

Incidence of the Benefits and Costs of Environmental Programs,
W77-08870 6G

EPA Proposes Untimely Amendments,
W77-08970 5G

Effects of Economic Development on Water Resources,
W77-09051 5G

Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

ECONOMIES OF SCALE
Economic Evaluation of Idaho's Water Supply,
W77-08816 6B

ECOSYSTEMS
A Conceptual Representation of the New York Bight Ecosystem,
W77-08900 5B

Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

EDDY VISCOSITY
A Mathematical Model of Steady Flow in Curved Shallow Channels,
W77-09036 8B

EDISTO ESTUARY (SC)
A Reconnaissance of the Hydrology of the Edisto and Ashepoo Estuaries, South Carolina,
W77-09076 2L

EDMUNDSON CREEK (CA)
Flood Plain Information: Llagas Creek Unit I, Including Edmundson (Little Llagas), Church, San Martin, New, Center, Corralitos, Tennant, Maple, and Foothill Creeks, Santa Clara County, California.
W77-08620 4A

EDWARDS AQUIFER
Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

EELS
Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

EFFECTS
Effect of Agricultural and Silvicultural Practices on the Runoff from Drainage Basins of the Nizhnedevitskaya Hydrologic Station,
W77-08835 4C

EFFLUENT LIMITATIONS
Complying with Discharge Regulations,
W77-08954 5G

United States V. GAF Corporation: A Leak the FWPCA,
W77-08979 5

Effluent Guidelines and Standards for Fert izer Manufacturing Point Source Categor Urea and Ammonium Nitrate Subcategory.
W77-08984 5

Effluent Guidelines and Standards for Iron a Steel Manufacturing Point Source Category.
W77-08986 5

EFFLUENTS
Effects of Primary Treated and Biological Stabilized Kraft Mill Effluents on the Produ tion, Biomass and Growth Rates of Juveni Salmonids in Three Stream Channels,
W77-08921 5

Complying with Discharge Regulations,
W77-08954 5

Effluent Limitations and NPDES: Federal a State Implementation of the Federal Water Po lution Control Act Amendments of 1972,
W77-08956 5

Effluent Guidelines and Standards for Iron a Steel Manufacturing Point Source Category.
W77-08986 5

Modine Manufacturing Co V Pollution Contr Board of Illinois (Stream Reclassification a Effluent Variances Required by New Was Treatment Technology),
W77-09007 6

Preliminary Study of Wastewater Movement and Near Grand Teton National Park, Wyo ing, Through October 1976,
W77-09087 5

Population Response and Heavy Metal Conce trations in Cottontail Rabbits and Small Mam mals in Wastewater Irrigated Habitats,
W77-09097 5

ELECTRIC MOTOR FACE SEALS
Self-Pressurizing Seals Keep Submersible M tors Dry,
W77-08672 8

ELECTRIC MOTORS
Self-Pressurizing Seals Keep Submersible M tors Dry,
W77-08672 8

ELECTRIC POWER COSTS
A Case for Geothermal Energy,
W77-08655 8

Economics of Geothermal Energy Develop ment (In Imperial County, California),
W77-08657 8

ELECTRIC POWER PRODUCTION
A Case for Geothermal Energy,
W77-08655 8

Economics of Geothermal Energy Develop ment (In Imperial County, California),
W77-08657 8

ELECTRIC POWERPLANTS
Energy Plant Siting Legislation,
W77-09050 6

ELECTROCHEMISTRICAL STRIPPING
Electrochemical Determinations of Trac Quantities of Phosphate and Nitrate,
W77-08817 5A

ELECTRODES
Electrochemical Determinations of Trace Quantities of Phosphate and Nitrate,
W77-08817 5A

ELUTRIATE
Analyses of Native Water, Bed Material, and Elutriate Samples of Major Louisiana Water Waterways, 1975,
W77-09084 5A

EMBANKMENTS
Load Transfer and Hydraulic Fracturing in Zoned Dams,
W77-08857 8B

EMINENT DOMAIN
Almeda County Water District V Niles Sand and Gravel Company, Inc. (Use of Correlative Rights Doctrine to Defeat Claim of Inverse Condemnation),
W77-08991 6E

ENDOSULFAN
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

ENDOTHALL
Effects of Dipotassium Endothall on Rooted Aquatics and Adult and First Generation Bluegills,
W77-08785 5C

ENERGY
Today's Windmills: A Blend of Old and New,
W77-08650 8C

Ground Water - Solar Heat,
W77-08652 8C

Total Energy Use in an Urban-Agricultural Power Plant Complex,
W77-08691 5G

An Energy Accounting Evaluation of Several Alternatives for Hydropower and Geothermal Development,
W77-09057 6B

ENERGY CONSERVATION
Sludge Incineration,
W77-08717 5E

ENGINEERING
A Consultant's View of PL 92-500.
W77-08958 5G

ENVIRONMENT
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6G

ENVIRONMENT EVALUATION
Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

ENVIRONMENTAL CONTROL
Incidence of the Benefits and Costs of Environmental Programs,
W77-08870 6G

Homeowners Emergency Life Protection Committee V. Lynn (Enjoining of Major Federal Activity with Alleged Inadequate Environmental Impact Statement).
W77-09003 6E

Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

ENVIRONMENTAL EFFECTS
Recreational Water Resources Problems.
W77-08711 6B

Sludge Incineration,
W77-08717 5E

Hydrologic Changes After Logging in Two Small Oregon Coastal Watersheds,
W77-08746 4C

The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

A Conceptual Representation of the New York Bight Ecosystem,
W77-08900 5B

Analysis of Pollution from Marine Engines and Effects on the Environment.
W77-08902 5B

A Transient, Two-Dimensional, Discrete-Element, Far-Field Model for Thermal Impact Analysis of Power Plant Discharges in Coastal and Offshore Regions. Part I: General Description of the Mathematical Model and Results of an Application,
W77-08905 5B

N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

Cooperative Gulf of Mexico Estuarine Inventory and Study--Texas: Area Description,
W77-08916 2L

An Examination of Some Physical and Biological Impacts of Dredging in Estuaries,
W77-08918 5C

Ocean Dumping in the United States - 1975, Third Annual Report of the Environmental Protection Agency on the Administration of Title I of the Marine Protection, Research, and Sanctuaries Act of 1972, as Amended.
W77-08919 5B

Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

A Consultant's View of PL 92-500.
W77-08958 5G

Florida's Barge Canal Prospects for the Future,
W77-08964 4A

Analyses of Native Water, Bed Material, and Elutriate Samples of Major Louisiana Water Waterways, 1975,
W77-09084 5A

ENVIRONMENTAL ENGINEERING
A Consultant's View of PL 92-500.
W77-08958 5G

ENVIRONMENTAL IMPACT ASSESSMENT
Application of Temperature Preference Studies to Environmental Impact Assessment,
W77-08768 5C

ENVIRONMENTAL IMPACT STATEMENT
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6G

Site Evaluation and Preconstruction Testing at Potential Deepwater Port Locations.
W77-08989 6E

ENVIRONMENTAL IMPACT STATEMENT (EIS)
Homeowners Emergency Life Protection Committee V. Lynn (Enjoining of Major Federal Activity with Alleged Inadequate Environmental Impact Statement).
W77-09003 6E

ENVIRONMENTAL POLICY
Section 208 and Section 303 Water Quality Planning and Management: Where is it Now,
W77-08949 5G

ENZYMATIC TREATMENT
Enzymatic Treatment of Dairy Effluents,
W77-08937 5D

EQUATIONS
Integral Equation for the Description of Stream-Aquifer Interaction,
W77-09092 2F

EQUIPMENT
A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

EROSION
Flood Plain Information: Albuquerque Arroyas, Part V, Albuquerque, New Mexico.
W77-08611 4A

Present-Day Slumping and Erosion Phenomena on Irrigated Lands (Exemplified by Southeastern Ciscaucasia), (In Russian),
W77-08885 2J

Means and Method for Controlling Beach and Sandbar Erosion,
W77-08894 8B

EROSION CONTROL
Performance Characteristics of a Grassed-Waterway Transition,
W77-08849 4D

ESTIMATING
Analysis of Supply and Demand of Urban Oriented Nonreservoir Recreation.
W77-08871 6B

Nonlinear Estimation in Stream Quality Modeling,
W77-09047 5B

Optimal Estimation in Stream Quality Modeling,
W77-09052 5B

ESTUARIES
Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

Effect of the Boundary Surface Between Sea and Fresh Waters on the Distribution of Dissolved Oxygen in the Mouth Region of the Dnieper River,
W77-08832 5B

Some Hydrochemical Characteristics of the Mouth Reaches of the Anabar, Lena, Yana, and Indigirka Rivers,
W77-08833 2L

Role of River Runoff and of Water Exchange in the Salinity of the Northern Caspian Sea,
W77-08836 2H

Oceanographic Features, Currents, and Transport in Cabot Strait,
W77-08851 2L

Cooperative Gulf of Mexico Estuarine Inventory and Study--Texas: Area Description,
W77-08916 2L

Analytical Models for the Evaluation of Supplemental Aeration in Texas Estuaries,
W77-08917 5B

An Examination of Some Physical and Biological Impacts of Dredging in Estuaries,
W77-08918 5C

A Reconnaissance of the Hydrology of the Edisto and Ashepoo Estuaries, South Carolina,
W77-09076 2L

ESTUARINE ENVIRONMENT
Testing of a Technique for Remotely Measuring Water Salinity in an Estuarine Environment,
W77-08903 2L

ESTUARINE LAGOON
Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

ESTUARY
The Third London Airport Study,
W77-09037 2L

EUTROPHICATION
An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

Hydrologic Considerations in Dewatering and Refilling Lake Carlton, Orange and Lake Counties, Florida,
W77-09080 5G

EVALUATION
Waste Water Aeration System Produces Small Bubbles.
W77-08630 5D

An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

Economic Evaluation of Idaho's Water Supply,
W77-08816 6B

Integrated Evaluation Programs for Fairfax County, Va.,
W77-08862 6B

EVAPORATION
Hydrology of Three Recreational Lakes in Eastern Washington State,
W77-08608 5B

Evaporation from Seven Reservoirs in the Denver Water-Supply System, Central Colorado,
W77-08736 2D

EVAPOTRANSPIRATION
Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

EXTENDED PERIOD SIMULATION
WATSIM - A Fortran Program for 24 Hour Simulation of Flows and Reservoir Fluctuations in Water Distribution Networks,
W77-08943 7C

FAIRFAX COUNTY (VA)
Flood-Plain Delineation for Difficult Run Basin, Fairfax County, Virginia,
W77-09071 4C

FALKLAND ISLANDS
The Maximum Extent of Glaciers in Part of West Falkland,
W77-09032 2C

FARM WASTES
Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

Permit Program Regulations For Concentrated Animal Feeding Operations.
W77-08988 5G

FATHEAD MINNOWS
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

FAULTS (GEOLOGY)
Fault Control of Subsidence, Houston, Texas,
W77-08662 4B

FEDERAL BUDGET
EPA Proposes Untimely Amendments,
W77-08970 5G

FEDERAL JURISDICTION
Mianus River Preservation Committee V. Administrator, Environmental Protection Agency (Jurisdiction of Federal Appeals Court for Permits Issued by State Agency Under NPDES).
W77-09001 6E

FEDERAL POLLUTION CONTROL ACT AMENDMENTS OF 1972
When You Think About Polluted Waters, Think About Your Streams and Rivers.
W77-08960 5G

FEDERAL-STATE WATER RIGHTS CONFLICTS
PL 92-500: New Federalism or Federal Takeover,
W77-08972 6E

As an Incident of National Sovereignty, the United States Has Paramount Rights and Power in the Seabed and Subsoil of the Outer Continental Shelf,
W77-08974 6E

FEDERAL WATER POLLUTION CONTROL ACT
Section 208 and Section 303 Water Quality Planning and Management: Where is it Now,
W77-08949 5G

Many Changes Urged for PL 92-500,
W77-08950 5G

Effluent Limitations and NPDES: Federal and State Implementation of the Federal Water Pollution Control Act Amendments of 1972,
W77-08956 5G

PL 92-500: A Dose of Chaos,
W77-08959 5G

When You Think About Polluted Waters Think About Your Streams and Rivers.
W77-08960 5G

What 208 Planning Can Do: A Local and Federal View,
W77-08968 6G

Enforcement of Municipal Permits: Portent of Problems,
W77-08971 6G

Recent Development, Environmental Law Water Pollution.
W77-08975 5G

Toxic Pollutant Effluent Standards for Aldrin/Dieldrin, DDT, Endrin, and Toxaphene,
W77-08983 5G

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972
Section 208 and Section 303 Water Quality Planning and Management: Where is it Now,
W77-08949 5G

Many Changes Urged for PL 92-500,
W77-08950 5G

Effluent Limitations and NPDES: Federal and State Implementation of the Federal Water Pollution Control Act Amendments of 1972,
W77-08956 5G

What 208 Planning Can Do: A Local and Federal View,
W77-08968 6G

PL 92-500: New Federalism or Federal Takeover,
W77-08972 6E

Wetlands Protection Under the Corps of Engineer's New Dredge and Fill Jurisdiction,
W77-08977 5G

United States V. GAF Corporation: A Leak in the FWPCA,
W77-08979 5G

Mianus River Preservation Committee V. Administrator, Environmental Protection Agency (Jurisdiction of Federal Appeals Court for Permits Issued by State Agency Under NPDES).
W77-09001 6E

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 (FWPCA AMENDMENTS OF 1972)
Enforcement of Municipal Permits: Portent of Problems,
W77-08971 6G

FEDERAL WATER POLLUTION CONTROL ACT (FWPCA)
Commonwealth of Massachusetts V. United States Veteran's Administration (Notice of Suit Provisions of the FWPCA; Federal Common Law Nuisance Actions).
W77-09002 6E

FEED LOTS
Permit Program Regulations For Concentrated Animal Feeding Operations.
W77-08988 5G

FEED RESPONSE
Behavioral Studies on Chemoreception in Balanus hameri,
W77-08799 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

FEEDING BEHAVIOUR
Behavioral Studies on Chemoreception in Balanus hameri,
W77-08799 5C

FEEDING RATES
Behavioral Studies on Chemoreception in Balanus hameri,
W77-08799 5C

FERTILIZERS
Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Urea and Ammonium Nitrate Subcategory.
W77-08984 5G

FETCH
Estimating Wave Generation on Restricted Fetches,
W77-09021 2L

FILL PERMITS
Rykar V Gill (State's Refusal to Allow Upland Owner to Fill Adjacent Marshland Because of Owner's Access to Deep Water by Use of Wharfing Techniques),
W77-09005 6E

FILTERS
Phosphate and Nitrate Removal by a Grass Filtration System for Final Treatment of Municipal Waste Water,
W77-09100 5D

FILTRATION
Influence of Initial Mixing on Direct Filtration,
W77-08809 5F

Direct Filtration of Lake Michigan Water,
W77-08812 5F

Method and Apparatus for Purifying Aqueous Streams Contaminated with Organic Materials,
W77-08889 5D

Phosphate and Nitrate Removal by a Grass Filtration System for Final Treatment of Municipal Waste Water,
W77-09100 5D

FINANCING
Changes Urged at NCWQ Hearings,
W77-08967 6E

FINE AGGREGATES
Fine Screening of Raw Sewage,
W77-08629 8G

FINE SCREENING (STRAINERS)
Fine Screening of Raw Sewage,
W77-08629 8G

FINITE ELEMENT ANALYSIS
Finite Element Solution of the Two-Dimensional Unsaturated Flow Equation,
W77-08923 2G

Numerical Solution for Flow Under Sluice Gates,
W77-09012 8B

FISH
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem: I. An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W77-08695 5C

Expansion of the Range of Some Fish Species in Connection with Hydraulic Engineering Construction on the Volga and Acclimatization Works, (In Russian),
W77-08715 8I

Photochemical Dechlorination of Water Supply for Fish Tanks with Commercial Water Sterilizers,
W77-08842 5F

FISH BEHAVIOR
Compilation of Temperature Preference Data,
W77-08767 7C

Application of Temperature Preference Studies to Environmental Impact Assessment,
W77-08768 5C

Laboratory Methods for Determining Temperature Preference,
W77-08770 5C

Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

FISH DISEASES
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

Effects of a Parasite, Eubothrium salvelini (Cestoda: Pseudophyllidea), on the Resistance of Juvenile Sockeye Salmon, Oncorhynchus nerka, to Zinc,
W77-08791 5C

FISH EGGS
The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichtys olivaceus, (In Japanese),
W77-08782 5C

FISH HANDLING FACILITIES
Auxiliary Air System for Use in Laboratory Experiments,
W77-08800 7B

FISH HATCHERIES
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

Auxiliary Air System for Use in Laboratory Experiments,
W77-08800 7B

FISH MANAGEMENT
Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

FISH PARASITES
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

Effects of a Parasite, Eubothrium salvelini (Cestoda: Pseudophyllidea), on the Resistance of Juvenile Sockeye Salmon, Oncorhynchus nerka, to Zinc,
W77-08791 5C

FISH PHYSIOLOGY
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

Compilation of Temperature Preference Data,
W77-08767 7C

Application of Temperature Preference Studies to Environmental Impact Assessment,
W77-08768 5C

Laboratory Methods for Determining Temperature Preference,
W77-08770 5C

Physiological and Behavioral Reactions of Fishes to Temperature Change,
W77-08802 5C

FISH POPULATIONS
The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

Studies of the Fish Populations in Two Eastern North Carolina Swamp Streams,
W77-09062 2I

FISH REPELLENTS
Ecology of Toxicity in Marine Sponges,
W77-08793 5C

FISH REPRODUCTION
Effects of Dipotassium Endothall on Rooted Aquatics and Adult and First Generation Bluegills,
W77-08785 5C

FISH SPECIES COMPOSITION
Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

FISH TOXINS
Ecology of Toxicity in Marine Sponges,
W77-08793 5C

FISH TYPES
Studies of the Fish Populations in Two Eastern North Carolina Swamp Streams,
W77-09062 2I

FISHERIES
Fish Fauna of Lakes of the Lower Reaches of the Zarafshan River and its Fishery Use, (In Russian),
W77-08708 2H

FISHKILL
Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

FLAME RETARDANTS
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

FLASH FLOOD
Flood Plain Information: Llagas Creek Unit I, Including Edmundson (Little Llagas), Church, San Martin, New, Center, Corralitos, Tennant, Maple, and Foothill Creeks, Santa Clara County, California.
W77-08620 4A

FLASH FLOODS
Flood Plain Information: Albuquerque Arroyas, Part V, Albuquerque, New Mexico.
W77-08611 4A

FLATFISH
The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichtys olivaceus, (In Japanese),
W77-08782 5C

FLOCCULATION
Influence of Initial Mixing on Direct Filtration,
W77-08809 5F

Direct Filtration of Lake Michigan Water,
W77-08812 5F

Flocculant Use on Tankers,
W77-08906 5G

FLOOD CONTROL
Flood Plain Information Report, Indian and Dry Creeks, Linn County, Iowa.
W77-08617 4A

Flood Plain Information: Llagas Creek Unit I, Including Edmundson (Little Llagas), Church, San Martin, New, Center, Corralitos, Tennant, Maple, and Foothill Creeks, Santa Clara County, California.
W77-08620 4A

Designing for Sediment Transport,
W77-08962 4D

Szeles--Natale, Inc. V Board of Commissioners of Swatara Township, Dauphin County (Flood Control Aided by Land Development Restraints),
W77-08992 6E

Flood-Plain Delineation for Difficult Run Basin, Fairfax County, Virginia,
W77-09071 4C

FLOOD DAMAGE
Special Flood Hazard Information Report: Missouri and Kansas Rivers, Kansas City, Kansas.
W77-08613 4A

Flood Plain Information: Ohio River, Lawrence County, Ohio.
W77-08614 4A

FLOOD DATA
Special Flood Hazard Information Report: Missouri and Kansas Rivers, Kansas City, Kansas.
W77-08613 4A

Flood Plain Information: Ohio River, Lawrence County, Ohio.
W77-08614 4A

Flood Plain Information Report, Indian and Dry Creeks, Linn County, Iowa.
W77-08617 4A

Floods in the Big Creek Basin, Linn County, Iowa,
W77-08731 2E

FLOOD PLAIN INSURANCE
Economics of Permanent Flood-Plain Evacuation,
W77-08856 6B

Storm Tide Frequency Analysis for the Coast of Georgia,
W77-08914 2L

FLOOD PLAINS
Flood Plain Information: Albuquerque Arroyas, Part V, Albuquerque, New Mexico.
W77-08611 4A

Special Flood Hazard Information: Arkansas River, Fort Dodge - Wilroads Gardens, Vicinity of Dodge City, Kansas.
W77-08612 4A

Special Flood Hazard Information Report: Missouri and Kansas Rivers, Kansas City, Kansas.
W77-08613 4A

Flood Plain Information: Ashuelot River, City of Keene, New Hampshire.
W77-08615 4A

Special Flood Hazard Report: Buffalo Creek, Meadow Grove, Nebraska.
W77-08616 4A

Flood Plain Information: Llagas Creek Unit I, Including Edmundson (Little Llagas), Church, San Martin, New, Center, Corralitos, Tennant, Maple, and Foothill Creeks, Santa Clara County, California.
W77-08620 4A

Economics of Permanent Flood-Plain Evacuation,
W77-08856 6B

Flood-Plain Delineation for Difficult Run Basin, Fairfax County, Virginia,
W77-09071 4C

FLOOD PROFILES
Flood Plain Information: Albuquerque Arroyas, Part V, Albuquerque, New Mexico.
W77-08611 4A

Special Flood Hazard Information: Arkansas River, Fort Dodge - Wilroads Gardens, Vicinity of Dodge City, Kansas.
W77-08612 4A

Flood Plain Information: Ohio River, Lawrence County, Ohio.
W77-08614 4A

Special Flood Hazard Report: Buffalo Creek, Meadow Grove, Nebraska.
W77-08616 4A

Flood Plain Information Report, Indian and Dry Creeks, Linn County, Iowa.
W77-08617 4A

Flood Hazard Information: Yampa River and Tributaries, Steamboat Springs, Colorado.
W77-08619 4A

Flood Plain Information: Llagas Creek Unit I, Including Edmundson (Little Llagas), Church, San Martin, New, Center, Corralitos, Tennant, Maple, and Foothill Creeks, Santa Clara County, California.
W77-08620 4A

Floods in the Big Creek Basin, Linn County, Iowa,
W77-08731 2E

Flood-Plain Delineation for Difficult Run Basin, Fairfax County, Virginia,
W77-09071 4C

FLOOD PROTECTION
Flood Plain Information: Ashuelot River, City of Keene, New Hampshire.
W77-08615 4A

Special Flood Hazard Report: Buffalo Creek, Meadow Grove, Nebraska.
W77-08616 4A

FLOOD RECURRENCE INTERVAL
Floods in the Big Creek Basin, Linn County Iowa,
W77-08731 2E

FLOODS
Quantitative and Qualitative Implications o Urban Storm Runoff Abatement Measures,
W77-08602 5C

Flood Plain Information: Albuquerque Ar royas, Part V, Albuquerque, New Mexico.
W77-08611 4A

Special Flood Hazard Information: Arkansa River, Fort Dodge - Wilroads Gardens, Vicinit of Dodge City, Kansas.
W77-08612 4A

Special Flood Hazard Information Report: Mis souri and Kansas Rivers, Kansas City, Kansas
W77-08613 4A

Flood Plain Information: Ohio River, Lawrenc County, Ohio.
W77-08614 4A

Flood Plain Information: Ashuelot River, Cit of Keene, New Hampshire.
W77-08615 4A

Special Flood Hazard Report: Buffalo Creek Meadow Grove, Nebraska.
W77-08616 4A

Flood Plain Information Report, Indian an Dry Creeks, Linn County, Iowa.
W77-08617 4A

Flood Hazard Information: Yampa River an Tributaries, Steamboat Springs, Colorado.
W77-08619 4A

Flood Plain Information: Llagas Creek Unit I Including Edmundson (Little Llagas), Church San Martin, New, Center, Corralitos, Tennant Maple, and Foothill Creeks, Santa Clara Coun ty, California.
W77-08620 4A

Floods in the Big Creek Basin, Linn County Iowa,
W77-08731 2E

Storm Tide Frequency Analysis for the Coas of Georgia,
W77-08914 2L

FLORIDA
Simulations of Water-Level Drawdowns i Proposed Well-Field Areas, Dade County Florida,
W77-08739 4B

Florida's Sovereignty Submerged Lands: Wha Are They, Who Owns Them and Where is the Boundary,
W77-08951 6E

Biscayne Bay Symposium II,
W77-08961 5C

Florida's Barge Canal Prospects for the Future
W77-08964 4A

A 'Rough Cut' Model of a South Florida Wate Supply Plan,
W77-08980 4B

Geologic Data from Test Drilling in Palm Beach County, Florida Since 1970,
W77-09073 7C

LIBRARY OF THE UNIVERSITY OF ILLINOIS-CHAMPAIGN

Hydrologic Considerations in Dewatering and Refilling Lake Carlton, Orange and Lake Counties, Florida,
W77-09080 5G

FLOW
The Effect of Surcharging on Discharge Through a Pipe,
W77-08644 8B

Simulation of Pollutant Movement in Groundwater Aquifers,
W77-08807 5B

Retention and Flow Characteristics of Polymer Solutions in Porous Media,
W77-08850 2G

Principles of Graphical Gradually Varied Flow Model,
W77-09015 2E

Short Jet Impingement,
W77-09016 8B

FLOW CHARACTERISTICS
Flood Plain Information: Ashuelot River, City of Keene, New Hampshire.
W77-08615 4A

Flow Regimes in Debris Flow,
W77-09045 2J

FLOW DURATION
Missouri Stream and Springflow Characteristics Low-Flow Frequency and Flow Duration,
W77-08743 2E

FLOW NETS
Shape of a Streamline Water Table Near Inflow and Outflow Boundaries,
W77-09023 2F

FLOW PROFILES
Computer Applications for Step-Backwater and Floodway Analyses,
W77-09090 4A

FLOW RATES
A Review of Velocity-Measuring Devices,
W77-09085 7B

FLOW RESISTANCE
Resistance of Two Dimensional Triangular Roughness,
W77-09035 8B

FLOW RESTRICTOR (IRRIGATION)
Flow Restrictor and Trickle Emitter,
W77-08879 3F

FLOW SEPARATION
Theoretical and Experimental Study of Flow Separation After a Sudden Increase in the Cross-Section of a Circular Pipe (Etude Theorique Et Experimentale D' Un Ecoulement Decolle En Aval D'Un Elargissement Brusque De Revolution),
W77-09034 8B

FLOW-THROUGH SYSTEMS
A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

FLUCTUATIONS
Aspects of the Daily and Seasonal Course of Transpiration Intensity in Meadow Plants, (In Russian),
W77-08709 2D

FLUID DYNAMICS
Seismic Design of Liquid-Storage Tanks,
W77-08859 8D

FLUMES
Resistance of Two Dimensional Triangular Roughness,
W77-09035 8B

FLUORESCENCE
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

FLUORINE
Removal of Fluorine from Waste Waters. III. Fundamental Tests with Chemical Reagents (Haisuichu no fusso jokyo nikansuru kenkyu. III. Shiyaku kei niyoru kisoshiken),
W77-08626 5D

FOOD CHAINS
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem: I. An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W77-08695 5C

Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

FORECASTING
The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

Coupled Dynamic Streamflow-Temperature Models,
W77-09014 2E

FOREST MANAGEMENT
Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

FOREST SOILS
Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

FOREST WATERSHEDS
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W77-08933 3B

FORESTRY
Effect of Agricultural and Silvicultural Practices on the Runoff from Drainage Basins of the Nizhnedevitskaya Hydrologic Station,
W77-08835 4C

FORM DRAG
Resistance of Two Dimensional Triangular Roughness,
W77-09035 8B

FRACTURES (GEOLOGIC)
Load Transfer and Hydraulic Fracturing in Zoned Dams,
W77-08857 8B

FRACTURING
Load Transfer and Hydraulic Fracturing in Zoned Dams,
W77-08857 8B

FRANCE
Qualitative and Quantitative Changes in the Benthic Fauna of a Trout Stream, the Couze Pavin Puy-De-Dome, Caused by Agricultural and Urban Pollution, (In French),
W77-08955 5C

FRANCE (PYRENES)
The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

FREQUENCY OF OCCURRENCE (WASTES)
Frequency of Organic Compounds Identified in Water,
W77-08944 5A

FRESHWATER
Inland Waters. Monographs from Limnology and Related Areas, Vol. 26, Part 1. The Zooplankton of Inland Waters,
W77-08861 2H

FRESHWATER FISH
Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

FRESHWATER LENSES
A Mathematical Model Study of Fresh-Water Lenses,
W77-08837 2F

FROGS
The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

FROZEN SOILS
Water and Ice Potentials in Frozen Soils,
W77-08828 2C

GAMETOGENESIS
Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

GASOLINE COMBUSTION FALLOUT
Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connectituct Rivers,
W77-08814 5B

GENETICS
Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

GEOCHEMISTRY
Thermal and Chemical Problems of Thermal Waters, Symposium.
W77-08677 2K

Some Features of the Geochemistry of Thermal Water in Platform Areas from Experimental Data,
W77-08679 5B

The Helium Isotopes in Thermal Fluids,
W77-08680 5B

Hydrothermal Processes in the Atlantic Ocean Crust, 26 Degrees N,
W77-08681 2K

Geochemistry of Thermal Waters from Various Geothermal Provinces of India,
W77-08682 2K

Temperature and Chemism of Ground Waters in the Western Areas of the East European Platform,
W77-08683 2K

Geochemistry and Origin of Thermal Waters in Poland,
W77-08684 2K

Thermal Waters in Taiwan, A Preliminary Study,
W77-08685 4B

The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

Studies by the Dynamic Method on the Reaction of Rock with Hot Spring Water of the Tamagawa Hot Springs in Japan,
W77-08689 2K

GEOLOGIC INVESTIGATIONS
Geothermal Energy Development,
W77-08661 4B

GEOLOGY
Study of the Chemical and Gaseous Composition of Thermal Waters of the Eastern Part of the Pannonian Depression (Considerations sur la Composition Chimique et Gazeuse des eaux Thermales de la Partie Orientale de la Depression Pannonique (Roumanie)),
W77-08688 2K

GEOMORPHOLOGY
The Maximum Extent of Glaciers in Part of West Falkland,
W77-09032 2C

GEORGIA
Storm Tide Frequency Analysis for the Coast of Georgia,
W77-08914 2L

GEOTHERMAL STUDIES
A Case for Geothermal Energy,
W77-08655 8C

Economics of Geothermal Energy Development (In Imperial County, California),
W77-08657 8C

Geothermal Energy Development,
W77-08661 4B

Thermal and Chemical Problems of Thermal Waters, Symposium.
W77-08677 2K

Geochemistry of Thermal Waters from Various Geothermal Provinces of India,
W77-08682 2K

Geochemistry and Origin of Thermal Waters in Poland,
W77-08684 2K

Thermal Waters in Taiwan, A Preliminary Study,
W77-08685 4B

The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

Some Geochemical Problems in the Utilization of Geothermal Waters,
W77-08687 5B

Studies by the Dynamic Method on the Reaction of Rock with Hot Spring Water of the Tamagawa Hot Springs in Japan,
W77-08689 2K

Important Geothermal Sites in Greece, on the Base of Thermomineral Spring Layings, and the Possibilities of Their Exploitation and Utilisation,
W77-08690 4B

Total Energy Use in an Urban-Agricultural Power Plant Complex,
W77-08691 5G

An Energy Accounting Evaluation of Several Alternatives for Hydropower and Geothermal Development,
W77-09057 6B

Hydrologic Reconnaissance of the Geothermal Area Near Klamath Falls, Oregon, with a Section on Preliminary Interpretation of Geophysical Data,
W77-09070 4B

Chemical and Isotopic Investigations of Groundwater in Potential Geothermal Areas in Hawaii,
W77-09082 2K

GEOTHERNMAL STUDIES
Study of the Chemical and Gaseous Composition of Thermal Waters of the Eastern Part of the Pannonian Depression (Considerations sur la Composition Chimique et Gazeuse des eaux Thermales de la Partie Orientale de la Depression Pannonique (Roumanie)),
W77-08688 2K

GESAGARD 50
The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

GLACIATION
The Maximum Extent of Glaciers in Part of West Falkland,
W77-09032 2C

GLACIERS
Was There a Late-Wurm Arctic Ice Sheet,
W77-08839 2C

Study of an Ice Core to the Bedrock in the Accumulation Zone of an Alpine Glacier,
W77-08846 2C

The Maximum Extent of Glaciers in Part of West Falkland,
W77-09032 2C

An Experimental Study of the Motion of Ice Past Obstacles by the Process of Regelation,
W77-09033 2C

GLOBAL WATER LAW SYSTEMS
Proceedings of the International Conference on Global Water Law Systems, September 1-9, 1975, Valencia, Spain.
W77-08966 6E

GLUCOSE
Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

GLYCOGEN
Survival of Bacteria in Turbid and Polluted Waters,
W77-08606 5C

GNATHONEMUS
The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

GOVERNMENT SUPPORTS
What 208 Planning Can Do: A Local and Federal View,
W77-08968 6E

GOVERNMENTAL INTERRELATIONS
Many Changes Urged for PL 92-500,
W77-08950 5C

What 208 Planning Can Do: A Local and Federal View,
W77-08968 6E

GRADIENT DEVICES
Laboratory Methods for Determining Temperature Preference,
W77-08770 5C

GRADIENT TROUGH
Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

GRAND CAYMAN ISLAND
A Mathematical Model Study of Fresh-Water Lenses,
W77-08837 2F

GRAND TETON NATIONAL PARK (WYO)
Preliminary Study of Wastewater Movement in and Near Grand Teton National Park, Wyoming, Through October 1976,
W77-09087 5E

GRAPHICAL ANALYSIS
Principles of Graphical Gradually Varied Flow Model,
W77-09015 2E

GRASS FILTRATION SYSTEM
Phosphate and Nitrate Removal by a Grass Filtration System for Final Treatment of Municipal Waste Water,
W77-09100 5E

GRASS SHRIMP
Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

GRASSED WATERWAYS
Performance Characteristics of a Grassed-Waterway Transition,
W77-08849 4D

GRAY SQUIRREL
Trap Responses of the Gray Squirrel (Sciurus carolinensis carolinensis), Raccoon (PRocyon lotor lotor), and Opossum (Didelphis virginiana virginiana) to Environmental Factors in Two Swamp Watersheds of Northeastern North Carolina,
W77-08936 6G

GREAT BRITAIN
A Case for Geothermal Energy,
W77-08655 8C

GREAT LAKES
The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

Estimation of Winds Over the Great Lakes,
W77-09022 2H

GREECE (NEOVOLCANIC REGIONS)
Important Geothermal Sites in Greece, on the Base of Thermomineral Spring Layings, and the Possibilities of Their Exploitation and Utilisation,
W77-08690 4B

GREEN RIVER (MASS)
Characterization of Urban Runoff in Greenfield, Massachusetts--Phase I,
W77-08939 5B

GROUNDWATER
Ground Water - Solar Heat,
W77-08652 8C

Ground Water Budget of the Mountainous Regions of Hungary, (In Hungarian),
W77-08663 2F

An Ecological Model for Heavy Metal Contamination of Crops and Ground Water,
W77-08706 5B

The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

Water Resources Data for Washington, Water Year 1975.
W77-08737 7C

Water Resources Data for Montana, Water Year 1975.
W77-08738 7C

Artificial Recharge for Subsidence Abatement at the NASA-Johnson Space Center, Phase I,
W77-08744 4B

Water for Industrial and Agricultural Development in Attala, Holmes, Humphreys, Issaquena, Sharkey, and Yazoo Counties, Mississippi,
W77-08748 4B

Soil and Rock Strata to Trap, Filter and Store Water for Rural Domestic use,
W77-08821 3B

A Mathematical Model Study of Fresh-Water Lenses,
W77-08837 2F

Digital Model Studies of Steady-State Radial Flow to Partially Penetrating Wells in Alluvial Plains,
W77-08838 2F

Observation Records of Ground Water Level, (In Japanese),
W77-08904 4B

United States V. GAF Corporation: A Leak in the FWPCA,
W77-08979 5G

A 'Rough Cut' Model of a South Florida Water Supply Plan,
W77-08980 4B

Ground-Water Use Act (Regulation of Ground Water Resources Thru a Permit System).
W77-08999 6E

Ground Water Model for the Island of Anholt, Denmark,
W77-09030 2F

Transjoen, A Groundwater Influenced Lake with Special Redox and Sulphate Conditions,
W77-09031 2H

Solute Travel Times to Wells,
W77-09042 5B

Selected Problems in Idaho Ground Water Law,
W77-09049 6E

Hydrologic Reconnaissance of the Geothermal Area Near Klamath Falls, Oregon, with a Section on Preliminary Interpretation of Geophysical Data,
W77-09070 4B

Water Resources Data for Mississippi, Water Year 1975.
W77-09074 7C

Water Resources Data for North Dakota, Water Year 1975.
W77-09075 7C

Chemical and Isotopic Investigations of Groundwater in Potential Geothermal Areas in Hawaii,
W77-09082 2K

Integral Equation for the Description of Stream-Aquifer Interaction,
W77-09092 2F

GROUNDWATER AVAILABILITY
Availability of Ground Water in the Middle Merrimack River Basin, Central and Southern New Hampshire,
W77-08733 7C

Ground-Water Use Act (Regulation of Ground Water Resources Thru a Permit System).
W77-08999 6E

GROUNDWATER BASINS
Ground Water Budget of the Mountainous Regions of Hungary, (In Hungarian),
W77-08663 2F

GROUNDWATER MODELS
Ground Water Model for the Island of Anholt, Denmark,
W77-09030 2F

GROUNDWATER MOVEMENT
Simulation of Pollutant Movement in Groundwater Aquifers,
W77-08807 5B

Digital Model Studies of Steady-State Radial Flow to Partially Penetrating Wells in Alluvial Plains,
W77-08838 2F

Finite Element Solution of the Two-Dimensional Unsaturated Flow Equation,
W77-08923 2G

Transient Analysis of Phreatic Aquifers Lying Between Two Open Channels,
W77-09026 2F

Ground Water Model for the Island of Anholt, Denmark,
W77-09030 2F

Solute Travel Times to Wells,
W77-09042 5B

Analog Simulation of the Ground-Water System, Yuma, Arizona,
W77-09067 2F

GROUNDWATER RECHARGE
Character of Seepage of Precipitation to the Water Table in the Central Forest Steppe,
W77-09043 4B

Artificial Recharge to a Freshwater-Sensitive Brackish-Water Sand Aquifer, Norfolk, Virginia,
W77-09066 4B

GROUNDWATER RESOURCES
Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

Annual Summary of Ground-Water Conditions in Arizona, Spring 1975 to Spring 1976,
W77-08732 7C

Availability of Ground Water in the Middle Merrimack River Basin, Central and Southern New Hampshire,
W77-08733 7C

Guide for Data Collection to Calibrate a Predictive Digital Ground-Water Model of the Unconfined Aquifer in and Near the City of Modesto, California,
W77-08735 2F

Outline of the Water Resources of the Satus Creek Basin, Yakima Indian Reservation, Washington,
W77-08740 4B

Water-Level Changes in Northwestern Kansas, 1950-76,
W77-08742 4B

Ground-Water Data for Michigan, 1975,
W77-08753 7C

A 'Rough Cut' Model of a South Florida Water Supply Plan,
W77-08980 4B

Ground-Water Use Act (Regulation of Ground Water Resources Thru a Permit System).
W77-08999 6E

Report on Preliminary Data for Madison Limestone Test Well No. 1, NE1/4SE1/4 Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming,
W77-09072 4B

Geologic Data from Test Drilling in Palm Beach County, Florida Since 1970,
W77-09073 7C

GROUNDWATER RESOURCES

Ground-Water Resources and Geology of Walworth County, Wisconsin,
W77-09081 2F

Ground-Water Hydrology of Berkeley County, West Virginia,
W77-09083 4B

Water-Level Records for the San Luis Valley of Colorado, 1973-77,
W77-09088 7C

GROUNDWATER-SURFACE WATER RELATIONSHIPS

The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

GROWTH MEDIA EVALUATION

Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

GROWTH RATE

Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

GROWTH RATES

Effect of Water Deficiency on the Growth Rate of Some Winter Soft Wheat Cultivars, (In Bulgarian),
W77-08716 3F

Effects of Dipotassium Endothall on Rooted Aquatics and Adult and First Generation Bluegills,
W77-08785 5C

Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

Optimal Temperature for Growth of Juvenile Bluegills,
W77-08798 5C

Effects of Primary Treated and Biologically Stabilized Kraft Mill Effluents on the Production, Biomass and Growth Rates of Juvenile Salmonids in Three Stream Channels,
W77-08921 5C

Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

GROWTH STAGES

Neoplastic and Possibly Related Skin Lesions in Neotenic Tiger Salamanders from a Sewage Lagoon,
W77-08729 5C

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

Effects of Dipotassium Endothall on Rooted Aquatics and Adult and First Generation Bluegills,
W77-08785 5C

GULF OF MEXICO

Cooperative Gulf of Mexico Estuarine Inventory and Study--Texas: Area Description,
W77-08916 2L

GYRODINIUM

A Certain Marine Catenate Dinoflagellate Tentatively Applied for Detecting Carcinogens,
W77-08795 5A

Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

HACKENSACK MEADOWLANDS (NJ)

Solid Waste Management: A Test of Alternative Strategies Using Optimization Techniques,
W77-08723 5E

HALOGENATED PESTICIDES

The Accumulation of Polybominated Biphenyls by Fish,
W77-08777 5C

HALOWAX

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

HARBORS

Site Evaluation and Preconstruction Testing at Potential Deepwater Port Locations.
W77-08989 6E

HARPTICOIDS

Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

HAWAII

Nitrogen Removal from Secondary Effluent by a Laboratory Soil Column,
W77-08607 5B

Mineral Distribution Within the Sediments of Pearl Harbor,
W77-08815 2L

Ground-Water Use Act (Regulation of Ground Water Resources Thru a Permit System).
W77-08999 6E

Molokai Irrigation and Water Utilization Project.
W77-09000 6E

Chemical and Isotopic Investigations of Groundwater in Potential Geothermal Areas in Hawaii,
W77-09082 2K

HAWAII BOARD OF LAND AND NATURAL RESOURCES

Molokai Irrigation and Water Utilization Project.
W77-09000 6E

HAY

Effects of Treated Municipal Wastewater and Commercial Fertilizer on Growth, Fiber, Acid-Soluble Nucleotides, Protein and Amino Acid Content in Wheat Hay,
W77-08876 5C

HAZARDOUS SUBSTANCES

To Extend the Marine Protection, Research, and Sanctuaries Act (Hearing on S 3147 to Extend the Act 2 Years).
W77-08981 6E

HAZARDS

Agents, Methods and Devices for Amelioration of Discharges of Hazardous Chemicals on Water,
W77-08910 5G

HEADWATER STREAMS

Chemical Character of Headwater Streams in Vermont and New Hampshire,
W77-09027 2K

HEARINGS

Changes Urged at NCWQ Hearings,
W77-08967 6E

HEAT EXCHANGERS

Induced Vertical Mixing in a Stratified Impoundment by a Subsurface Warm Water Discharge,
W77-08929 5E

An Energy Accounting Evaluation of Several Alternatives for Hydropower and Geothermal Development,
W77-09057 6E

HEAT RESISTANCE

Evaluation of Wheat Plants with Regard to Drought- and Heat-Resistance Under Field Conditions, (In Russian),
W77-08877 3F

HEAT STORAGE (ENERGY)

Ground Water - Solar Heat,
W77-08652 8G

HEAT TRANSFER

Snowmelt: A Two-Dimensional Turbulent Diffusion Model,
W77-08823 2C

Thermal Loading of Natural Streams,
W77-09068 5E

HEAT TREATMENT

Sludge Treatment: Problems and Solutions Part 1,
W77-08640 5E

HEATED WATER

Hydrothermal Processes in the Atlantic Ocean Crust, 26 Degrees N,
W77-08681 2K

Some Geochemical Problems in the Utilization of Geothermal Waters,
W77-08687 5E

Studies by the Dynamic Method on the Reaction of Rock with Hot Spring Water of the Tamagawa Hot Springs in Japan,
W77-08689 2K

Important Geothermal Sites in Greece, on the Base of Thermomineral Spring Layings, and the Possibilities of Their Exploitation and Utilisation,
W77-08690 4B

Total Energy Use in an Urban-Agricultural Power Plant Complex,
W77-08691 5G

Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

The Effect of Warm Effluent from the Novorossiysk Thermal Power Plan on Zooplankton,
W77-08804 5C

Density and Distribution of Benthos in Lake Keowee, South Carolina,
W77-08818 5C

HEATED WATER POLLUTION
Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

HEAVY METALS
Nitrification and Heavy Metal Removal in the Activated Sludge Treatment Process,
W77-08623 5D

Heavy Metal Tolerance of Marine Phytoplankton. III. Combined Effects of Copper and Zinc Ions on Cultures of Four Common Species,
W77-08692 5C

An Ecological Model for Heavy Metal Contamination of Crops and Ground Water,
W77-08706 5B

A Study of Heavy Metals in Lake Abbaya, Ethiopia, and the Incidence of Non-Parasitic Elephantiasis,
W77-08774 5A

Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connectituct Rivers,
W77-08814 5B

Suitability of New England Soils in Accepting Waste Effluent - Phase I,
W77-09063 5E

Suitability of New England Soils in Accepting Waste Effluents, Phase II,
W77-09064 5E

Population Response and Heavy Metal Concentrations in Cottontail Rabbits and Small Mammals in Wastewater Irrigated Habitats,
W77-09097 5B

HELIUM
The Helium Isotopes in Thermal Fluids,
W77-08680 5B

HEPTACHLOR
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

HERBICIDES
Reactions in the Aqueous Environment of Low Molecular Weight Organic Molecules,
W77-08754 5B

Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

Effects of Dipotassium Endothall on Rooted Aquatics and Adult and First Generation Bluegills,
W77-08785 5C

Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

HERRINGS
Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

HISARS
Development of a Hydrologic Information Storage and Retrieval System,
W77-08609 7C

HISARS - Hydrologic Information Storage and Retrieval System - Reference Manual,
W77-08610 7C

HISTORIC FLOODS
Special Flood Hazard Information Report: Missouri and Kansas Rivers, Kansas City, Kansas.
W77-08613 4A

Flood Plain Information: Ohio River, Lawrence County, Ohio.
W77-08614 4A

HOGGARD MILL CREEK (NC)
Studies of the Fish Populations in Two Eastern North Carolina Swamp Streams,
W77-09062 2I

HOSPITAL WASTEWATER REUSE
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

HOT MINERAL WATER
The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

HOT SPRINGS
Studies by the Dynamic Method on the Reaction of Rock with Hot Spring Water of the Tamagawa Hot Springs in Japan,
W77-08689 2K

Important Geothermal Sites in Greece, on the Base of Thermomineral Spring Layings, and the Possibilities of Their Exploitation and Utilisation,
W77-08690 4B

HOUSTON-GALVESTON AREA (TEXAS)
Fault Control of Subsidence, Houston, Texas,
W77-08662 4B

HUMAN DISEASES
A Study of Heavy Metals in Lake Abbaya, Ethiopia, and the Incidence of Non-Parasitic Elephantiasis,
W77-08774 5A

HUMAN INFLUENCE
Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connectituct Rivers,
W77-08814 5B

HUMAN INFLUENCE INDEX
Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

HUNGARY
Ground Water Budget of the Mountainous Regions of Hungary, (In Hungarian),
W77-08663 2F

Dispersion Measurement on the Danube,
W77-09040 5B

HYDRAULIC DESIGN
The Effect of Surcharging on Discharge Through a Pipe,
W77-08644 8B

HYDRAULIC ENGINEERING
Expansion of the Range of Some Fish Species in Connection with Hydraulic Engineering Construction on the Volga and Acclimatization Works, (In Russian),
W77-08715 8I

HYDRAULIC EQUIPMENT
Liquid Jet Eductors, The 'Pumps' with No Moving Parts,
W77-08671 8C

Avoiding the Perils of Cavitation,
W77-08674 8C

HYDRAULIC PROPERTIES
Effects of Spatial Variability of Soil Hydraulic Properties in Water Budget Modeling,
W77-08825 2G

HYDRAULIC STRUCTURES
Seepage Under Structure on N Strata of Soil,
W77-08843 2F

HYDRAULIC TRANSFORM GRAPHS
Principles of Graphical Gradually Varied Flow Model,
W77-09015 2E

HYDRAULICS
Numerical Solution for Flow Under Sluice Gates,
W77-09012 8B

Mean Behavior of Buoyant Jets in a Crossflow
W77-09013 8B

Theoretical and Experimental Study of Flow Separation After a Sudden Increase in the Cross-Section of a Circular Pipe (Etude Theorique Et Experimentale D' Un Ecoulement Decolle En Aval D'Un Elargissement Brusque De Revolution),
W77-09034 8B

HYDRODYNAMICS
Drag and Inertia Forces on a Cylinder in Periodic Flow,
W77-09017 8B

Added Mass of Pile Group,
W77-09018 8B

Transient Analysis of Phreatic Aquifers Lying Between Two Open Channels,
W77-09026 2F

HYDROGEN ION CONCENTRATION
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

Behavioral Studies on Chemoreception in Balanus hameri,
W77-08799 5C

HYDROGEOLOGY
The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

Guide for Data Collection to Calibrate a Predictive Digital Ground-Water Model of the Unconfined Aquifer in and Near the City of Modesto, California,
W77-08735 2F

Geologic Data from Test Drilling in Palm Beach County, Florida Since 1970,
W77-09073 7C

Ground-Water Resources and Geology of Walworth County, Wisconsin,
W77-09081 2F

Ground-Water Hydrology of Berkeley County, West Virginia,
W77-09083 4B

Storage of Low-Level Radioactive Wastes in the Ground: Hydrogeologic and Hydrochemical Factors,
W77-09086 5E

HYDROLOGIC BUDGET
The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

Effects of Spatial Variability of Soil Hydraulic Properties in Water Budget Modeling,
W77-08825 2G

HYDROLOGIC DATA
HISARS - Hydrologic Information Storage and Retrieval System - Reference Manual,
W77-08610 7C

Water Resources Data for Washington, Water Year 1975.
W77-08737 7C

Water Resources Data for Montana, Water Year 1975.
W77-08738 7C

Water Resources Data for Mississippi, Water Year 1975.
W77-09074 7C

Water Resources Data for North Dakota, Water Year 1975.
W77-09075 7C

HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM
Development of a Hydrologic Information Storage and Retrieval System,
W77-08609 7C

HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM (MANUAL)
HISARS - Hydrologic Information Storage and Retrieval System - Reference Manual,
W77-08610 7C

HYDROTHERMAL STUDIES
Temperature and Chemism of Ground Waters in the Western Areas of the East European Platform,
W77-08683 2K

Geochemistry and Origin of Thermal Waters in Poland,
W77-08684 2K

Hydrothermal Fluids of Seawater Salinity in Ophiolitic Sulphide Ore Deposits in Cyprus,
W77-08854 2L

ICE
Water and Ice Potentials in Frozen Soils,
W77-08828 2C

Was There a Late-Wurm Arctic Ice Sheet,
W77-08839 2C

Study of an Ice Core to the Bedrock in the Accumulation Zone of an Alpine Glacier,
W77-08846 2C

An Experimental Study of the Motion of Ice Past Obstacles by the Process of Regelation,
W77-09033 2C

ICE SHEETS
Was There a Late-Wurm Arctic Ice Sheet,
W77-08839 2C

IDAHO
Economic Evaluation of Idaho's Water Supply,
W77-08816 6B

Snake River Interstate Compact.
W77-08996 6E

Headgates and Measuring Devices: Distribution of Stored Water.
W77-08997 6E

Distribution of Water Among Appropriators.
W77-08998 6E

Polymerization of Concrete Fights Cavitation,
W77-09044 8F

Selected Problems in Idaho Ground Water Law,
W77-09049 6E

Energy Plant Siting Legislation,
W77-09050 6E

A Comparative Study of Organic Carbon and Nutrients in Lake Sediment,
W77-09065 5A

ILLINOIS
Cement-Mud Spacer System Improves Illinois Wells,
W77-086- 8F

Recent Development, Environmental Law--Water Pollution.
W77-08975 5G

Modine Manufacturing Co V Pollution Control Board of Illinois (Stream Reclassification and Effluent Variances Required by New Waste Treatment Technology),
W77-09007 6E

ILLINOIS ENVIRONMENTAL PROTECTION ACT
Modine Manufacturing Co V Pollution Control Board of Illinois (Stream Reclassification and Effluent Variances Required by New Waste Treatment Technology),
W77-09007 6E

ILLINOIS POLLUTION CONTROL BOARD
Modine Manufacturing Co V Pollution Control Board of Illinois (Stream Reclassification and Effluent Variances Required by New Waste Treatment Technology),
W77-09007 6E

IMMATURE GROWTH STAGE
The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

IMMUNOASSAY
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

IMPAIRED WATER QUALITY
Spill Penalties Draw Criticism,
W77-08973 6E

IMPERIAL COUNTY (CALIF)
Economics of Geothermal Energy Development (In Imperial County, California),
W77-08657 8C

IMPOUNDMENTS
The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

INCINERATION
Sewage Sludge Incineration Should Be Improved by Addition of Newsprint Pulp.
W77-08639 5E

Sludge Incineration,
W77-08717 5E

INDENTIFICATION OF UNCERTAINTIES
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6C

INDIA
Geochemistry of Thermal Waters from Various Geothermal Provinces of India,
W77-08682 2E

Effect of Sediment Load on Stable Sand Canal Dimensions,
W77-09020 8E

INDIAN RESERVATIONS
Outline of the Water Resources of the Satus Creek Basin, Yakima Indian Reservation, Washington,
W77-08740 4E

Soil and Rock Strata to Trap, Filter and Store Water for Rural Domestic use,
W77-08821 3E

INDIANA
Indiana Stream-Temperature Characteristics,
W77-08755 7C

Point Stochastic Analysis of Daily Rainfall Occurrence with Application to Indiana,
W77-08935 2E

Recent Development, Environmental Law-Water Pollution.
W77-08975 5C

INDICATOR MICROBIAL POPULATIONS
The Effect of the Willimantic Sewage Treatment Plant on the Microflora and Metabolism of the Shetucket River,
W77-09094 5C

LIBRARY OF THE UNIVERSITY OF ILLINOIS-URBANA

INDUSTRIAL GROWTH
Economic Role of the Waterway in Western Europe,
W77-08860 4A

INDUSTRIAL WASTES
Pretreatment Helps Niagara Cut Costs,
W77-08633 5D

Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

North Carolina Conference on Water Conservation.
W77-08820 3D

Frequency of Organic Compounds Identified in Water,
W77-08944 5A

Complying with Discharge Regulations,
W77-08954 5G

When You Think About Polluted Waters, Think About Your Streams and Rivers.
W77-08960 5G

Modine Manufacturing Co V Pollution Control Board of Illinois (Stream Reclassification and Effluent Variances Required by New Waste Treatment Technology),
W77-09007 6E

INERTIA
Drag and Inertia Forces on a Cylinder in Periodic Flow,
W77-09017 8B

Added Mass of Pile Group,
W77-09018 8B

INFILTRATION
The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

Flow Characteristics During Infiltration into a Horizontal Sand Column,
W77-08826 2G

Infiltration Equations for Simple Soil Systems,
W77-09025 2G

INFILTRATION RATES
Infiltration Equations for Simple Soil Systems,
W77-09025 2G

INFILTRATION TESTS
Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

INFORMATION RETRIEVAL
Development of a Hydrologic Information Storage and Retrieval System,
W77-08609 7C

HISARS - Hydrologic Information Storage and Retrieval System - Reference Manual,
W77-08610 7C

INFORMATION SYSTEMS
Philadelphia's Water System Automation Plan,
W77-08864 5F

INHIBITORS
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

INJECTION WELLS
Artificial Recharge for Subsidence Abatement at the NASA-Johnson Space Center, Phase I,
W77-08744 4B

Artificial Recharge to a Freshwater-Sensitive Brackish-Water Sand Aquifer, Norfolk, Virginia,
W77-09066 4B

INJUNCTIVE RELIEF
Florida's Barge Canal Prospects for the Future,
W77-08964 4A

Almeda County Water District V Niles Sand and Gravel Company, Inc. (Use of Correlative Rights Doctrine to Defeat Claim of Inverse Condemnation),
W77-08991 6E

Homeowners Emergency Life Protection Committee V. Lynn (Enjoining of Major Federal Activity with Alleged Inadequate Environmental Impact Statement).
W77-09003 6E

INLAND LAKES DEMONSTRATION PROJECT
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

Chippewa Flowage Investigations. Part 3A: Appendixes.
W77-08726 6B

Chippewa Flowage Investigations. Part 3B: Appendixes.
W77-08727 6B

INLAND STEEL COMPANY
Recent Development, Environmental Law--Water Pollution.
W77-08975 5G

INLAND WATERS
Inland Waters. Monographs from Limnology and Related Areas, Vol. 26, Part 1. The Zooplankton of Inland Waters,
W77-08861 2H

INLAND WATERWAYS
User Charges in Inland Navigation Policy,
W77-08604 6C

INORGANIC COPPER
Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

INPUT-OUTPUT ANALYSIS
A Predictive Phosphorus Model for Lakes - Development and Testing,
W77-08930 5C

INSECTICIDES
Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

Effects of Temperature and Kelthane on Grass Shrimp,
W77-08874 5C

INSTITUTIONAL CONSTRAINTS
The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

Selected Problems in Idaho Ground Water Law,
W77-09049 6E

INSTITUTIONS
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

INSTRUMENTATION
Instrumentation Improves Waste Water Treatment Plant Control,
W77-08642 5D

A Review of Velocity-Measuring Devices,
W77-09085 7B

Real-Time Measurements of Aquatic Nitrogen,
W77-09095 5D

INTER-AGENCY COOPERATION
Water-Resources Investigations in Kentucky, 1976.
W77-09078 7C

Water-Resources Investigations in Wisconsin, 1976.
W77-09079 7C

INTERNAL-PLANT STRESS RANGE
Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

INTERNATIONAL BOUND AND WATER COMM
Analog Simulation of the Ground-Water System, Yuma, Arizona,
W77-09067 2F

INTERNATIONAL COMMISSIONS
The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

INTERNATIONAL CONFERENCE
Proceedings of the International Conference on Global Water Law Systems, September 1-9, 1975, Valencia, Spain.
W77-08966 6E

INTERNATIONAL JOINT COMMISSION
The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

INTERNATIONAL LAW
International Law and Radioactive Pollution by Ocean Dumping: 'With All Their Genius and With All Their Skill...'
W77-08957 5G

INTERSTATE
Recent Development, Environmental Law--Water Pollution.
W77-08975 5G

INTERSTATE COMPACTS
Snake River Interstate Compact.
W77-08996 6E

INTERSTATE RIVERS
Recent Development, Environmental Law--Water Pollution.
W77-08975 5G

Snake River Interstate Compact.
W77-08996 6E

INTRACOASTAL WATERWAY (SC)
A Reconnaissance of the Hydrology of the Intracoastal Waterway from Bucksport to Little River Inlet, South Carolina,
W77-09077 2L

INVERSE CONDEMNATION
Almeda County Water District V Niles Sand and Gravel Company, Inc. (Use of Correlative Rights Doctrine to Defeat Claim of Inverse Condemnation),
W77-08991 6E

INVERTEBRATES
Ecology of Toxicity in Marine Sponges,
W77-08793 5C

Density and Distribution of Benthos in Lake Keowee, South Carolina,
W77-08818 5C

Benthic Macroinvertebrates as Indexes of Water Quality in the Scioto River Basin, Ohio,
W77-08925 5A

Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

Species Differences in Breakdown of Tree Leaves in Streams–Significance for Composition of Stream Communities,
W77-09056 5B

Effects of Primary Sewage Effluent from the City of Willimantic on the Benthic Invertebrate Fauna of the Willimantic/Shetucket Rivers,
W77-09093 5C

INVESTIGATIONS
Chippewa Flowage Investigations. Part 3A: Appendixes.
W77-08726 6B

Chippewa Flowage Investigations. Part 3B: Appendixes.
W77-08727 6B

Water-Resources Investigations in Kentucky, 1976.
W77-09078 7C

Water-Resources Investigations in Wisconsin, 1976.
W77-09079 7C

ION EXCHANGE
New Directions in Ion Exchange,
W77-08719 5D

The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

Experimental Study of Multi-Cation Diffusion in an Artifical Quartz Sandstone,
W77-08811 2K

IONS
Adsorption and Vertical Movement of the Zinc and Manganese Ions in Three Types of Soil,
W77-09054 5B

IOWA
Flood Plain Information Report, Indian and Dry Creeks, Linn County, Iowa.
W77-08617 4A

Strength of Soil Aggregates: Influence of Size, Density and Clay and Organic Matter Content,
W77-08707 2G

Network Characteristics in Suburbanizing Streams,
W77-08830 4C

IRON
The Behaviour of Dissolved Iron, Manganese and Zinc in the Beaulieu Estuary, S. England,
W77-08701 5B

Effluent Guidelines and Standards for Iron and Steel Manufacturing Point Source Category.
W77-08986 5G

IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY
Effluent Guidelines and Standards for Iron and Steel Manufacturing Point Source Category.
W77-08986 5G

IRON COMPOUNDS
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

IRRIGATED LANDS
Present-Day Slumping and Erosion Phenomena on Irrigated Lands (Exemplified by Southeastern Ciscaucasia), (In Russian),
W77-08885 2J

IRRIGATED SITES
The Effects of Wastewater Irrigation on the Activities and Movements of Songbirds,
W77-09098 5C

IRRIGATION
Sludge Disposal in the North West,
W77-08628 5E

Annual Summary of Ground-Water Conditions in Arizona, Spring 1975 to Spring 1976,
W77-08732 7C

Outline of the Water Resources of the Satus Creek Basin, Yakima Indian Reservation, Washington,
W77-08740 4B

Universal Coupling for Movable Irrigation Pipes,
W77-08875 3F

Flow Restrictor and Trickle Emitter,
W77-08879 3F

Easily Movable Irrigation Sprinkler System,
W77-08880 3F

Irrigation Sprinkling Apparatus with Adjustable Ground Contacting Elements,
W77-08886 3F

Irrigation Drain Valve,
W77-08887 3F

Rotary Water Sprinkler,
W77-08888 3F

Gravitational Irrigation System and Method of Installing,
W77-08895 3F

Sprinkler Having Improved Water Distribution,
W77-08899 3F

IRRIGATION DESIGN
Groundwater Policies Now Lean Towards Management.
W77-08660 4B

IRRIGATION EFFECTS
Effects of Treated Municipal Wastewater and Commercial Fertilizer on Growth, Fiber, Acid-Soluble Nucleotides, Protein and Amino Acid Content in Wheat Hay,
W77-08876 5C

Deer Habitat Response to Irrigation with Municipal Wastewater,
W77-09099 5C

IRRIGATION EFFICIENCY
Universal Coupling for Movable Irrigation Pipes,
W77-08875 3F

Flow Restrictor and Trickle Emitter,
W77-08879 3F

Irrigation Sprinkling Apparatus with Adjustable Ground Contacting Elements,
W77-08886 3F

Irrigation Drain Valve,
W77-08887 3F

Rotary Water Sprinkler,
W77-08888 3F

Gravitational Irrigation System and Method of Installing,
W77-08895 3F

Sprinkler Having Improved Water Distribution,
W77-08899 3F

IRRIGATION PRACTICE
Gravitational Irrigation System and Method of Installing,
W77-08895 3F

IRRIGATION PRACTICES
Universal Coupling for Movable Irrigation Pipes,
W77-08875 3F

Flow Restrictor and Trickle Emitter,
W77-08879 3F

Irrigation Sprinkling Apparatus with Adjustable Ground Contacting Elements,
W77-08886 3F

Irrigation Drain Valve,
W77-08887 3F

Rotary Water Sprinkler,
W77-08888 3F

Sprinkler Having Improved Water Distribution,
W77-08899 3F

IRRIGATION PROGRAMS
Molokai Irrigation and Water Utilization Project.
W77-09000 6E

IRRIGATION SYSTEMS
Universal Coupling for Movable Irrigation Pipes,
W77-08875 3F

Easily Movable Irrigation Sprinkler System,
W77-08880 3F

Gravitational Irrigation System and Method of Installing,
W77-08895 3F

IRRIGATION WATER
Water Resources and Water Utilization in Israel,
W77-09011 6E

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Population Response and Heavy Metal Concentrations in Cottontail Rabbits and Small Mammals in Wastewater Irrigated Habitats,
W77-09097 5B

Deer Habitat Response to Irrigation with Municipal Wastewater,
W77-09099 5C

IRRIGATION WELLS
Groundwater Policies Now Lean Towards Management.
W77-08660 4B

ISLANDS
A Mathematical Model Study of Fresh-Water Lenses,
W77-08837 2F

ISOTOPE STUDIES
Carbon Isotopic Study of the Fate of Landfill Leachate in Groundwater,
W77-08670 5B

The Helium Isotopes in Thermal Fluids,
W77-08680 5B

ISOTROPIC IMPERMEABLE ROCK
Tests Show Jet-Drilling Hard Rock Potential,
W77-08667 8E

ISRAEL
Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

Water Resources and Water Utilization in Israel,
W77-09011 6E

ISRAELI MEDITERRANEAN COAST
Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

IVAN'KOVO RESERVOIR (USSR)
Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

JAPAN
Studies by the Dynamic Method on the Reaction of Rock with Hot Spring Water of the Tamagawa Hot Springs in Japan,
W77-08689 2K

Observation Records of Ground Water Level, (In Japanese),
W77-08904 4B

JET DRILLING
Rock Type Decides Jetting Economics,
W77-08666 8C

Tests Show Jet-Drilling Hard Rock Potential,
W77-08667 8E

JET FLOW
Short Jet Impingement,
W77-09016 8B

JETS
Mean Behavior of Buoyant Jets in a Crossflow
W77-09013 8B

Short Jet Impingement,
W77-09016 8B

JETTIES
United States V 62.61 Acres of Land, More or Less, In City of Virginia Beach, Commonwealth of Virginia (A Compensable Property Right as Might Exist in a Wharf or Pier will not be Found in a Jetty Constructed in Navigable Waters),
W77-08990 6E

JOINTS (CONNECTIONS)
Drill String Makeup, Past, Present, Future,
W77-08648 8C

JORDAN RIVER (UTAH)
Provo-Jordan River Parkway Authority.
W77-09009 6E

JUDICIAL DECISIONS
Mc Ilray V Hamilton (Permissive Use of Spring Overflow Defeats Prescriptive Right Claim),
W77-09006 6E

Modine Manufacturing Co V Pollution Control Board of Illinois (Stream Reclassification and Effluent Variances Required by New Waste Treatment Technology),
W77-09007 6E

JURISDICTION
Commonwealth of Massachusetts V. United States Veteran's Administration (Notice of Suit Provisions of the FWPCA; Federal Common Law Nuisance Actions).
W77-09002 6E

JUVENILE GROWTH STAGE
Effects of Primary Treated and Biologically Stabilized Kraft Mill Effluents on the Production, Biomass and Growth Rates of Juvenile Salmonids in Three Stream Channels,
W77-08921 5C

KANSAS
Special Flood Hazard Information: Arkansas River, Fort Dodge - Wilroads Gardens, Vicinity of Dodge City, Kansas.
W77-08612 4A

Special Flood Hazard Information Report: Missouri and Kansas Rivers, Kansas City, Kansas.
W77-08613 4A

Water-Level Changes in Northwestern Kansas, 1950-76,
W77-08742 4B

KANSAS CITY (KA)
Special Flood Hazard Information Report: Missouri and Kansas Rivers, Kansas City, Kansas.
W77-08613 4A

KANSAS RIVER (KA)
Special Flood Hazard Information Report: Missouri and Kansas Rivers, Kansas City, Kansas.
W77-08613 4A

KARST HYDROLOGY
Ground Water Budget of the Mountainous Regions of Hungary, (In Hungarian),
W77-08663 2F

KENTUCKY
Reaeration and Velocity Prediction for Small Streams,
W77-08867 5B

Water-Resources Investigations in Kentucky, 1976.
W77-09078 7C

KILLIFISHES
Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

KIRCHNER MARSH (MINN)
Paleohydrologic Phenomena Recorded by Lake Sediments,
W77-08750 2J

KLAMATH FALLS AREA (OREG)
Hydrologic Reconnaissance of the Geothermal Area Near Klamath Falls, Oregon, with a Section on Preliminary Interpretation of Geophysical Data,
W77-09070 4B

LABORATORY ANALYSIS
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

LABORATORY EMERGENCIES
Auxiliary Air System for Use in Laboratory Experiments,
W77-08800 7B

LABORATORY EQUIPMENT
A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

Auxiliary Air System for Use in Laboratory Experiments,
W77-08800 7B

LABORATORY TESTS
Drag and Inertia Forces on a Cylinder in Periodic Flow,
W77-09017 8B

Added Mass of Pile Group,
W77-09018 8B

An Experimental Study of the Motion of Ice Past Obstacles by the Process of Regelation,
W77-09033 2C

Theoretical and Experimental Study of Flow Separation After a Sudden Increase in the Cross-Section of a Circular Pipe (Etude Theorique Et Experimentale D' Un Ecoulement Decolle En Aval D'Un Elargissement Brusque De Revolution),
W77-09034 8B

A Mathematical Model of Steady Flow in Curved Shallow Channels,
W77-09036 8B

LAGOONS
Prediction of Nitrogen Transformations in the Storage Lagoon of a Land Treatment System,
W77-08624 5D

Neoplastic and Possibly Related Skin Lesions in Neotenic Tiger Salamanders from a Sewage Lagoon,
W77-08729 5C

Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

LAKE ABBAYA (ETHIOPIA)
A Study of Heavy Metals in Lake Abbaya, Ethiopia, and the Incidence of Non-Parasitic Elephantiasis,
W77-08774 5A

LAKE ALTON (MO)
Advanced Waste Treatment Design Protects Lake Alton,
W77-08631 5G

LAKE CARLSON (MINN)
Paleohydrologic Phenomena Recorded by Lake Sediments,
W77-08750 2J

LAKE CARLTON (FLA)
Hydrologic Considerations in Dewatering and Refilling Lake Carlton, Orange and Lake Counties, Florida,
W77-09080 5G

LAKE ENVIRONMENTS
The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

LAKE FISHERIES
Fish Fauna of Lakes of the Lower Reaches of the Zarafshan River and its Fishery Use, (In Russian),
W77-08708 2H

LAKE KAINJI (NIGERIA)
The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

LAKE KEOWEE (SC)
Density and Distribution of Benthos in Lake Keowee, South Carolina,
W77-08818 5C

LAKE MICHIGAN
Direct Filtration of Lake Michigan Water,
W77-08812 5F

LAKE MORPHOMETRY
Limnological Investigation of Six Lakes in Southeast Alaska,
W77-09069 7C

LAKE ONTARIO
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-08752 7B

LAKE OSCALETA (NY)
Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

LAKE RESTORATION
Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

LAKE SEDIMENTS
Paleohydrologic Phenomena Recorded by Lake Sediments,
W77-08750 2J

A Comparative Study of Organic Carbon and Nutrients in Lake Sediment,
W77-09065 5A

LAKE-SHORELAND MANAGEMENT
Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

LAKE SHORES
Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

LAKE WACCABUC (NY)
Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

LAKES
A Primer on Limnology,
W77-08605 2H

Hydrology of Three Recreational Lakes in Eastern Washington State,
W77-08608 5B

Fish Fauna of Lakes of the Lower Reaches of the Zarafshan River and its Fishery Use, (In Russian),
W77-08708 2H

An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

The Use and Misuse of Pure Water PVT Properties for Lake Waters,
W77-08840 2H

Inland Waters. Monographs from Limnology and Related Areas, Vol. 26, Part 1. The Zooplankton of Inland Waters,
W77-08861 2H

Transjoen, A Groundwater Influenced Lake with Special Redox and Sulphate Conditions,
W77-09031 2H

A Comparative Study of Organic Carbon and Nutrients in Lake Sediment,
W77-09065 5A

Limnological Investigation of Six Lakes in Southeast Alaska,
W77-09069 7C

Hydrologic Considerations in Dewatering and Refilling Lake Carlton, Orange and Lake Counties, Florida,
W77-09080 5G

LAMINAR FLOW
Flow Regimes in Debris Flow,
W77-09045 2J

LAMINATED ROCK
Rock Type Decides Jetting Economics,
W77-08666 8C

LAND DEVELOPMENT
Legal Battles on the California Coast: A Review of the Rules,
W77-08963 6E

LAND DISPOSAL
Nitrogen Removal from Secondary Effluent by a Laboratory Soil Column,
W77-08607 5B

LAND FORMING
Rykar V Gill (State's Refusal to Allow Upland Owner to Fill Adjacent Marshland Because of Owner's Access to Deep Water by Use of Wharfing Techniques),
W77-09005 6E

LAND MANAGEMENT
The Hydrology of a Small Catchment Basin at Samaru, Nigeria: IV: Assessment of Soil Erosion Under Varied Land Management and Vegetation Cover;
W77-08698 4D

Water as an Environmental Constraint in Land Use Planning,
W77-08721 6G

LAND RECLAMATION
Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

LAND SUBSIDENCE
Land Subsidence,
W77-08653 4B

Fault Control of Subsidence, Houston, Texas,
W77-08662 4B

Artificial Recharge for Subsidence Abatement at the NASA-Johnson Space Center, Phase I,
W77-08744 4B

LAND USE
Water as an Environmental Constraint in Land Use Planning,
W77-08721 6G

Integrated Evaluation Programs for Fairfax County, Va.,
W77-08862 6B

Water--An Element of Land-Use and Urban Growth Policies,
W77-08872 6B

Storm Tide Frequency Analysis for the Coast of Georgia,
W77-08914 2L

Legal Battles on the California Coast: A Review of the Rules,
W77-08963 6E

Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

LAND USE PLANNING
Water as an Environmental Constraint in Land Use Planning,
W77-08721 6G

LANDFILLS
Carbon Isotopic Study of the Fate of Landfill Leachate in Groundwater,
W77-08670 5B

The Design of a System for Collecting Leachate from a Lined Landfill Site,
W77-08827 5G

LANDSAT IMAGES
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-08752 7B

LARVAE
The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichthys olivaceus, (In Japanese),
W77-08782 5C

Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

The Effect of Warm Effluent from the Novorossiysk Thermal Power Plan on Zooplankton,
W77-08804 5C

ARVICIDE
Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

EACHATE
The Design of a System for Collecting Leachate from a Lined Landfill Site,
W77-08827 5G

EACHING
Atmospheric Sulfate Additions and Cation Leaching in a Douglas Fir Ecosystem,
W77-08822 2K

EAD
Mussels (Mytilus Sp.) as an Indicator of Lead Pollution,
W77-08693 5C

Effects of Mercury, Cadmium, and Lead Salts on Regeneration and Ecdysis in the Fiddler Crab, UCA Pugilator,
W77-08702 5C

An Ecological Model for Heavy Metal Contamination of Crops and Ground Water,
W77-08706 5B

Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connecticut Rivers,
W77-08814 5B

EASES
Water-Use Leasing Act.
W77-09010 6E

EAVES
Species Differences in Breakdown of Tree Leaves in Streams--Significance for Composition of Stream Communities,
W77-09056 5B

EBANON
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

EGAL ASPECTS
Legal Battles on the California Coast: A Review of the Rules,
W77-08963 6E

Selected Problems in Idaho Ground Water Law,
W77-09049 6E

EGISLATION
As an Incident of National Sovereignty, the United States Has Paramount Rights and Power in the Seabed and Subsoil of the Outer Continental Shelf,
W77-08974 6E

Porter--Cologne Water Quality Control Act.
W77-08978 6E

Energy Plant Siting Legislation,
W77-09050 6E

Policy Innovation and Institutional Fragmentation,
W77-09053 6E

LEPOMIS
Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

LETHAL LIMIT
Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

Thermal Acclimation, Upper Temperature Tolerance, and Preferred Temperature of Juvenile Yellowtail Snappers, Ocvurus chrvsurus (Bloch) (Pisces: Lutjanidae),
W77-08769 5C

Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichtys olivaceus, (In Japanese),
W77-08782 5C

Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

LETHAL TEMPERATURE
Thermal Acclimation, Upper Temperature Tolerance, and Preferred Temperature of Juvenile Yellowtail Snappers, Ocvurus chrvsurus (Bloch) (Pisces: Lutjanidae),
W77-08769 5C

LIBERTY LAKE BASIN (WASH)
Hydrology of Three Recreational Lakes in Eastern Washington State,
W77-08608 5B

LIGHT
Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

LIME
Dewatering Chemical-Primary Sludges,
W77-08865 5D

LIMNOLOGY
A Primer on Limnology,
W77-08605 2H

Limnological Investigation of Six Lakes in Southeast Alaska,
W77-09069 7C

LINEAR DISPLACEMENT
Retention and Flow Characteristics of Polymer Solutions in Porous Media,
W77-08850 2G

LINEAR PROGRAMMING
Solid Waste Management: A Test of Alternative Strategies Using Optimization Techniques,
W77-08723 5E

LINN COUNTY (IOWA)
Floods in the Big Creek Basin, Linn County, Iowa,
W77-08731 2E

LIQUID JET EDUCTORS (PUMPS)
Liquid Jet Eductors, The 'Pumps' with No Moving Parts,
W77-08671 8C

LIQUID OXYGEN
What's Up with Oxygen/2,
W77-08627 5D

Hyperoxygen Concentrations in the Hypolimnion Produced by Injection of Liquid Oxygen,
W77-09028 5G

LITHOLOGIC LOGS
Geologic Data from Test Drilling in Palm Beach County, Florida Since 1970,
W77-09073 7C

LITTLE LLAGAS CREEK (CA)
Flood Plain Information: Llagas Creek Unit I, Including Edmundson (Little Llagas), Church, San Martin, New, Center, Corralitos, Tennant, Maple, and Foothill Creeks, Santa Clara County, California.
W77-08620 4A

LIVERPOOL BAY (ENGLAND)
Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

LLAGAS CREEK (CALIF)
Flood Plain Information: Llagas Creek Unit I, Including Edmundson (Little Llagas), Church, San Martin, New, Center, Corralitos, Tennant, Maple, and Foothill Creeks, Santa Clara County, California.
W77-08620 4A

LOAD DISTRIBUTION
Urban Stormwater Pollutant Loadings: A Statistical Summary Through 1972,
W77-09046 5B

LOAD TRANSFER
Load Transfer and Hydraulic Fracturing in Zoned Dams,
W77-08857 8B

LOGGING (RECORDING)
Multi-Shot Camera System for Borehole Surveying.
W77-08668 8G

LONGITUDINAL ANALYSIS
Longitudinal Analysis of Change in Levels of Affiliation and Participation in Voluntary Formal Organizations,
W77-09058 6B

LOUISIANA
Records of Wells, Water-Level Measurements, and Drillers' Logs, Red River Valley, Louisiana,
W77-08734 7C

Analyses of Native Water, Bed Material, and Elutriate Samples of Major Louisiana Water Waterways, 1975,
W77-09084 5A

LOW FLOW
Missouri Stream and Springflow Characteristics Low-Flow Frequency and Flow Duration,
W77-08743 2E

LOW-FLOW FREQUENCY
Missouri Stream and Springflow Characteristics Low-Flow Frequency and Flow Duration,
W77-08743 2E

LUMBERING
Hydrologic Changes After Logging in Two Small Oregon Coastal Watersheds,
W77-08746 4C

MADISON LIMESTONE
Report on Preliminary Data for Madison Limestone Test Well No. 1, NE1/4SE1/4 Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming,
W77-09072 4B

MAINTENANCE MEDIA
Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

MAMMALIAN CELL CULTURE
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

MANAGEMENT
The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

MANATI RIVER (PUERTO RICO)
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

MANGANESE
The Behaviour of Dissolved Iron, Manganese and Zinc in the Beaulieu Estuary, S. England,
W77-08701 5B

Adsorption and Vertical Movement of the Zinc and Manganese Ions in Three Types of Soil,
W77-09054 5B

MAPS
Annual Summary of Ground-Water Conditions in Arizona, Spring 1975 to Spring 1976,
W77-08732 7C

Availability of Ground Water in the Middle Merrimack River Basin, Central and Southern New Hampshire,
W77-08733 7C

Limnological Investigation of Six Lakes in Southeast Alaska,
W77-09069 7C

MARINE ALGAE
A Certain Marine Catenate Dinoflagellate Tentatively Applied for Detecting Carcinogens,
W77-08795 5A

Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

MARINE ANIMALS
Ecology of Toxicity in Marine Sponges,
W77-08793 5C

Behavioral Studies on Chemoreception in Balanus hameri,
W77-08799 5C

MARINE BACTERIA
Kinetic Response of Perturbed Marine Nitrification Systems,
W77-08946 5C

MARINE DIESEL OIL
Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

MARINE FISH
Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

MARYLAND
Trace Element Inventory for the Northern Chesapeake Bay with Emphasis on the Influence of Man,
W77-08704 5C

Effects of Economic Development on Water Resources,
W77-09051 5G

MASS TRANSFER
The Use of Packed Beds in Water Pollution Control,
W77-08637 5D

MASSACHUSETTS
Proceedings: The Connecticut River System: A Workshop on Research Needs and Priorities.
W77-08808 6B

Characterization of Urban Runoff in Greenfield, Massachusetts--Phase I,
W77-08939 5B

Commonwealth of Massachusetts V. United States Veteran's Administration (Notice of Suit Provisions of the FWPCA; Federal Common Law Nuisance Actions).
W77-09002 6E

MATERIALS ENGINEERING
Pump Construction Materials,
W77-08675 8G

MATERIALS RECOVERY
New Directions in Ion Exchange,
W77-08719 5D

MATHEMATICAL MODELS
Simulation of Two-Dimensional Contaminant Transport with Isoparametric Hermitian Finite Elements,
W77-08829 5B

Seepage Under Structure on N Strata of Soil,
W77-08843 2F

A Transient, Two-Dimensional, Discrete-Element, Far-Field Model for Thermal Impact Analysis of Power Plant Discharges in Coastal and Offshore Regions. Part I: General Description of the Mathematical Model and Results of an Application,
W77-08905 5B

Analytical Models for the Evaluation of Supplemental Aeration in Texas Estuaries,
W77-08917 5B

A Predictive Phosphorus Model for Lakes - Development and Testing,
W77-08930 5C

A Mathematical Model of Steady Flow in Curved Shallow Channels,
W77-09036 8B

MATHEMATICAL STUDIES
Finite Element Solution of the Two-Dimensional Unsaturated Flow Equation,
W77-08923 2G

Urban Stormwater Pollutant Loadings: A Statistical Summary Through 1972,
W77-09046 5B

MAYFLIES
Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

MEADOW PLANTS
Aspects of the Daily and Seasonal Course of Transpiration Intensity in Meadow Plants, (In Russian),
W77-08709 2D

MEASUREMENT
NPDES Permits and Water Analyses.
W77-08953 5G

Real-Time Measurements of Aquatic Nitrogen,
W77-09095 5D

MECHANICAL EQUIPMENT
Tests of Oil Recovery Devices in Broken Ice Fields. Phase I,
W77-08915 5G

MEDITERRANEAN SEA
Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

MEIOFAUNA
Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

MEMBRANES
Electrochemical Determinations of Trace Quantities of Phosphate and Nitrate,
W77-08817 5A

MERCURY
The Role of Methylmercury Production in the Transfer of Mercury in a Salt Marsh Ecosystem,
W77-08697 5C

Dose-Dependent Effects of Methylmercury on Limb Regeneration of Newts (Triturus Viridescens),
W77-08699 5C

Methylmercury Induced Injury of Single Barnacle Muscle Fibers,
W77-08700 5C

Effects of Mercury, Cadmium, and Lead Salts on Regeneration and Ecdysis in the Fiddler Crab, UCA Pugilator,
W77-08702 5C

Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

A Study of Heavy Metals in Lake Abbaya, Ethiopia, and the Incidence of Non-Parasitic Elephantiasis,
W77-08774 5A

Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichtys olivaceus, (In Japanese),
W77-08782 5C

MERCURY POISONING CHRONIC SYMPTOMS
A Study of Heavy Metals in Lake Abbaya, Ethiopia, and the Incidence of Non-Parasitic Elephantiasis,
W77-08774 5A

METABOLISM
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

METAL TRANSPORT
Hydrothermal Fluids of Seawater Salinity in Ophiolitic Sulphide Ore Deposits in Cyprus,
W77-08854 2L

METALS
Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

Effects of a Parasite, Eubothrium salvelini (Cestoda: Pseudophyllidea), on the Resistance of Juvenile Sockeye Salmon, Oncorhynchus nerka, to Zinc,
W77-08791 5C

Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

Mineral Distribution Within the Sediments of Pearl Harbor,
W77-08815 2L

Seasonal Patterns of Dissolved Oxygen, Nutrients, and Metals in Natural and Channelized Swamp Streams,
W77-08932 5B

METHOD OF CHARACTERISTICS
Some Computational Aspects of One- and Two-Dimensional Unsteady Flow Simulation by the Method of Characteristics,
W77-08745 2E

METHODOLOGY
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

Application of Temperature Preference Studies to Environmental Impact Assessment,
W77-08768 5C

Laboratory Methods for Determining Temperature Preference,
W77-08770 5C

Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

A Comparison of Methods of Hydrocarbon Analysis of Marine Biota,
W77-08789 5A

New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

Analysis of Supply and Demand of Urban Oriented Nonreservoir Recreation.
W77-08871 6B

Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

METHOXYCHLOR
Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

METHYLMERCURY
The Role of Methylmercury Production in the Transfer of Mercury in a Salt Marsh Ecosystem,
W77-08697 5C

Dose-Dependent Effects of Methylmercury on Limb Regeneration of Newts (Triturus Viridescens),
W77-08699 5C

Methylmercury Induced Injury of Single Barnacle Muscle Fibers,
W77-08700 5C

MEXICO
Analog Simulation of the Ground-Water System, Yuma, Arizona,
W77-09067 2F

MICHIGAN
Ground-Water Data for Michigan, 1975,
W77-08753 7C

MICROBIAL DEGRADATION
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

A Biodegradation of Oil on Water Surfaces,
W77-08909 5G

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W77-09059 5C

MICROCYSTIS AERUGINOSA
Physical and Chemical Parameters Associated with Phytoplankton Abundance and Periodicity in a Fertilized Fish Pond,
W77-08922 5C

MICROORGANISMS
Controlling Sludge Bulking,
W77-08636 5D

MIDDLE MERRIMACK RIVER BASIN (NH)
Availability of Ground Water in the Middle Merrimack River Basin, Central and Southern New Hampshire,
W77-08733 7C

MIEDZIAN 50
The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

MILITARY RESERVATIONS
United States V Holmes (Waters and Subaqueous Areas Located Within Perimeters of a Military Post),
W77-09008 6E

MINE DRAINAGE
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

MINE WASTES
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

MINE WATER
Remote Sealing of Mine Passages Containing Flowing Water,
W77-08896 5G

MINERAL DISTRIBUTION
Mineral Distribution Within the Sediments of Pearl Harbor,
W77-08815 2L

MINERAL WATER
The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

MINERALOGY
Hydrothermal Fluids of Seawater Salinity in Ophiolitic Sulphide Ore Deposits in Cyprus,
W77-08854 2L

MINNESOTA
Paleohydrologic Phenomena Recorded by Lake Sediments,
W77-08750 2J

In Re City of White Bear Lake (Standard for Granting of Permits Under the Minnesota Water Management Law).
W77-08993 6E

MISSISSIPPI
Water for Industrial and Agricultural Development in Attala, Holmes, Humphreys, Issaquena, Sharkey, and Yazoo Counties, Mississippi,
W77-08748 4B

MISSISSIPPI COAST
Testing of a Technique for Remotely Measuring Water Salinity in an Estuarine Environment,
W77-08903 2L

MISSISSIPPI RIVER
Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

MISSOURI
Special Flood Hazard Information Report: Missouri and Kansas Rivers, Kansas City, Kansas.
W77-08613 4A

Missouri Stream and Springflow Characteristics Low-Flow Frequency and Flow Duration,
W77-08743 2E

Mc Ilray V Hamilton (Permissive Use of Spring Overflow Defeats Prescriptive Right Claim),
W77-09006 6E

MISSOURI RIVER
Special Flood Hazard Information Report: Missouri and Kansas Rivers, Kansas City, Kansas.
W77-08613 4A

MITOTIC DELAYS
Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

MIXED-OAK FOREST
The Effects of Wastewater Irrigation on the Activities and Movements of Songbirds,
W77-09098 5C

MIXING
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

Influence of Initial Mixing on Direct Filtration,
W77-08809 5F

MODEL STUDIES
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem: I. An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W77-08695 5C

An Ecological Model for Heavy Metal Contamination of Crops and Ground Water,
W77-08706 5B

Guide for Data Collection to Calibrate a Predictive Digital Ground-Water Model of the Unconfined Aquifer in and Near the City of Modesto, California,
W77-08735 2F

Simulations of Water-Level Drawdowns in Proposed Well-Field Areas, Dade County, Florida,
W77-08739 4B

Some Computational Aspects of One- and Two-Dimensional Unsteady Flow Simulation by the Method of Characteristics,
W77-08745 2E

Simulation of Pollutant Movement in Groundwater Aquifers,
W77-08807 5B

Snowmelt: A Two-Dimensional Turbulent Diffusion Model,
W77-08823 2C

Effects of Spatial Variability of Soil Hydraulic Properties in Water Budget Modeling,
W77-08825 2G

The Design of a System for Collecting Leachate from a Lined Landfill Site,
W77-08827 5G

Water and Ice Potentials in Frozen Soils,
W77-08828 2C

Simulation of Two-Dimensional Contaminant Transport with Isoparametric Hermitian Finite Elements,
W77-08829 5B

A Mathematical Model Study of Fresh-Water Lenses,
W77-08837 2F

Digital Model Studies of Steady-State Radial Flow to Partially Penetrating Wells in Alluvial Plains,
W77-08838 2F

Design Efficiency of Stormwater Detention Basins,
W77-08841 4D

Density Currents and Their Applications,
W77-08844 5B

Surface Particle Orbits in Uniform Waves,
W77-08845 8B

Induced Vertical Mixing in a Stratified Impoundment by a Subsurface Warm Water Discharge,
W77-08929 5B

A Predictive Phosphorus Model for Lakes - Development and Testing,
W77-08930 5C

Point Stochastic Analysis of Daily Rainfall Occurrence with Application to Indiana,
W77-08935 2B

Principles of Graphical Gradually Varied Flow Model,
W77-09015 2E

Estimating Wave Generation on Restricted Fetches,
W77-09021 2L

Infiltration Equations for Simple Soil Systems,
W77-09025 2G

Transient Analysis of Phreatic Aquifers Lying Between Two Open Channels,
W77-09026 2F

Multivariate Distributions in Hydrology and River Regulation,
W77-09029 2E

Ground Water Model for the Island of Anholt, Denmark,
W77-09030 2F

A Mathematical Model of Steady Flow in Curved Shallow Channels,
W77-09036 8B

The Third London Airport Study,
W77-09037 2L

Natural Stream Temperature Variations in a Catchment,
W77-09039 5B

Dispersion Measurement on the Danube,
W77-09040 5B

Solute Travel Times to Wells,
W77-09042 5B

Nonlinear Estimation in Stream Quality Modeling,
W77-09047 5B

Optimal Estimation in Stream Quality Modeling,
W77-09052 5B

Thermal Loading of Natural Streams,
W77-09068 5B

MODINE MANUFACTURING COMPANY
Modine Manufacturing Co V Pollution Control Board of Illinois (Stream Reclassification and Effluent Variances Required by New Waste Treatment Technology),
W77-09007 6E

MOISTURE CONTENT
Water and Ice Potentials in Frozen Soils,
W77-08828 2C

MOISTURE STRESS
Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

MOLLUSKS
Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

MOLOKAI IRRIGATION AND WATER UTILIZATION PROJECT
Molokai Irrigation and Water Utilization Project.
W77-09000 6E

MOLYBDENUM
Transport of Molybdenum in Mountainous Streams, Colorado,
W77-08705 5B

Molybdenum Content in the Subsurface Waters of the Vinnitsa Oblast, (In Russian),
W77-08882 2K

MONITORING
Instrumentation Improves Waste Water Treatment Plant Control,
W77-08642 5D

Neoplastic and Possibly Related Skin Lesions in Neotenic Tiger Salamanders from a Sewage Lagoon,
W77-08729 5C

Make Money by Computer,
W77-08730 5D

Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

Characterization of Urban Runoff in Greenfield, Massachusetts--Phase I,
W77-08939 5B

NPDES Permits and Water Analyses.
W77-08953 5G

LIBRARY U. OF I. URBANA-CHAMPAIGN

MONOCHLORINATED BIPHENYL ISOMERS
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

MONTANA
Water Resources Data for Montana, Water Year 1975.
W77-08738 7C

MONTMORILLONITE
Mineral Distribution Within the Sediments of Pearl Harbor,
W77-08815 2L

MORMYRIDS
The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

MORTALITY
Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

Thermal Acclimation, Upper Temperature Tolerance, and Preferred Temperature of Juvenile Yellowtail Snappers, Ocvurus chrvsurus (Bloch) (Pisces: Lutjanidae),
W77-08769 5C

Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichtys olivaceus, (In Japanese),
W77-08782 5C

Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

MOVEMENT
An Experimental Study of the Motion of Ice Past Obstacles by the Process of Regelation,
W77-09033 2C

MUGIL
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

MULLET
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

MULLICA RIVER BASIN (NJ)
Surface-Groundwater Interactions and the Conjunctive Use of the Water Resources of the Mullica River Basin, New Jersey,
W77-08810 4B

MULTIATTRIBUTE UTILITY FUNCTION
Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

MULTIDIMENSIONAL SCALING
The Structural Analysis of Environmental Perception and Cognition: A Multidimensional Scaling Approach,
W77-08722 6B

MULTIOBJECTIVE SYSTEM FRAMEWORK
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6G

MULTIPLE PURPOSE PROJECTS
Chippewa Flowage Investigations. Part 3A: Appendixes.
W77-08726 6B

Chippewa Flowage Investigations. Part 3B: Appendixes.
W77-08727 6B

MULTIVARIATE DISTRIBUTIONS
Multivariate Distributions in Hydrology and River Regulation,
W77-09029 2E

MUNICIPAL WASTES
When You Think About Polluted Waters, Think About Your Streams and Rivers.
W77-08960 5G

MUNICIPAL WATER
North Carolina Conference on Water Conservation.
W77-08820 3D

MUNICIPALITIES
Enforcement of Municipal Permits: Portent of Problems,
W77-08971 6E

MUSSELS
Mussels (Mytilus Sp.) as an Indicator of Lead Pollution,
W77-08693 5C

Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

NANCY LAKE AREA (ALAS)
Environmental Planning for an Alaskan Water-Oriented Recreation Area,
W77-08805 6B

NASA-JOHNSON SPACE CENTER (TEX)
Artificial Recharge for Subsidence Abatement at the NASA-Johnson Space Center, Phase I,
W77-08744 4B

NATIONAL COMMISSION ON WATER QUALITY
Many Changes Urged for PL 92-500,
W77-08950 5G

NATIONAL PARKS
Preliminary Study of Wastewater Movement in and Near Grand Teton National Park, Wyoming, Through October 1976,
W77-09087 5B

NATIONAL POLLUTANT DISCHARGE ELIMINATION PERMITS
NPDES Permits and Water Analyses.
W77-08953 5G

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
Effluent Limitations and NPDES: Federal and State Implementation of the Federal Water Pollution Control Act Amendments of 1972,
W77-08956 5G

Commonwealth of Massachusetts V. United States Veteran's Administration (Notice of Suit Provisions of the FWPCA; Federal Common Law Nuisance Actions).
W77-09002 6E

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
Permit Program Regulations For Concentrated Animal Feeding Operations.
W77-08988 5G

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM
Complying with Discharge Regulations,
W77-08954 5G

NATIONAL TEST ORGANISM
Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

NATURAL STREAMS
Thermal Loading of Natural Streams,
W77-09068 5B

NATURAL SUBSTRATE LEVELS
Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

NAVIGABLE WATERS
United States V 62.61 Acres of Land, More or Less, In City of Virginia Beach, Commonwealth of Virginia (A Compensable Property Right as Might Exist in a Wharf or Pier will not be Found in a Jetty Constructed in Navigable Waters),
W77-08990 6E

A Reconnaissance of the Hydrology of the Intracoastal Waterway from Bucksport to Little River Inlet, South Carolina,
W77-09077 2L

Analyses of Native Water, Bed Material, and Elutriate Samples of Major Louisiana Water Waterways, 1975,
W77-09084 5A

NAVIGATION
User Charges in Inland Navigation Policy,
W77-08604 6C

NEARSHORE CURRENTS
Harbor and Nearshore Currents, Oswego Harbor, New York,
W77-08913 2L

NEBRASKA (NB)
Special Flood Hazard Report: Buffalo Creek, Meadow Grove, Nebraska.
W77-08616 4A

NEIGHBORHOOD AWARENESS
Longitudinal Analysis of Change in Levels of Affiliation and Participation in Voluntary Formal Organizations,
W77-09058 6B

NEMATODES
Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

NET POSITIVE SUCTION HEAD (NPSH)
Avoiding the Perils of Cavitation,
W77-08674 8C

NETWORKS
Network Characteristics in Suburbanizing Streams,
W77-08830 4C

Pressure Reducing Valves in Pipe Network Analyses,
W77-08855 8B

WATSIM - A Fortran Program for 24 Hour Simulation of Flows and Reservoir Fluctuations in Water Distribution Networks,
W77-08943 7C

NEW HAMPSHIRE
Flood Plain Information: Ashuelot River, City of Keene, New Hampshire.
W77-08615 4A

Availability of Ground Water in the Middle Merrimack River Basin, Central and Southern New Hampshire,
W77-08733 7C

Chemical Character of Headwater Streams in Vermont and New Hampshire,
W77-09027 2K

NEW JERSEY
Solid Waste Management: A Test of Alternative Strategies Using Optimization Techniques,
W77-08723 5E

Surface-Groundwater Interactions and the Conjunctive Use of the Water Resources of the Mullica River Basin, New Jersey,
W77-08810 4B

Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

NEW MEXICO
Survival of Bacteria in Turbid and Polluted Waters,
W77-08606 5C

Flood Plain Information: Albuquerque Arroyas, Part V, Albuquerque, New Mexico.
W77-08611 4A

Trap-Efficiency Investigation Bernalillo Floodwater Retarding Reservoir No. 1 (Piedra Lisa Arroyo) Near Bernalillo, New Mexico, Water Years 1956-1974,
W77-08741 4D

Water-Use Leasing Act.
W77-09010 6E

Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

NEW YORK
Time-of-Travel Study, Black River from Lyons Falls to Dexter, New York,
W77-08747 4A

Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

Harbor and Nearshore Currents, Oswego Harbor, New York,
W77-08913 2L

Mc Cormick V Lawrence (Constitutionality of New York Statute Aimed at Promoting Governmental Interest in Preserving Appearance of an Area).
W77-09004 6E

NEW YORK BIGHT
A Conceptual Representation of the New York Bight Ecosystem,
W77-08900 5B

NEW ZEALAND
Grain-Size Parameters of Insoluble Residues in Mixxed Terrigenous-Skeletal Carbonate Sediments and Sedimentary Rocks: Some New Zealand Examples,
W77-08848 2L

NEWMAN LAKE BASIN (WASH)
Hydrology of Three Recreational Lakes in Eastern Washington State,
W77-08608 5B

NEWTS
Dose-Dependent Effects of Methylmercury on Limb Regeneration of Newts (Triturus Viridescens),
W77-08699 5C

NICHESM
Expansion of the Range of Some Fish Species in Connection with Hydraulic Engineering Construction on the Volga and Acclimatization Works, (In Russian),
W77-08715 8I

NIGER RIVER
The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

NINLINEAR ESTIMATION
Nonlinear Estimation in Stream Quality Modeling,
W77-09047 5B

NITRATE REMOVAL
Phosphate and Nitrate Removal by a Grass Filtration System for Final Treatment of Municipal Waste Water,
W77-09100 5D

NITRATES
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

Electrochemical Determinations of Trace Quantities of Phosphate and Nitrate,
W77-08817 5A

Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

NITRIFICATION
Nitrification and Heavy Metal Removal in the Activated Sludge Treatment Process,
W77-08623 5D

Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

NITRIFYING BACTERIA
Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

Kinetic Response of Perturbed Marine Nitrification Systems,
W77-08946 5C

NITRITES
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

Kinetic Response of Perturbed Marine Nitrification Systems,
W77-08946 5C

NITROGEN
Nitrogen Removal from Secondary Effluent by a Laboratory Soil Column,
W77-08607 5B

An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

Role of Nitrogen in Activated Sludge Process,
W77-08869 5D

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W77-09059 5C

Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

Suitability of New England Soils in Accepting Waste Effluent - Phase I,
W77-09063 5E

Suitability of New England Soils in Accepting Waste Effluents, Phase II,
W77-09064 5E

Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

NITROGEN COMPOUNDS
N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

Kinetic Response of Perturbed Marine Nitrification Systems,
W77-08946 5C

Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Urea and Ammonium Nitrate Subcategory.
W77-08984 5G

Real-Time Measurements of Aquatic Nitrogen,
W77-09095 5D

NITROGEN CYCLE
Kinetic Response of Perturbed Marine Nitrification Systems,
W77-08946 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

NITROGENOUS BIOCHEMICAL OXYGEN DEMAND
Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

NOCARDIA
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

NON-DESTRUCTIVE TESTS
Water Turbine Pump Failure,
W77-08656 8G

NON-PARASITIC ELEPHANTIASIS
A Study of Heavy Metals in Lake Abbaya, Ethiopia, and the Incidence of Non-Parasitic Elephantiasis,
W77-08774 5A

NON-POINT POLLUTION SOURCES
Characterization of Urban Runoff in Greenfield, Massachusetts--Phase I,
W77-08939 5B

NON-POINT SOURCE POLLUTION
Hydrology of Three Recreational Lakes in Eastern Washington State,
W77-08608 5B

NON-POINT SOURCES (POLLUTION)
Many Changes Urged for PL 92-500,
W77-08950 5G

What 208 Planning Can Do: A Local and Federal View,
W77-08968 6E

NON-STRUCTURAL ALTERNATIVES
Flood Plain Information Report, Indian and Dry Creeks, Linn County, Iowa.
W77-08617 4A

NORFOLK (VA)
Artificial Recharge to a Freshwater-Sensitive Brackish-Water Sand Aquifer, Norfolk, Virginia,
W77-09066 4B

NORTH ATLANTIC
The Distribution of Trace Metals in the Western North Atlantic Off Nova Scotia,
W77-08703 5B

NORTH CAROLINA
North Carolina Conference on Water Conservation.
W77-08820 3D

Dune Stabilization with Panicum Amarum Along the North Carolina Coast,
W77-08908 2L

Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

Water Resources Research Interests in the Colleges and Universities of North Carolina.
W77-08931 9A

Seasonal Patterns of Dissolved Oxygen, Nutrients, and Metals in Natural and Channelized Swamp Streams,
W77-08932 5B

Trap Responses of the Gray Squirrel (Sciurus carolinensis carolinensis), Raccoon (PRocyon lotor lotor), and Opossum (Didelphis virginiana virginiana) to Environmental Factors in Two Swamp Watersheds of Northeastern North Carolina,
W77-08936 6G

Inventory of Active Water Resources Research Projects in North Carolina.
W77-08938 9A

Studies of the Fish Populations in Two Eastern North Carolina Swamp Streams,
W77-09062 2I

NORTH DAKOTA
Water Resources Data for North Dakota, Water Year 1975.
W77-09075 7C

NORWAY
Transjoen, A Groundwater Influenced Lake with Special Redox and Sulphate Conditions,
W77-09031 2H

NOTICE
Commonwealth of Massachusetts V. United States Veteran's Administration (Notice of Suit Provisions of the FWPCA; Federal Common Law Nuisance Actions).
W77-09002 6E

NOVOROSSIYSK BAY (BLACK SEA)
The Effect of Warm Effluent from the Novorossiysk Thermal Power Plan on Zooplankton,
W77-08804 5C

NUCLEAR REACTORS
Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

NUISANCE (LEGAL ASPECTS)
Commonwealth of Massachusetts V. United States Veteran's Administration (Notice of Suit Provisions of the FWPCA; Federal Common Law Nuisance Actions).
W77-09002 6E

NUMERICAL ANALYSIS
Some Computational Aspects of One- and Two-Dimensional Unsteady Flow Simulation by the Method of Characteristics,
W77-08745 2E

The Third London Airport Study,
W77-09037 2L

NUTRIENT CARRYOVER
Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

NUTRIENTS
An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

Seasonal Patterns of Dissolved Oxygen, Nutrients, and Metals in Natural and Channelized Swamp Streams,
W77-08932 5B

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W77-09059 5C

Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

NUTRITIONAL DEFICIENCIES
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

OBSERVATION WELLS
Ground-Water Data for Michigan, 1975,
W77-08753 7C

OCEAN CIRCULATION
High Sensitivity Flowmeter,
W77-08898 7B

OCEAN CURRENTS
Current-Meter Recordings of Low-Speed Turbidity Currents,
W77-08847 2L

High Sensitivity Flowmeter,
W77-08898 7B

OCEAN DUMPING
Ocean Dumping in the United States - 1975, Third Annual Report of the Environmental Protection Agency on the Administration of Title I of the Marine Protection, Research, and Sanctuaries Act of 1972, as Amended.
W77-08919 5B

To Extend the Marine Protection, Research, and Sanctuaries Act (Hearing on S 3147 to Extend the Act 2 Years).
W77-08981 6E

OCEANOGRAPHIC BASELINE STUDY
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

OCEANOGRAPHY
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

Wave Height Measuring Device,
W77-08897 7B

High Sensitivity Flowmeter,
W77-08898 7B

OCEANS
Say Goodbye to Ocean Dumping,
W77-08969 5G

To Extend the Marine Protection, Research, and Sanctuaries Act (Hearing on S 3147 to Extend the Act 2 Years).
W77-08981 6E

ODOR
Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

ODOR-PRODUCING ALGAE
Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

OHIO
Flood Plain Information: Ohio River, Lawrence County, Ohio.
W77-08614 4A

Benthic Macroinvertebrates as Indexes of Water Quality in the Scioto River Basin, Ohio,
W77-08925 5A

Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

Hyperoxygen Concentrations in the Hypolimnion Produced by Injection of Liquid Oxygen,
W77-09028 5G

OHIO RIVER
Flood Plain Information: Ohio River, Lawrence County, Ohio.
W77-08614 4A

OIL
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

Amend the Merchant Marine Act of 1920 (Hearings on S 2422 to Include the Virgin Islands Within the Scope of the Act With Respect to Transportation of Oil and Oil Products).
W77-08982 6E

OIL DISPERSANTS
Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

OIL INDUSTRY
Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

Site Evaluation and Preconstruction Testing at Potential Deepwater Port Locations.
W77-08989 6E

OIL POLLUTANTS
Agents, Methods and Devices for Amelioration of Discharges of Hazardous Chemicals on Water,
W77-08910 5G

OIL POLLUTION
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

Barrier for Water Carried Pollutants,
W77-08878 5G

Detergent Composition for Dispersing Oil Spills,
W77-08884 5G

Fending Device for Oil Containment Boom,
W77-08892 5G

Identification of Weathered Oil Films Found in the Marine Environment,
W77-08901 5A

Flocculant Use on Tankers,
W77-08906 5G

A Biodegradation of Oil on Water Surfaces,
W77-08909 5G

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W77-09059 5C

OIL RECOVERY DEVICES
Tests of Oil Recovery Devices in Broken Ice Fields. Phase I,
W77-08915 5G

OIL SPILLS
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

Detergent Composition for Dispersing Oil Spills,
W77-08884 5G

Fending Device for Oil Containment Boom,
W77-08892 5G

Identification of Weathered Oil Films Found in the Marine Environment,
W77-08901 5A

A Biodegradation of Oil on Water Surfaces,
W77-08909 5G

Agents, Methods and Devices for Amelioration of Discharges of Hazardous Chemicals on Water,
W77-08910 5G

Tests of Oil Recovery Devices in Broken Ice Fields. Phase I,
W77-08915 5G

Control of Pollution by Oil and Hazardous Substances, Discharge Removal.
W77-08987 5G

OIL STORAGE
Seismic Design of Liquid-Storage Tanks,
W77-08859 8D

OIL WASTES
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

OILY WATER
Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

ON-SITE-INVESTIGATION
Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

ON-SITE INVESTIGATIONS
Geophysical Exploration for Potable Groundwater Supplies in the Kalahari Gemsbok National Park,
W77-08654 4B

The Maximum Extent of Glaciers in Part of West Falkland,
W77-09032 2C

ON-SITE TESTS
Pumping Tests Provide Useful Data,
W77-08658 8G

OPEN CHANNEL FLOW
Some Computational Aspects of One- and Two-Dimensional Unsteady Flow Simulation by the Method of Characteristics,
W77-08745 2E

OPOSSUM
Trap Responses of the Gray Squirrel (Sciurus carolinensis carolinensis), Raccoon (PRocyon lotor lotor), and Opossum (Didelphis virginiana virginiana) to Environmental Factors in Two Swamp Watersheds of Northeastern North Carolina,
W77-08936 6G

OPTIMIZATION
Solid Waste Management: A Test of Alternative Strategies Using Optimization Techniques,
W77-08723 5E

OPTIMUM SOIL MOISTURE
Problems of Optimum Soil Moisture Level: Determination and Control, (In Russian),
W77-08952 2G

ORANGE AND LAKE COUNTIES (FLA)
Hydrologic Considerations in Dewatering and Refilling Lake Carlton, Orange and Lake Counties, Florida,
W77-09080 5G

ORE DEPOSITS
Hydrothermal Fluids of Seawater Salinity in Ophiolitic Sulphide Ore Deposits in Cyprus,
W77-08854 2L

OREGON
Hydrologic Changes After Logging in Two Small Oregon Coastal Watersheds,
W77-08746 4C

Hydrologic Reconnaissance of the Geothermal Area Near Klamath Falls, Oregon, with a Section on Preliminary Interpretation of Geophysical Data,
W77-09070 4B

ORGANIC CHLORIDES
Effects of Temperature and Kelthane on Grass Shrimp,
W77-08874 5C

ORGANIC COMPOUNDS
Experimental Data on the Regulation of 1,2-Dibromopropane in Reservoir Water, (In Russian),
W77-08718 5C

Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

A Comparison of Methods of Hydrocarbon Analysis of Marine Biota,
W77-08789 5A

Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

Frequency of Organic Compounds Identified in Water,
W77-08944 5A

A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

ORGANIC CONTAMINANTS
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

ORGANIC PESTICIDES
Reactions in the Aqueous Environment of Low Molecular Weight Organic Molecules,
W77-08754 5B

ORGANIC WASTES
Method of Purifying Waste Water,
W77-08881 5D

Method for Purifying Water of Organic Compounds Not Readily Biodegradable,
W77-08883 5D

Method and Apparatus for Purifying Aqueous Streams Contaminated with Organic Materials,
W77-08889 5D

Benthic Macroinvertebrates as Indexes of Water Quality in the Scioto River Basin, Ohio,
W77-08925 5A

Frequency of Organic Compounds Identified in Water,
W77-08944 5A

ORTHO-XYLENE
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

ORTHOCLADIINAE
Chironomid Fauna of the Upper Course of the Iseti River, (In Russian),
W77-09048 5C

OSWEGO HARBOR (NY)
Harbor and Nearshore Currents, Oswego Harbor, New York,
W77-08913 2L

OUTER CONTINENTAL SHELF
A Conceptual Representation of the New York Bight Ecosystem,
W77-08900 5B

Identification of Weathered Oil Films Found in the Marine Environment,
W77-08901 5A

Testing of a Technique for Remotely Measuring Water Salinity in an Estuarine Environment,
W77-08903 2L

A Transient, Two-Dimensional, Discrete-Element, Far-Field Model for Thermal Impact Analysis of Power Plant Discharges in Coastal and Offshore Regions. Part I: General Description of the Mathematical Model and Results of an Application,
W77-08905 5B

N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

A Biodegradation of Oil on Water Surfaces,
W77-08909 5G

Wave Refraction Diagrams for the Baltimore Canyon Region of the Mid-Atlantic Continental Shelf Computed by Using Three Bottom Topography Approximation Techniques,
W77-08912 2L

Ocean Dumping in the United States - 1975, Third Annual Report of the Environmental Protection Agency on the Administration of Title I of the Marine Protection, Research, and Sanctuaries Act of 1972, as Amended.
W77-08919 5B

OUTFALLS
New Plymouth Sewerage Scheme,
W77-08632 5D

OVERLAND FLOW
Phosphate and Nitrate Removal by a Grass Filtration System for Final Treatment of Municipal Waste Water,
W77-09100 5D

OWNERSHIP OF BEDS
Florida's Sovereignty Submerged Lands: What Are They, Who Owns Them and Where is the Boundary,
W77-08951 6E

United States V Holmes (Waters and Subaqueous Areas Located Within Perimeters of a Military Post),
W77-09008 6E

OXIDATION
Polluted Water Purification,
W77-08890 5D

OXIDATION-REDUCTION POTENTIAL
Transjoen, A Groundwater Influenced Lake with Special Redox and Sulphate Conditions,
W77-09031 2H

OXISOL
Nitrogen Removal from Secondary Effluent by a Laboratory Soil Column,
W77-08607 5B

OXYGEN
What's Up with Oxygen/2,
W77-08627 5D

The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

OXYGEN LEVEL FLUCTUATIONS
Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

OXYGENATION
Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

Reaeration and Velocity Prediction for Small Streams,
W77-08867 5B

Hyperoxygen Concentrations in the Hypolimnion Produced by Injection of Liquid Oxygen,
W77-09028 5G

OZONE
Ozone Disinfection of Secondary Effluent,
W77-08638 5D

PACKED BEDS
The Use of Packed Beds in Water Pollution Control,
W77-08637 5D

PALEOHYDROLOGY
Paleohydrologic Phenomena Recorded by Lake Sediments,
W77-08750 2J

PALEOLIMNOLOGY
Paleohydrologic Phenomena Recorded by Lake Sediments,
W77-08750 2J

PALM BEACH COUNTY (FLA)
Geologic Data from Test Drilling in Palm Beach County, Florida Since 1970,
W77-09073 7C

PANICUM AMARUM
Dune Stabilization with Panicum Amarum Along the North Carolina Coast,
W77-08908 2L

PARASITISM
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

A Study of Heavy Metals in Lake Abbaya, Ethiopia, and the Incidence of Non-Parasitic Elephantiasis,
W77-08774 5A

PARKS
Mc Cormick V Lawrence (Constitutionality of New York Statute Aimed at Promoting Governmental Interest in Preserving Appearance of an Area).
W77-09004 6E

PARTICLE SIZE
Grain-Size Parameters of Insoluble Residues in Mixxed Terrigenous-Skeletal Carbonate Sediments and Sedimentary Rocks: Some New Zealand Examples,
W77-08848 2L

PASSAIC RIVER (NJ)
Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

PATENTS
Universal Coupling for Movable Irrigation Pipes,
W77-08875 3F

Barrier for Water Carried Pollutants,
W77-08878 5G

PATENTS

Flow Restrictor and Trickle Emitter,
W77-08879 3F

Easily Movable Irrigation Sprinkler System,
W77-08880 3F

Method of Purifying Waste Water,
W77-08881 5D

Method for Purifying Water of Organic Compounds Not Readily Biodegradable,
W77-08883 5D

Detergent Composition for Dispersing Oil Spills,
W77-08884 5G

Irrigation Sprinkling Apparatus with Adjustable Ground Contacting Elements,
W77-08886 3F

Irrigation Drain Valve,
W77-08887 3F

Rotary Water Sprinkler,
W77-08888 3F

Method and Apparatus for Purifying Aqueous Streams Contaminated with Organic Materials,
W77-08889 5D

Polluted Water Purification,
W77-08890 5D

Method for Purifying Waste Waters which Contain Anionic-Type Organic Compounds,
W77-08891 5D

Fending Device for Oil Containment Boom,
W77-08892 5G

Skimmer Fence,
W77-08893 5G

Means and Method for Controlling Beach and Sandbar Erosion,
W77-08894 8B

Gravitational Irrigation System and Method of Installing,
W77-08895 3F

Remote Sealing of Mine Passages Containing Flowing Water,
W77-08896 5G

Wave Height Measuring Device,
W77-08897 7B

High Sensitivity Flowmeter,
W77-08898 7B

Sprinkler Having Improved Water Distribution,
W77-08899 3F

PATH OF POLLUTANTS

The Role of Methylmercury Production in the Transfer of Mercury in a Salt Marsh Ecosystem,
W77-08697 5C

The Distribution of Trace Metals in the Western North Atlantic Off Nova Scotia,
W77-08703 5B

Transport of Molybdenum in Mountainous Streams, Colorado,
W77-08705 5B

An Ecological Model for Heavy Metal Contamination of Crops and Ground Water,
W77-08706 5B

Time-of-Travel Study, Black River from Lyons Falls to Dexter, New York,
W77-08747 4A

Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

Simulation of Pollutant Movement in Groundwater Aquifers,
W77-08807 5B

Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

Simulation of Two-Dimensional Contaminant Transport with Isoparametric Hermitian Finite Elements,
W77-08829 5B

Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

Seasonal Patterns of Dissolved Oxygen, Nutrients, and Metals in Natural and Channelized Swamp Streams,
W77-08932 5B

Preliminary Study of Wastewater Movement in and Near Grand Teton National Park, Wyoming, Through October 1976,
W77-09087 5B

PATHOGENIC BACTERIA

Composting Destroys Pathogens in Sewage Solids,
W77-08641 5E

PATHOGENS

Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

PEAK DISCHARGE

Flood Plain Information: Ashuelot River, City of Keene, New Hampshire.
W77-08615 4A

Special Flood Hazard Report: Buffalo Creek, Meadow Grove, Nebraska.
W77-08616 4A

Flood Hazard Information: Yampa River and Tributaries, Steamboat Springs, Colorado.
W77-08619 4A

PELOPIINAE

Chironomid Fauna of the Upper Course of the Iseti River, (In Russian),
W77-09048 5C

PENALTIES (LEGAL)

Spill Penalties Draw Criticism,
W77-08973 6E

Control of Pollution by Oil and Hazardous Substances, Discharge Removal.
W77-08987 5G

PENNSYLVANIA

Szeles--Natale, Inc. V Board of Commissioners of Swatara Township, Dauphin County (Flood Control Aided by Land Development Restraints),
W77-08992 6E

PERCOLATING WATER

Almeda County Water District V Niles Sand and Gravel Company, Inc. (Use of Correlative Rights Doctrine to Defeat Claim of Inverse Condemnation),
W77-08991 6E

PERCOLATION

Nitrogen Removal from Secondary Effluent by a Laboratory Soil Column,
W77-08607 5B

Suitability of New England Soils in Accepting Waste Effluents, Phase II,
W77-09064 5E

PERFORMANCE

Predicting Performance of Pipe Culverts Buried in Soil,
W77-08622 8B

Waste Water Aeration System Produces Small Bubbles.
W77-08630 5D

Plant Size Influence on Performance in Activated Sludge Systems with Application to Regional Wastewater Treatment Planning,
W77-08928 5D

PERIPHYTON

Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

PERMITS

Complying with Discharge Regulations,
W77-08954 5G

Effluent Limitations and NPDES: Federal and State Implementation of the Federal Water Pollution Control Act Amendments of 1972,
W77-08956 5G

Changes Urged at NCWQ Hearings,
W77-08967 6E

Enforcement of Municipal Permits: Portent of Problems,
W77-08971 6E

Permit Program Regulations For Concentrated Animal Feeding Operations.
W77-08988 5G

Szeles--Natale, Inc. V Board of Commissioners of Swatara Township, Dauphin County (Flood Control Aided by Land Development Restraints),
W77-08992 6E

In Re City of White Bear Lake (Standard for Granting of Permits Under the Minnesota Water Management Law).
W77-08993 6E

Mianus River Preservation Committee V. Administrator, Environmental Protection Agency (Jurisdiction of Federal Appeals Court for Permits Issued by State Agency Under NPDES).
W77-09001 6E

Commonwealth of Massachusetts V. United States Veteran's Administration (Notice of Suit Provisions of the FWPCA; Federal Common Law Nuisance Actions).
W77-09002 6E

Mc Cormick V Lawrence (Constitutionality of New York Statute Aimed at Promoting Governmental Interest in Preserving Appearance of an Area).
W77-09004 6E

PESTICIDE RESIDUES
Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

The Accumulation of Polybominated Biphenyls by Fish,
W77-08777 5C

Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

PESTICIDES
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

PETERBOROUGH (ONTARIO)
Seasonal Variations in the Impact of Suburban Development on Runoff Response: Peterborough, Ontario,
W77-08831 4C

PHENOLS
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

PHOSPHATE REMOVAL
Phosphate and Nitrate Removal by a Grass Filtration System for Final Treatment of Municipal Waste Water,
W77-09100 5D

PHOSPHATES
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichtys olivaceus, (In Japanese),
W77-08782 5C

Electrochemical Determinations of Trace Quantities of Phosphate and Nitrate,
W77-08817 5A

PHOSPHORUS
An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W77-09059 5C

Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

PHOSPHORUS COMPOUNDS
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

PHOSPHORUS CONCENTRATION MODELS. HYDRAULIC LOADING
A Predictive Phosphorus Model for Lakes - Development and Testing,
W77-08930 5C

PHOTOCHEMICAL
Photochemical Dechlorination of Water Supply for Fish Tanks with Commercial Water Sterilizers,
W77-08842 5F

PHOTOGRAPHY
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-08752 7B

PHYSICAL PROPERTIES
Transjoen, A Groundwater Influenced Lake with Special Redox and Sulphate Conditions,
W77-09031 2H

PHYSIOLOGICAL ECOLOGY
Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

PHYSIOLOGICAL RESPONSES
Physiological and Behavioral Reactions of Fishes to Temperature Change,
W77-08802 5C

PHYSIOLOGICAL TEMPERATURE OPTIMA
Physiological and Behavioral Reactions of Fishes to Temperature Change,
W77-08802 5C

PHYTOPLANKTON
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

Physical and Chemical Parameters Associated with Phytoplankton Abundance and Periodicity in a Fertilized Fish Pond,
W77-08922 5C

PICNIC BAY (HONG KONG)
Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

PILE GROUPS
Added Mass of Pile Group,
W77-09018 8B

PILE SPACING
Added Mass of Pile Group,
W77-09018 8B

PILES (FOUNDATIONS)
Added Mass of Pile Group,
W77-09018 8B

PINFISH
Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

PIPELINES
The Effect of Surcharging on Discharge Through a Pipe,
W77-08644 8B

PIPES
Pressure Reducing Valves in Pipe Network Analyses,
W77-08855 8B

PIPING
Predicting Performance of Pipe Culverts Buried in Soil,
W77-08622 8B

PL 92-500
What 208 Planning Can Do: A Local and Federal View,
W77-08968 6E

PLANNING
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

PLANASA--A National Plan for Water Supply and Sewerage in Brazil,
W77-08646 6E

Integrated Evaluation Programs for Fairfax County, Va.,
W77-08862 6B

Water--An Element of Land-Use and Urban Growth Policies,
W77-08872 6B

Plant Size Influence on Performance in Activated Sludge Systems with Application to Regional Wastewater Treatment Planning,
W77-08928 5D

Legal Battles on the California Coast: A Review of the Rules,
W77-08963 6E

What 208 Planning Can Do: A Local and Federal View,
W77-08968 6E

PLANT GROWTH
Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

PLUMES
Mean Behavior of Buoyant Jets in a Crossflow
W77-09013 8B

PNEUMATIC DOSING APPARATUS
A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

POINT SOURCES (POLLUTION)
Effluent Limitations and NPDES: Federal and State Implementation of the Federal Water Pollution Control Act Amendments of 1972,
W77-08956 5G

POINT SOURCES (POLTLUTION)
When You Think About Polluted Waters, Think About Your Streams and Rivers.
W77-08960 5G

POLAND
Geochemistry and Origin of Thermal Waters in Poland,
W77-08684 2K

Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

POLITICAL ASPECTS
Policy Innovation and Institutional Fragmentation,
W77-09053 6E

POLLUTANT IDENTIFICATION
Bituminoid Formation in the Mud Sediments of Domestic Sewage, (In Russian),
W77-08618 5A

High Speed Liquid Chromatographic Analysis of Cobalamin Productivity and Distribution in Activated Sewage Sludge Treatment,
W77-08621 5A

Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

A Comparison of Methods of Hydrocarbon Analysis of Marine Biota,
W77-08789 5A

Electrochemical Determinations of Trace Quantities of Phosphate and Nitrate,
W77-08817 5A

Identification of Weathered Oil Films Found in the Marine Environment,
W77-08901 5A

Agents, Methods and Devices for Amelioration of Discharges of Hazardous Chemicals on Water,
W77-08910 5G

Benthic Macroinvertebrates as Indexes of Water Quality in the Scioto River Basin, Ohio,
W77-08925 5A

Frequency of Organic Compounds Identified in Water,
W77-08944 5A

A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

Complying with Discharge Regulations,
W77-08954 5G

POLLUTANT LOADINGS
Urban Stormwater Pollutant Loadings: A Statistical Summary Through 1972,
W77-09046 5B

POLLUTANTS
Simulation of Two-Dimensional Contaminant Transport with Isoparametric Hermitian Finite Elements,
W77-08829 5B

Urban Stormwater Pollutant Loadings: A Statistical Summary Through 1972,
W77-09046 5B

POLLUTION ABATEMENT
Pretreatment Helps Niagara Cut Costs,
W77-08633 5D

Flocculant Use on Tankers,
W77-08906 5G

International Law and Radioactive Pollution by Ocean Dumping: 'With All Their Genius and With All Their Skill...'
W77-08957 5G

PL 92-500: A Dose of Chaos,
W77-08959 5G

When You Think About Polluted Waters, Think About Your Streams and Rivers.
W77-08960 5G

POLYBROMINATED BIPHENYLS
The Accumulation of Polybominated Biphenyls by Fish,
W77-08777 5C

POLYCHLORINATED BIPHENYLS
Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

POLYCHLORINATED NAPHTHALENES
Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

POLYCRYSTALLINE DIAMOND
Diamond Composites Used in New Bits.
W77-08651 8G

POLYELECTROLYTES
Influence of Initial Mixing on Direct Filtration,
W77-08809 5F

Direct Filtration of Lake Michigan Water,
W77-08812 5F

POLYKRIKOS
A Certain Marine Catenate Dinoflagellate Tentatively Applied for Detecting Carcinogens,
W77-08795 5A

POLYMERS
Retention and Flow Characteristics of Polymer Solutions in Porous Media,
W77-08850 2G

Polymerization of Concrete Fights Cavitation,
W77-09044 8F

PONDS
Effect of Ponds and Small Reservoirs on River Runoff in the Forest-Steppe and Steppe Zones of the Volga Basin,
W77-08834 4A

Hyperoxygen Concentrations in the Hypolimnion Produced by Injection of Liquid Oxygen,
W77-09028 5G

POPULATION
Integrated Evaluation Programs for Fairfax County, Va.,
W77-08862 6B

Incidence of the Benefits and Costs of Environmental Programs,
W77-08870 6G

POROUS MEDIA
Retention and Flow Characteristics of Polymer Solutions in Porous Media,
W77-08850 2G

PORT AUTHORITIES
Site Evaluation and Preconstruction Testing at Potential Deepwater Port Locations.
W77-08989 6E

PORTER-COLOGNE WATER QUALITY CONTROL ACT
Porter--Cologne Water Quality Control Act.
W77-08978 6E

PORTS
Site Evaluation and Preconstruction Testing at Potential Deepwater Port Locations.
W77-08989 6E

POTABLE WATER
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

Interim Primary Drinking Water Regulations: Promulgation of Regulations on Radionuclides.
W77-08985 5G

POWER FAILURE
Auxiliary Air System for Use in Laboratory Experiments,
W77-08800 7B

POWER PLANTS
An Energy Accounting Evaluation of Several Alternatives for Hydropower and Geothermal Development,
W77-09057 6B

POWERPLANTS
A Transient, Two-Dimensional, Discrete-Element, Far-Field Model for Thermal Impact Analysis of Power Plant Discharges in Coastal and Offshore Regions. Part I: General Description of the Mathematical Model and Results of an Application,
W77-08905 5B

PRE-TREATMENT (WATER)
Pretreatment Helps Niagara Cut Costs,
W77-08633 5D

PRECIPITATION (ATMOSPHERIC)
Atmospheric Sulfate Additions and Cation Leaching in a Douglas Fir Ecosystem,
W77-08822 2K

Seasonal Variations in the Impact of Suburban Development on Runoff Response: Peterborough, Ontario,
W77-08831 4C

REFERENCE
Application of Temperature Preference Studies to Environmental Impact Assessment,
W77-08768 5C

REFERENDUM
Compilation of Temperature Preference Data,
W77-08767 7C

REFERRED TEMPERATURE
Thermal Acclimation, Upper Temperature Tolerance, and Preferred Temperature of Juvenile Yellowtail Snappers, Ocvurus chrvsurus (Bloch) (Pisces: Lutjanidae),
W77-08769 5C

Laboratory Methods for Determining Temperature Preference,
W77-08770 5C

RESCRIPTIVE RIGHTS
Mc Ilray V Hamilton (Permissive Use of Spring Overflow Defeats Prescriptive Right Claim),
W77-09006 6E

United States V Holmes (Waters and Subaqueous Areas Located Within Perimeters of a Military Post),
W77-09008 6E

RESERVATION
Biscayne Bay Symposium II,
W77-08961 5G

RESSURE REDUCTION
Pressure Reducing Valves in Pipe Network Analyses,
W77-08855 8B

RIMARY PRODUCTIVITY
An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

RODUCTIVITY
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

Environmental Planning for an Alaskan Water-Oriented Recreation Area,
W77-08805 6B

Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connecticut Rivers,
W77-08814 5B

Species Differences in Breakdown of Tree Leaves in Streams--Significance for Composition of Stream Communities,
W77-09056 5B

The Effect of the Willimantic Sewage Treatment Plant on the Microflora and Metabolism of the Shetucket River,
W77-09094 5C

ROGRAMS
Integrated Evaluation Programs for Fairfax County, Va.,
W77-08862 6B

Incidence of the Benefits and Costs of Environmental Programs,
W77-08870 6G

PROJECT PLANNING
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

PROJECTS
Inventory of Active Water Resources Research Projects in North Carolina.
W77-08938 9A

PROPERTY INTERESTS
United States V 62.61 Acres of Land, More or Less, In City of Virginia Beach, Commonwealth of Virginia (A Compensable Property Right as Might Exist in a Wharf or Pier will not be Found in a Jetty Constructed in Navigable Waters),
W77-08990 6E

PROPERTY RIGHTS
United States V 62.61 Acres of Land, More or Less, In City of Virginia Beach, Commonwealth of Virginia (A Compensable Property Right as Might Exist in a Wharf or Pier will not be Found in a Jetty Constructed in Navigable Waters),
W77-08990 6E

PROTECTION
Wetlands Protection Under the Corps of Engineer's New Dredge and Fill Jurisdiction,
W77-08977 5G

PROVO-JORDAN RIVER PARKWAY AUTHORITY (UTAH)
Provo-Jordan River Parkway Authority.
W77-09009 6E

PROVO RIVER (UTAH)
Provo-Jordan River Parkway Authority.
W77-09009 6E

PSYCHOLOGICAL ASPECTS
The Structural Analysis of Environmental Perception and Cognition: A Multidimensional Scaling Approach,
W77-08722 6B

PUBLIC ACCESS
A Rational National Policy on Public Use of the Beaches,
W77-08976 6E

PUBLIC HEALTH
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

A Study of Heavy Metals in Lake Abbaya, Ethiopia, and the Incidence of Non-Parasitic Elephantiasis,
W77-08774 5A

Interim Primary Drinking Water Regulations: Promulgation of Regulations on Radionuclides.
W77-08985 5G

PUBLIC HEALTH ENVIRONMENTAL CONTROL
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

PUBLIC PARTICIPATION
Citizen Participation in Water Policy Formation,
W77-08603 6B

PUBLIC RIGHTS
A Rational National Policy on Public Use of the Beaches,
W77-08976 6E

PUBLIC TRUST DOCTRINE
Florida's Sovereignty Submerged Lands: What Are They, Who Owns Them and Where is the Boundary,
W77-08951 6E

PUERTO RICO
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

PULP AND PAPER INDUSTRIES
Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

PULP WASTES
Sewage Sludge Incineration Should Be Improved by Addition of Newsprint Pulp.
W77-08639 5E

Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

Method of Purifying Waste Water,
W77-08881 5D

Method for Purifying Water of Organic Compounds Not Readily Biodegradable,
W77-08883 5D

Effects of Primary Treated and Biologically Stabilized Kraft Mill Effluents on the Production, Biomass and Growth Rates of Juvenile Salmonids in Three Stream Channels,
W77-08921 5C

PULPMILL EFFLUENT
Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

PUMP FAILURE
Water Turbine Pump Failure,
W77-08656 8G

PUMPING
Today's Windmills: A Blend of Old and New,
W77-08650 8C

Land Subsidence,
W77-08653 4B

Pumping Tests Provide Useful Data,
W77-08658 8G

Liquid Jet Eductors, The 'Pumps' with No Moving Parts,
W77-08671 8C

Selection of Slurry Pumps for Severe Applications,
W77-08673 8C

Avoiding the Perils of Cavitation,
W77-08674 8C

Simulations of Water-Level Drawdowns in Proposed Well-Field Areas, Dade County, Florida,
W77-08739 4B

Ground-Water Data for Michigan, 1975,
W77-08753 7C

Observation Records of Ground Water Level, (In Japanese),
W77-08904 4B

PUMPING TEST DATA
Pumping Tests Provide Useful Data,
W77-08658 8G

PUMPS
Water Turbine Pump Failure,
W77-08656 8G

Liquid Jet Eductors, The 'Pumps' with No Moving Parts,
W77-08671 8C

Self-Pressurizing Seals Keep Submersible Motors Dry,
W77-08672 8C

Selection of Slurry Pumps for Severe Applications,
W77-08673 8C

Pump Construction Materials,
W77-08675 8G

QUAHOG CLAM
Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

RACCOON
Trap Responses of the Gray Squirrel (Sciurus carolinensis carolinensis), Raccoon (PRocyon lotor lotor), and Opossum (Didelphis virginiana virginiana) to Environmental Factors in Two Swamp Watersheds of Northeastern North Carolina,
W77-08936 6G

RADIOACTIVE WASTE DISPOSAL
International Law and Radioactive Pollution by Ocean Dumping: 'With All Their Genius and With All Their Skill...'
W77-08957 5G

Storage of Low-Level Radioactive Wastes in the Ground: Hydrogeologic and Hydrochemical Factors,
W77-09086 5E

RADIOACTIVE WASTES
International Law and Radioactive Pollution by Ocean Dumping: 'With All Their Genius and With All Their Skill...'
W77-08957 5G

Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

RADIOACTIVITY EFFECTS
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem: I. An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W77-08695 5C

RADIOECOLOGY
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem: I. An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W77-08695 5C

RADIOISOTOPES
Interim Primary Drinking Water Regulations: Promulgation of Regulations on Radionuclides.
W77-08985 5G

Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

RADIUM RADIOISOTOPES
Interim Primary Drinking Water Regulations: Promulgation of Regulations on Radionuclides.
W77-08985 5G

RAFT RIVER VALLEY (IDAHO)
Selected Problems in Idaho Ground Water Law,
W77-09049 6E

RAINBOW TROUT
The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

RAINFALL
Point Stochastic Analysis of Daily Rainfall Occurrence with Application to Indiana,
W77-08935 2B

RAINFALL OCCURRENCES
Point Stochastic Analysis of Daily Rainfall Occurrence with Application to Indiana,
W77-08935 2B

RAINFALL-RUNOFF RELATIONSHIPS
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W77-08933 3B

REAERATION
Reaeration and Velocity Prediction for Small Streams,
W77-08867 5B

REASONABLE USE
Almeda County Water District V Niles Sand and Gravel Company, Inc. (Use of Correlative Rights Doctrine to Defeat Claim of Inverse Condemnation),
W77-08991 6E

RECLAMATION
Research Benefits in Water Resources Construction,
W77-08858 6B

The Third London Airport Study,
W77-09037 2L

RECREATION
Recreational Water Resources Problems.
W77-08711 6B

Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

RECREATION ACTIVITIES
Analysis of Supply and Demand of Urba
Oriented Nonreservoir Recreation.
W77-08871 6

RECREATION DEMAND
Analysis of Supply and Demand of Urba
Oriented Nonreservoir Recreation.
W77-08871 6

RECREATION FACILITIES
Environmental Planning for an Alaskan Wate
Oriented Recreation Area,
W77-08805 6

RECREATION USE
Analysis of Supply and Demand of Urba
Oriented Nonreservoir Recreation.
W77-08871 6

RECREATION WASTES
Environmental Planning for an Alaskan Wate
Oriented Recreation Area,
W77-08805 6

RECREATIONAL FACILITIES
Longitudinal Analysis of Change in Levels
Affiliation and Participation in Voluntary Fo
mal Organizations,
W77-09058 6

RED RIVER VALLEY (LA)
Records of Wells, Water-Level Measurement
and Drillers' Logs, Red River Valley, Lou
siana,
W77-08734 7

REFINED OIL
Effect of the Water-Soluble Fractions
Crude, Refined and Waste Oils on the Em
ryonic and Larval Stages of the Quahog Cla
Mercenaria sp.,
W77-08794 5

REFRACTION (WATER WAVES)
Comparison of Remotely Sensed Continenta
Shelf Wave Spectra with Spectra Computed b
Using a Wave Refraction Computer Model,
W77-08911 2

Wave Refraction Diagrams for the Baltimo
Canyon Region of the Mid-Atlantic Continent
Shelf Computed by Using Three Botto
Topography Approximation Techniques,
W77-08912 2

REGELATION
An Experimental Study of the Motion of Ic
Past Obstacles by the Process of Regelation,
W77-09033 2

REGIME DOMINANCE
The Hydrogeologic Regime of Glacial-Terra
Lakes, with Management and Planning Appl
cations,
W77-08724 2

REGIONAL ANALYSIS
Water Supply Economics,
W77-08863 6

REGIONAL DEVELOPMENT
Economic Role of the Waterway in Weste
Europe,
W77-08860 4

REGIONAL PLANNING
Water--An Element of Land-Use and Urba
Growth Policies,
W77-08872 6

REGIONAL WASTEWATER TREATMENT
Plant Size Influence on Performance in Activated Sludge Systems with Application to Regional Wastewater Treatment Planning,
W77-08928 5D

REGRESSION ANALYSIS
Economic Evaluation of Idaho's Water Supply,
W77-08816 6B

REGULATED FLOW
Multivariate Distributions in Hydrology and River Regulation,
W77-09029 2E

REGULATION
NPDES Permits and Water Analyses.
W77-08953 5G

Porter--Cologne Water Quality Control Act.
W77-08978 6E

Toxic Pollutant Effluent Standards for Aldrin/Dieldrin, DDT, Endrin, and Toxaphene,
W77-08983 5G

Effluent Guidelines and Standards for Iron and Steel Manufacturing Point Source Category.
W77-08986 5G

Permit Program Regulations For Concentrated Animal Feeding Operations.
W77-08988 5G

REMOTE SENSING
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-08752 7B

Testing of a Technique for Remotely Measuring Water Salinity in an Estuarine Environment,
W77-08903 2L

Comparison of Remotely Sensed Continental-Shelf Wave Spectra with Spectra Computed by Using a Wave Refraction Computer Model,
W77-08911 2L

REPRODUCTION
Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

RESEARCH AND DEVELOPMENT
Water Resources Research Interests in the Colleges and Universities of North Carolina.
W77-08931 9A

Inventory of Active Water Resources Research Projects in North Carolina.
W77-08938 9A

RESEARCH INTERESTS
Water Resources Research Interests in the Colleges and Universities of North Carolina.
W77-08931 9A

RESEARCH NEEDS
Proceedings: The Connecticut River System: A Workshop on Research Needs and Priorities.
W77-08808 6B

RESEARCH PRIORITIES
Proceedings: The Connecticut River System: A Workshop on Research Needs and Priorities.
W77-08808 6B

Water Resources Research Interests in the Colleges and Universities of North Carolina.
W77-08931 9A

RESERVOIR CONSTRUCTION
Longitudinal Analysis of Change in Levels of Affiliation and Participation in Voluntary Formal Organizations,
W77-09058 6B

RESERVOIR LEAKAGE
Development of a Low Cost Asphalt-Rubber Membrane for Water Harvesting Catchments and Reservoir Seepage Control,
W77-08601 3B

RESERVOIR OPERATION
WATSIM - A Fortran Program for 24 Hour Simulation of Flows and Reservoir Fluctuations in Water Distribution Networks,
W77-08943 7C

RESERVOIRS
Special Flood Hazard Information Report: Missouri and Kansas Rivers, Kansas City, Kansas.
W77-08613 4A

Flood Plain Information: Ohio River, Lawrence County, Ohio.
W77-08614 4A

Flood Plain Information: Llagas Creek Unit I, Including Edmundson (Little Llagas), Church, San Martin, New, Center, Corralitos, Tennant, Maple, and Foothill Creeks, Santa Clara County, California.
W77-08620 4A

Evaporation from Seven Reservoirs in the Denver Water-Supply System, Central Colorado,
W77-08736 2D

Trap-Efficiency Investigation Bernalillo Floodwater Retarding Reservoir No. 1 (Piedra Lisa Arroyo) Near Bernalillo, New Mexico, Water Years 1956-1974,
W77-08741 4D

Effect of Ponds and Small Reservoirs on River Runoff in the Forest-Steppe and Steppe Zones of the Volga Basin,
W77-08834 4A

RESIDENTIAL WATER
North Carolina Conference on Water Conservation.
W77-08820 3D

RESIDUAL OXYGEN BIOASSAY
The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

RESIDUE STUDIES
Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

RESISTIVITY
Geophysical Exploration for Potable Groundwater Supplies in the Kalahari Gemsbok National Park,
W77-08654 4B

RESOURCE MANAGEMENT
Ocean Dumping in the United States - 1975, Third Annual Report of the Environmental Protection Agency on the Administration of Title I of the Marine Protection, Research, and Sanctuaries Act of 1972, as Amended.
W77-08919 5B

RESOURCES DEVELOPMENT
Testing of a Technique for Remotely Measuring Water Salinity in an Estuarine Environment,
W77-08903 2L

A Transient, Two-Dimensional, Discrete-Element, Far-Field Model for Thermal Impact Analysis of Power Plant Discharges in Coastal and Offshore Regions. Part I: General Description of the Mathematical Model and Results of an Application,
W77-08905 5B

N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

An Examination of Some Physical and Biological Impacts of Dredging in Estuaries,
W77-08918 5C

RESPIRATION
The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

RETENTION
Retention and Flow Characteristics of Polymer Solutions in Porous Media,
W77-08850 2G

RETURN FLOW
The Effects of Wastewater Irrigation on the Activities and Movements of Songbirds,
W77-09098 5C

REVERSE OSMOSIS
New Directions in Ion Exchange,
W77-08719 5D

Method and Apparatus for Purifying Aqueous Streams Contaminated with Organic Materials,
W77-08889 5D

REVIEWS
Thermal and Chemical Problems of Thermal Waters, (Les Problemes Thermiques et Chimiques des eaux Thermales),
W77-08678 5B

REYNOLDS NUMBER
Drag and Inertia Forces on a Cylinder in Periodic Flow,
W77-09017 8B

Flow Regimes in Debris Flow,
W77-09045 2J

RIO GRANDE RIVER
Survival of Bacteria in Turbid and Polluted Waters,
W77-08606 5C

RIPARIAN PLANTS
Species Differences in Breakdown of Tree Leaves in Streams--Significance for Composition of Stream Communities,
W77-09056 5B

RIPARIAN RIGHTS
Florida's Sovereignty Submerged Lands: What Are They, Who Owns Them and Where is the Boundary,
W77-08951 6E

United States V 62.61 Acres of Land, More or Less, In City of Virginia Beach, Commonwealth of Virginia (A Compensable Property Right as Might Exist in a Wharf or Pier will not

be Found in a Jetty Constructed in Navigable Waters),
W77-08990 6E

United States V Holmes (Waters and Subaqueous Areas Located Within Perimeters of a Military Post),
W77-09008 6E

RISKS
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6G

RIVER FLOW
Surface-Groundwater Interactions and the Conjunctive Use of the Water Resources of the Mullica River Basin, New Jersey,
W77-08810 4B

RIVER REGULATION
Multivariate Distributions in Hydrology and River Regulation,
W77-09029 2E

RIVERS
Results of a Microbiological Investigation of the Danube River by One Point Profile (1969-1971), (In German),
W77-08694 5B

The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

Effect of the Boundary Surface Between Sea and Fresh Waters on the Distribution of Dissolved Oxygen in the Mouth Region of the Dnieper River,
W77-08832 5B

Some Hydrochemical Characteristics of the Mouth Reaches of the Anabar, Lena, Yana, and Indigirka Rivers,
W77-08833 2L

Systematic Identification of DO-BOD Model Structure,
W77-08866 5B

Modine Manufacturing Co V Pollution Control Board of Illinois (Stream Reclassification and Effluent Variances Required by New Waste Treatment Technology),
W77-09007 6E

Provo-Jordan River Parkway Authority.
W77-09009 6E

Multivariate Distributions in Hydrology and River Regulation,
W77-09029 2E

Dispersion Measurement on the Danube,
W77-09040 5B

ROCK PROPERTIES
Rock Type Decides Jetting Economics,
W77-08666 8C

Tests Show Jet-Drilling Hard Rock Potential,
W77-08667 8E

ROCKS
Studies by the Dynamic Method on the Reaction of Rock with Hot Spring Water of the Tamagawa Hot Springs in Japan,
W77-08689 2K

ROLLER CONE BITS
Recent Advances in Rotary Drill Bits,
W77-08649 8G

ROMANIA (PANNONIAN DEPRESSION)
Study of the Chemical and Gaseous Composition of Thermal Waters of the Eastern Part of the Pannonian Depression (Considerations sur la Composition Chimique et Gazeuse des eaux Thermales de la Partie Orientale de la Depression Pannonique (Roumanie)),
W77-08688 2K

ROOT DEVELOPMENT
Distribution of Corn Roots in Sandy Soil with a Declining Water Table,
W77-08676 2I

ROOT DISTRIBUTION
Distribution of Corn Roots in Sandy Soil with a Declining Water Table,
W77-08676 2I

ROTARY DRILLING
Cement-Mud Spacer System Improves Illinois Wells,
W77-08647 8F

Drill String Makeup, Past, Present, Future,
W77-08648 8C

Recent Advances in Rotary Drill Bits,
W77-08649 8G

Rock Type Decides Jetting Economics,
W77-08666 8C

Tests Show Jet-Drilling Hard Rock Potential,
W77-08667 8E

Air, Mist and Foam Drilling, A Look at Latest Techniques,
W77-08669 8C

ROUGHNESS (HYDRAULICS)
Roughness Effects on the Flow Direction Near Curved Stream Beds,
W77-09038 8B

RUBBER
Development of a Low Cost Asphalt-Rubber Membrane for Water Harvesting Catchments and Reservoir Seepage Control,
W77-08601 3B

RULEMAKING
Site Evaluation and Preconstruction Testing at Potential Deepwater Port Locations.
W77-08989 6E

RUNOFF
The Hydrology of a Small Catchment Basin at Samaru, Nigeria: IV: Assessment of Soil Erosion Under Varied Land Management and Vegetation Cover;
W77-08698 4D

Seasonal Variations in the Impact of Suburban Development on Runoff Response: Peterborough, Ontario,
W77-08831 4C

Effect of Ponds and Small Reservoirs on River Runoff in the Forest-Steppe and Steppe Zones of the Volga Basin,
W77-08834 4A

Effect of Agricultural and Silvicultural Practices on the Runoff from Drainage Basins of the Nizhnedevitskaya Hydrologic Station,
W77-08835 4C

Role of River Runoff and of Water Exchange in the Salinity of the Northern Caspian Sea,
W77-08836 2H

Multivariate Distributions in Hydrology and River Regulation,
W77-09029 2E

RUNOFF QUALITY
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

SAGEBRUSH
Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

SALAMANDERS
Neoplastic and Possibly Related Skin Lesions in Neotenic Tiger Salamanders from a Sewage Lagoon,
W77-08729 5C

SALINE WATER-FRESHWATER INTERFACES
A Reconnaissance of the Hydrology of the Edisto and Ashepoo Estuaries, South Carolina,
W77-09076 2L

A Reconnaissance of the Hydrology of the Intracoastal Waterway from Bucksport to Little River Inlet, South Carolina,
W77-09077 2L

SALINE WATER INTRUSION
A Reconnaissance of the Hydrology of the Edisto and Ashepoo Estuaries, South Carolina,
W77-09076 2L

SALINITY
The Behaviour of Dissolved Iron, Manganese and Zinc in the Beaulieu Estuary, S. England,
W77-08701 5B

Role of River Runoff and of Water Exchange in the Salinity of the Northern Caspian Sea,
W77-08836 2H

Testing of a Technique for Remotely Measuring Water Salinity in an Estuarine Environment,
W77-08903 2L

SALMONELLA
Survival of Bacteria in Turbid and Polluted Waters,
W77-08606 5C

SALMONIDS
The Accumulation of Polybominated Biphenyls by Fish,
W77-08777 5C

Effects of Primary Treated and Biologically Stabilized Kraft Mill Effluents on the Production, Biomass and Growth Rates of Juvenile Salmonids in Three Stream Channels,
W77-08921 5C

SALT MARSHES
The Role of Methylmercury Production in the Transfer of Mercury in a Salt Marsh Ecosystem,
W77-08697 5C

SALTON TROUGH (CALIF)
Economics of Geothermal Energy Development (In Imperial County, California),
W77-08657 8C

SALTS
The Use and Misuse of Pure Water PVT Properties for Lake Waters,
W77-08840 2H

SAMPLER
New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

SAMPLING
New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

SAN ANTONIO (TEX)
Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

SAN JOAQUIN VALLEY (CALIF)
Guide for Data Collection to Calibrate a Predictive Digital Ground-Water Model of the Unconfined Aquifer in and Near the City of Modesto, California,
W77-08735 2F

SAN LUIS VALLEY (COLO)
Water-Level Records for the San Luis Valley of Colorado, 1973-77,
W77-09088 7C

SANDS
Beach Sand Transport: Distribution and Total Drift,
W77-09019 2L

SANITARY ENGINEERING
PLANASA--A National Plan for Water Supply and Sewerage in Brazil,
W77-08646 6E

SAPONIFICATION
A Comparison of Methods of Hydrocarbon Analysis of Marine Biota,
W77-08789 5A

SATELLITES (ARTIFICIAL)
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-08752 7B

SATUS CREEK BASIN (WASH)
Outline of the Water Resources of the Satus Creek Basin, Yakima Indian Reservation, Washington,
W77-08740 4B

SAVANNAH RIVER PLANT (SC)
Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

SCENEDESMUS OBLIQUUS
Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

SCIOTO RIVER BASIN (OHIO)
New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

Benthic Macroinvertebrates as Indexes of Water Quality in the Scioto River Basin, Ohio,
W77-08925 5A

SCREENS
Fine Screening of Raw Sewage,
W77-08629 8G

SEA WATER
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

Hydrothermal Fluids of Seawater Salinity in Ophiolitic Sulphide Ore Deposits in Cyprus,
W77-08854 2L

SEALANTS
Self-Pressurizing Seals Keep Submersible Motors Dry,
W77-08672 8C

SEASHORES
A Rational National Policy on Public Use of the Beaches,
W77-08976 6E

SEASONAL
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

The Effect of Warm Effluent from the Novorossiysk Thermal Power Plan on Zooplankton,
W77-08804 5C

Seasonal Variations in the Impact of Suburban Development on Runoff Response: Peterborough, Ontario,
W77-08831 4C

Seasonal Patterns of Dissolved Oxygen, Nutrients, and Metals in Natural and Channelized Swamp Streams,
W77-08932 5B

SEASONAL VARIATION
Harbor and Nearshore Currents, Oswego Harbor, New York,
W77-08913 2L

SECOND INTERNATIONAL CONFERENCE ON WATER LAW AND ADMINISTRATION
Conclusions and Recommendations for the United Nations Water Conference (Preliminary Outline),
W77-08965 6E

SEDIMENT CONCENTRATION
Effect of Sediment Load on Stable Sand Canal Dimensions,
W77-09020 8B

SEDIMENT CONTROL
Trap-Efficiency Investigation Bernalillo Floodwater Retarding Reservoir No. 1 (Piedra Lisa Arroyo) Near Bernalillo, New Mexico, Water Years 1956-1974,
W77-08741 4D

SEDIMENT DEPOSITS
Mineral Distribution Within the Sediments of Pearl Harbor,
W77-08815 2L

SEDIMENT LOAD
Effect of Sediment Load on Stable Sand Canal Dimensions,
W77-09020 8B

SEDIMENT TRANSPORT
Designing for Sediment Transport,
W77-08962 4D

Beach Sand Transport: Distribution and Total Drift,
W77-09019 2L

SEDIMENT-WATER INTERFACES
N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

SEDIMENT YIELD
Hydrologic Changes After Logging in Two Small Oregon Coastal Watersheds,
W77-08746 4C

SEDIMENTOLOGY
Paleohydrologic Phenomena Recorded by Lake Sediments,
W77-08750 2J

SEDIMENTS
Flow Regimes in Debris Flow,
W77-09045 2J

SEEPAGE
Character of Seepage of Precipitation to the Water Table in the Central Forest Steppe,
W77-09043 4B

SEEPAGE CONTROL
Development of a Low Cost Asphalt-Rubber Membrane for Water Harvesting Catchments and Reservoir Seepage Control,
W77-08601 3B

SEISMIC DESIGN
Seismic Design of Liquid-Storage Tanks,
W77-08859 8D

SELECTION
Compilation of Temperature Preference Data,
W77-08767 7C

SEPARATION
Nitrification and Heavy Metal Removal in the Activated Sludge Treatment Process,
W77-08623 5D

SEPARATION TECHNIQUES
Removal of Fluorine from Waste Waters. III. Fundamental Tests with Chemical Reagents (Haisuichu no fusso jokyo nikansuru kenkyu. III. Shiyaku ke: niyoru kisoshiken),
W77-08626 5D

The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

Flocculant Use on Tankers,
W77-08906 5G

SEWAGE
Bituminoid Formation in the Mud Sediments of Domestic Sewage, (In Russian),
W77-08618 5A

Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

SEWAGE DISPOSAL
Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

Suitability of New England Soils in Accepting Waste Effluent - Phase I,
W77-09063 5E

SEWAGE EFFLUENTS
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

Suitability of New England Soils in Accepting Waste Effluent - Phase I,
W77-09063 5E

Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

Effects of Primary Sewage Effluent from the City of Willimantic on the Benthic Invertebrate Fauna of the Willimantic/Shetucket Rivers,
W77-09093 5C

Deer Habitat Response to Irrigation with Municipal Wastewater,
W77-09099 5C

SEWAGE LAGOONS
Suitability of New England Soils in Accepting Waste Effluent - Phase I,
W77-09063 5E

Preliminary Study of Wastewater Movement in and Near Grand Teton National Park, Wyoming, Through October 1976,
W77-09087 5B

SEWAGE SLUDGE
Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

To Extend the Marine Protection, Research, and Sanctuaries Act (Hearing on S 3147 to Extend the Act 2 Years).
W77-08981 6E

SEWAGE TREATMENT
Sewage Treatment in Developing Countries,
W77-08635 5D

Composting Destroys Pathogens in Sewage Solids,
W77-08641 5E

Trickling Filter-Activated Sludge Combinations,
W77-08868 5D

Real-Time Measurements of Aquatic Nitrogen,
W77-09095 5D

SEWAGE TREATMENT EFFLUENT
The Effect of Secondarily Treated Sewage on the Algal Populations of the Willimantic/Shetucket Rivers,
W77-09096 5C

SEWERAGE
PLANASA--A National Plan for Water Supply and Sewerage in Brazil,
W77-08646 6E

SEWERS
New Plymouth Sewerage Scheme,
W77-08632 5D

SHALLOW-WATER ORGANISMS
New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

SHAPE
Shape of a Streamline Water Table Near Inflow and Outflow Boundaries,
W77-09023 2F

SHEAR
Resistance of Two Dimensional Triangular Roughness,
W77-09035 8B

SHEAR STRESS
Roughness Effects on the Flow Direction Near Curved Stream Beds,
W77-09038 8B

SHETUCKET RIVER (CONN)
The Effect of the Willimantic Sewage Treatment Plant on the Microflora and Metabolism of the Shetucket River,
W77-09094 5C

SHIPS
Sinkage and Resistance for Ships in Channels,
W77-08873 8B

Amend the Merchant Marine Act of 1920 (Hearings on S 2422 to Include the Virgin Islands Within the Scope of the Act With Respect to Transportation of Oil and Oil Products).
W77-08982 6E

Site Evaluation and Preconstruction Testing at Potential Deepwater Port Locations.
W77-08989 6E

SHORE PROTECTION
Means and Method for Controlling Beach and Sandbar Erosion,
W77-08894 8B

SHRIMP
Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

Effects of Temperature and Kelthane on Grass Shrimp,
W77-08874 5C

SHRUB COVER
The Effects of Wastewater Irrigation on the Activities and Movements of Songbirds,
W77-09098 5C

SILICA
The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

SILTING
Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

Effects of Primary Sewage Effluent from the City of Willimantic on the Benthic Invertebrate Fauna of the Willimantic/Shetucket Rivers,
W77-09093 5C

SIMULATION ANALYSIS
Simulation of Pollutant Movement in Groundwater Aquifers,
W77-08807 5B

WATSIM - A Fortran Program for 24 Hour Simulation of Flows and Reservoir Fluctuations in Water Distribution Networks,
W77-08943 7C

SINKAGE
Sinkage and Resistance for Ships in Channels,
W77-08873 8B

SIROTHERM PROCESS
New Directions in Ion Exchange,
W77-08719 5D

SITES
Energy Plant Siting Legislation,
W77-09050 6E

SKIMMER FENCES
Skimmer Fence,
W77-08893 5G

SKIMMING
Skimmer Fence,
W77-08893 5G

SLICKGONE LT2
Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

SLUDGE BULKING
Controlling Sludge Bulking,
W77-08636 5D

SLUDGE DISPOSAL
Sludge Disposal in the North West,
W77-08628 5E

Sludge Incineration,
W77-08717 5E

Soil Testing for Sludge Disposal.
W77-08728 5E

Trickling Filter-Activated Sludge Combinations,
W77-08868 5D

Role of Nitrogen in Activated Sludge Process,
W77-08869 5D

SLUDGE TREATMENT
High Speed Liquid Chromatographic Analysis of Cobalamin Productivity and Distribution in Activated Sewage Sludge Treatment,
W77-08621 5A

Controlling Sludge Bulking,
W77-08636 5D

Sludge Treatment: Problems and Solutions, Part 1,
W77-08640 5D

Trickling Filter-Activated Sludge Combinations,
W77-08868 5D

Plant Size Influence on Performance in Activated Sludge Systems with Application to Regional Wastewater Treatment Planning,
W77-08928 5D

SLUICE GATES
Numerical Solution for Flow Under Sluice Gates,
W77-09012 8B

LIBRARY OF THE UNIVERSITY OF ILLINOIS

SLUMPING (EROSION)
Present-Day Slumping and Erosion Phenomena on Irrigated Lands (Exemplified by Southeastern Ciscaucasia), (In Russian),
W77-08885 2J

SLURRIES
Specialty Cements Can Solve Special Problems,
W77-08664 8F

Additives Tailor Cement to Individual Wells,
W77-08665 8F

Selection of Slurry Pumps for Severe Applications,
W77-08673 8C

SMALL ANIMALS (MAMMALS)
Population Response and Heavy Metal Concentrations in Cottontail Rabbits and Small Mammals in Wastewater Irrigated Habitats,
W77-09097 5B

SMALL WATERSHEDS
Water as an Environmental Constraint in Land Use Planning,
W77-08721 6G

SNAILS
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

SNAKE RIVER INTERSTATE COMPACT
Snake River Interstate Compact.
W77-08996 6E

SNOWMELT
Flood Hazard Information: Yampa River and Tributaries, Steamboat Springs, Colorado.
W77-08619 4A

Snowmelt: A Two-Dimensional Turbulent Diffusion Model,
W77-08823 2C

An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W77-08933 3B

SNOWPACKS
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W77-08933 3B

SOCIAL ASPECTS
A Consultant's View of PL 92-500.
W77-08958 5G

SOCIAL CHANGE
Longitudinal Analysis of Change in Levels of Affiliation and Participation in Voluntary Formal Organizations,
W77-09058 6B

SOCIAL PARTICIPATION
Citizen Participation in Water Policy Formation,
W77-08603 6B

Longitudinal Analysis of Change in Levels of Affiliation and Participation in Voluntary Formal Organizations,
W77-09058 6B

SOCIAL VALUES
The Structural Analysis of Environmental Perception and Cognition: A Multidimensional Scaling Approach,
W77-08722 6B

SOCKEYE SALMON
Effects of a Parasite, Eubothrium salvelini (Cestoda: Pseudophyllidea), on the Resistance of Juvenile Sockeye Salmon, Oncorhynchus nerka, to Zinc,
W77-08791 5C

SODIUM
The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

SOFTWARE
Prototype Software for On-Line Storage Forecasting Supported by Load Forecasting and Reduced System Representation for Water Distribution Systems,
W77-08942 7C

WATSIM - A Fortran Program for 24 Hour Simulation of Flows and Reservoir Fluctuations in Water Distribution Networks,
W77-08943 7C

SOIL AGGREGATES
Strength of Soil Aggregates: Influence of Size, Density and Clay and Organic Matter Content,
W77-08707 2G

SOIL BACTERIA
The Effect of Soil Moisture on the Development of Soil Microflora in Conditions of Field Experiments, (In Slovak),
W77-08696 5B

SOIL CHEMISTRY
Adsorption and Vertical Movement of the Zinc and Manganese Ions in Three Types of Soil,
W77-09054 5B

SOIL CONTAMINATION
An Ecological Model for Heavy Metal Contamination of Crops and Ground Water,
W77-08706 5B

Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

Simulation of Two-Dimensional Contaminant Transport with Isoparametric Hermitian Finite Elements,
W77-08829 5B

SOIL DISPOSAL FIELDS
Soil Testing for Sludge Disposal.
W77-08728 5E

SOIL EROSION
The Hydrology of a Small Catchment Basin at Samaru, Nigeria: IV: Assessment of Soil Erosion Under Varied Land Management and Vegetation Cover;
W77-08698 4D

SOIL MICROORGANISMS
The Effect of Soil Moisture on the Development of Soil Microflora in Conditions of Field Experiments, (In Slovak),
W77-08696 5B

SOIL MOISTURE
Distribution of Corn Roots in Sandy Soil with a Declining Water Table,
W77-08676 2I

The Effect of Soil Moisture on the Development of Soil Microflora in Conditions of Field Experiments, (In Slovak),
W77-08696 5B

Problems of Optimum Soil Moisture Level: Determination and Control, (In Russian),
W77-08952 2G

SOIL-MOISTURE STRESS
Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

SOIL PHYSICAL PROPERTIES
Suitability of New England Soils in Accepting Waste Effluents, Phase II,
W77-09064 5E

SOIL PHYSICS
Soil and Rock Strata to Trap, Filter and Store Water for Rural Domestic use,
W77-08821 3B

SOIL PROPERTIES
Effects of Spatial Variability of Soil Hydraulic Properties in Water Budget Modeling,
W77-08825 2G

Infiltration Equations for Simple Soil Systems,
W77-09025 2G

SOIL STRENGTH
Strength of Soil Aggregates: Influence of Size, Density and Clay and Organic Matter Content,
W77-08707 2G

SOIL TESTS
Soil Testing for Sludge Disposal.
W77-08728 5E

SOIL TYPES
Adsorption and Vertical Movement of the Zinc and Manganese Ions in Three Types of Soil,
W77-09054 5B

SOIL WATER MOVEMENT
The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

Flow Characteristics During Infiltration into a Horizontal Sand Column,
W77-08826 2G

Infiltration Equations for Simple Soil Systems,
W77-09025 2G

SOIL-WATER-PLANT RELATIONSHIPS
Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

SOLAR RADIATION
Ground Water - Solar Heat,
W77-08652 8C

SOLID WASTES
Solid Waste Management: A Test of Alternative Strategies Using Optimization Techniques,
W77-08723 5E

SOLUTES
Solute Travel Times to Wells,
W77-09042 5B

SONG BIRDS
The Effects of Wastewater Irrigation on the Activities and Movements of Songbirds,
W77-09098 5C

SOUTH CAROLINA
Density and Distribution of Benthos in Lake Keowee, South Carolina,
W77-08818 5C

Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

A Reconnaissance of the Hydrology of the Edisto and Ashepoo Estuaries, South Carolina,
W77-09076 2L

A Reconnaissance of the Hydrology of the Intracoastal Waterway from Bucksport to Little River Inlet, South Carolina,
W77-09077 2L

SOUTHEAST ALASKA
Limnological Investigation of Six Lakes in Southeast Alaska,
W77-09069 7C

SOVEREIGN IMMUNITY
A Rational National Policy on Public Use of the Beaches,
W77-08976 6E

SOXHLET EXTRACTION
A Comparison of Methods of Hydrocarbon Analysis of Marine Biota,
W77-08789 5A

SPECIES COMPOSITION
The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

The Effect of Warm Effluent from the Novorossiysk Thermal Power Plan on Zooplankton,
W77-08804 5C

SPECIFIC GROWTH RATE
Optimal Temperature for Growth of Juvenile Bluegills,
W77-08798 5C

SPECTROSCOPY
Bituminoid Formation in the Mud Sediments of Domestic Sewage, (In Russian),
W77-08618 5A

SPOIL BANKS
Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

SPONGE SPECIES
Ecology of Toxicity in Marine Sponges,
W77-08793 5C

SPONGES
Ecology of Toxicity in Marine Sponges,
W77-08793 5C

SPRING WATERS
Mc Ilray V Hamilton (Permissive Use of Spring Overflow Defeats Prescriptive Right Claim),
W77-09006 6E

SPRINKLER IRRIGATION
Easily Movable Irrigation Sprinkler System,
W77-08880 3F

Irrigation Sprinkling Apparatus with Adjustable Ground Contacting Elements,
W77-08886 3F

Rotary Water Sprinkler,
W77-08888 3F

Sprinkler Having Improved Water Distribution,
W77-08899 3F

ST LAWRENCE RIVER
Oceanographic Features, Currents, and Transport in Cabot Strait,
W77-08851 2L

STABILIZATION
Dune Stabilization with Panicum Amarum Along the North Carolina Coast,
W77-08908 2L

STANDARDS
In Re City of White Bear Lake (Standard for Granting of Permits Under the Minnesota Water Management Law).
W77-08993 6E

STANDING CROPS
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

STATE GOVERNMENTS
PL 92-500: New Federalism or Federal Takeover,
W77-08972 6E

STATISTICAL METHODS
Missouri Stream and Springflow Characteristics Low-Flow Frequency and Flow Duration,
W77-08743 2E

Systematic Identification of DO-BOD Model Structure,
W77-08866 5B

STATISTICAL MODELS
Point Stochastic Analysis of Daily Rainfall Occurrence with Application to Indiana,
W77-08935 2B

STEAMBOAT SPRINGS (CO)
Flood Hazard Information: Yampa River and Tributaries, Steamboat Springs, Colorado.
W77-08619 4A

STEEL
Effluent Guidelines and Standards for Iron and Steel Manufacturing Point Source Category.
W77-08986 5G

STEEL PIPES
Drill String Makeup, Past, Present, Future,
W77-08648 8C

STOCHASTIC PROCESSES
Point Stochastic Analysis of Daily Rainfall Occurrence with Application to Indiana,
W77-08935 2B

STORAGE
Prediction of Nitrogen Transformations in the Storage Lagoon of a Land Treatment System,
W77-08624 5D

STORAGE TANKS
Seismic Design of Liquid-Storage Tanks,
W77-08859 8D

STORM DRAINS
The Effect of Surcharging on Discharge Through a Pipe,
W77-08644 8B

STORM RUNOFF
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

Urban Stormwater Pollutant Loadings: A Statistical Summary Through 1972,
W77-09046 5B

STORM TIDES
Storm Tide Frequency Analysis for the Coast of Georgia,
W77-08914 2E

STORM WATER
Quantitative and Qualitative Implications o Urban Storm Runoff Abatement Measures,
W77-08602 5C

STORM WATER COMPOSITION
Urban Stormwater Pollutant Loadings: A Statistical Summary Through 1972,
W77-09046 5E

STRAITS
Oceanographic Features, Currents, and Trans port in Cabot Strait,
W77-08851 2E

STRATIFICATION
Seepage Under Structure on N Strata of Soil,
W77-08843 2E

Induced Vertical Mixing in a Stratified Im poundment by a Subsurface Warm Wate Discharge,
W77-08929 5E

STRATIFIED WATER COLUMN
Mineral Distribution Within the Sediments o Pearl Harbor,
W77-08815 2E

STRATIGRAPHY
Study of an Ice Core to the Bedrock in the Ac cumulation Zone of an Alpine Glacier,
W77-08846 2C

STREAM-AQUIFER INTERACTIONS
Integral Equation for the Description o Stream-Aquifer Interaction,
W77-09092 2E

STREAM CHANNELIZATION
Effects of Stream Channelization on Bottom land and Swamp Forest Ecosystems,
W77-08920 4A

STREAM GAGES
A Review of Velocity-Measuring Devices,
W77-09085 7E

STREAM MODELING
Nonlinear Estimation in Stream Quality Mode ing,
W77-09047 5E

STREAMFLOW
Floods in the Big Creek Basin, Linn County Iowa,
W77-08731 2E

Outline of the Water Resources of the Satu Creek Basin, Yakima Indian Reservation Washington,
W77-08740 4E

Hydrologic Changes After Logging in Tw Small Oregon Coastal Watersheds,
W77-08746 4C

Time-of-Travel Study, Black River from Lyon Falls to Dexter, New York,
W77-08747 4A

STREAMS
Indiana Stream-Temperature Characteristics,
W77-08755 7C

Qualitative and Quantitative Changes in the Benthic Fauna of a Trout Stream, the Couze Pavin Puy-De-Dome, Caused by Agricultural and Urban Pollution, (In French),
W77-08955 5C

Chemical Character of Headwater Streams in Vermont and New Hampshire,
W77-09027 2K

STREPTOCOCCUS
The Effect of the Willimantic Sewage Treatment Plant on the Microflora and Metabolism of the Shetucket River,
W77-09094 5C

STRESS
Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

STRIP MINE WASTES
Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

SUBLETHAL EFFECTS
Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

SUBMARINE CANYONS
Current-Meter Recordings of Low-Speed Turbidity Currents,
W77-08847 2L

Wave Refraction Diagrams for the Baltimore Canyon Region of the Mid-Atlantic Continental Shelf Computed by Using Three Bottom Topography Approximation Techniques,
W77-08912 2L

SUBMERGED LANDS
Florida's Sovereignty Submerged Lands: What Are They, Who Owns Them and Where is the Boundary,
W77-08951 6E

SUBMERGED LANDS ACT
As an Incident of National Sovereignty, the United States Has Paramount Rights and Power in the Seabed and Subsoil of the Outer Continental Shelf,
W77-08974 6E

SUBMERSIBLE ELECTRIC MOTORS
Self-Pressurizing Seals Keep Submersible Motors Dry,
W77-08672 8C

SUBMERSIBLE PUMPS
Self-Pressurizing Seals Keep Submersible Motors Dry,
W77-08672 8C

SUBSURFACE WATER
Remote Sealing of Mine Passages Containing Flowing Water,
W77-08896 5G

SUBURBAN DRAINAGE
Network Characteristics in Suburbanizing Streams,
W77-08830 4C

SULFATES
The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichtys olivaceus, (In Japanese),
W77-08782 5C

Transjoen, A Groundwater Influenced Lake with Special Redox and Sulphate Conditions,
W77-09031 2H

SULFIDES
Hydrothermal Fluids of Seawater Salinity in Ophiolitic Sulphide Ore Deposits in Cyprus,
W77-08854 2L

SUNFISHES
Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

Effects of Dipotassium Endothall on Rooted Aquatics and Adult and First Generation Bluegills,
W77-08785 5C

Optimal Temperature for Growth of Juvenile Bluegills,
W77-08798 5C

SUPERSATURATION
Hyperoxygen Concentrations in the Hypolimnion Produced by Injection of Liquid Oxygen,
W77-09028 5G

SUPERVISORY CONTROL (POWER)
Szeles--Natale, Inc. V Board of Commissioners of Swatara Township, Dauphin County (Flood Control Aided by Land Development Restraints),
W77-08992 6E

SURFACE-GROUNDWATER RELATIONSHIPS
Surface-Groundwater Interactions and the Conjunctive Use of the Water Resources of the Mullica River Basin, New Jersey,
W77-08810 4B

Ground-Water Hydrology of Berkeley County, West Virginia,
W77-09083 4B

Integral Equation for the Description of Stream-Aquifer Interaction,
W77-09092 2F

SURFACE HEAT DISSIPATION
Thermal Loading of Natural Streams,
W77-09068 5B

SURFACE RUNOFF
The Hydrology of a Small Catchment Basin at Samaru, Nigeria: IV: Assessment of Soil Erosion Under Varied Land Management and Vegetation Cover;
W77-08698 4D

SURFACE WATER
The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

SURFACE WATERS
Water Resources Data for Washington, Water Year 1975.
W77-08737 7C

Water Resources Data for Montana, Water Year 1975.
W77-08738 7C

Water for Industrial and Agricultural Development in Attala, Holmes, Humphreys, Issaquena, Sharkey, and Yazoo Counties, Mississippi,
W77-08748 4B

The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

Water Resources Data for Mississippi, Water Year 1975.
W77-09074 7C

Water Resources Data for North Dakota, Water Year 1975.
W77-09075 7C

SURVEYS
An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

Trap Responses of the Gray Squirrel (Sciurus carolinensis carolinensis), Raccoon (PRocyon lotor lotor), and Opossum (Didelphis virginiana virginiana) to Environmental Factors in Two Swamp Watersheds of Northeastern North Carolina,
W77-08936 6G

Studies of the Fish Populations in Two Eastern North Carolina Swamp Streams,
W77-09062 2I

SWAMP FOREST ECOSYSTEMS
Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

SWAMPS
Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

Seasonal Patterns of Dissolved Oxygen, Nutrients, and Metals in Natural and Channelized Swamp Streams,
W77-08932 5B

Studies of the Fish Populations in Two Eastern North Carolina Swamp Streams,
W77-09062 2I

SYSTEM EFFICIENCY
The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

SYSTEMATICS
Inland Waters. Monographs from Limnology and Related Areas, Vol. 26, Part 1. The Zooplankton of Inland Waters,
W77-08861 2H

SYSTEMS ENGINEERING
Coupled Dynamic Streamflow-Temperature Models,
W77-09014 2E

TADPOLES
The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

TAIWAN
Thermal Waters in Taiwan, A Preliminary Study,
W77-08685 4B

TANKS (CONTAINERS)
Seismic Design of Liquid-Storage Tanks,
W77-08859 8D

TAPEWORM
Effects of a Parasite, Eubothrium salvelini (Cestoda: Pseudophyllidea), on the Resistance of Juvenile Sockeye Salmon, Oncorhynchus nerka, to Zinc,
W77-08791 5C

TAR BALL POLLUTANTS
Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

TASMANIA
Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

TDBPP
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

TECHNICAL SOCIETIES
Conclusions and Recommendations for the United Nations Water Conference (Preliminary Outline),
W77-08965 6E

TEFLON
Retention and Flow Characteristics of Polymer Solutions in Porous Media,
W77-08850 2G

TEMPERATURE
The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

Compilation of Temperature Preference Data,
W77-08767 7C

Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

Chemical and Isotopic Investigations of Groundwater in Potential Geothermal Areas in Hawaii,
W77-09082 2K

TEMPERATURE CHANGE
Physiological and Behavioral Reactions of Fishes to Temperature Change,
W77-08802 5C

TEMPERATURE PREFERENCE DATA
Compilation of Temperature Preference Data,
W77-08767 7C

TEMPERATURE PREFERENCE STUDIES
Application of Temperature Preference Studies to Environmental Impact Assessment,
W77-08768 5C

TENNESSEE
Effects of Spatial Variability of Soil Hydraulic Properties in Water Budget Modeling,
W77-08825 2G

TERRIGENOUS-SKELETAL SEDIMENTS
Grain-Size Parameters of Insoluble Residues in Mixxed Terrigenous-Skeletal Carbonate Sediments and Sedimentary Rocks: Some New Zealand Examples,
W77-08848 2L

TERTIARY TREATMENT
Advanced Waste Treatment Design Protects Lake Alton,
W77-08631 5G

TEST WELLS
Report on Preliminary Data for Madison Limestone Test Well No. 1, NE1/4SE1/4 Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming,
W77-09072 4B

Geologic Data from Test Drilling in Palm Beach County, Florida Since 1970,
W77-09073 7C

TESTING
Fine Screening of Raw Sewage,
W77-08629 8G

Water Turbine Pump Failure,
W77-08656 8G

The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

TEXAS
Fault Control of Subsidence, Houston, Texas,
W77-08662 4B

Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

Artificial Recharge for Subsidence Abatement at the NASA-Johnson Space Center, Phase I,
W77-08744 4B

Cooperative Gulf of Mexico Estuarine Inventory and Study--Texas: Area Description,
W77-08916 2L

Analytical Models for the Evaluation of Supplemental Aeration in Texas Estuaries,
W77-08917 5B

Water Rights Adjudication Act.
W77-08994 6E

Unlawful Use, Diversion or Waste of State Water.
W77-08995 6E

Coupled Dynamic Streamflow-Temperature Models,
W77-09014 2E

THAMES ESTUARY
The Third London Airport Study,
W77-09037 2L

THEMAL POLLUTION
Physiological and Behavioral Reactions of Fishes to Temperature Change,
W77-08802 5C

THEORETICAL ANALYSIS
Theoretical and Experimental Study of Flow Separation After a Sudden Increase in the Cross-Section of a Circular Pipe (Etude Theorique Et Experimentale D' Un Ecoulement Decolle En Aval D'Un Elargissement Brusque De Revolution),
W77-09034 8B

THERMAL ACCLIMATION
Thermal Acclimation, Upper Temperature Tolerance, and Preferred Temperature of Juvenile Yellowtail Snappers, Ocvurus chrvsurus (Bloch) (Pisces: Lutjanidae),
W77-08769 5C

THERMAL EXCHANGE
Physiological and Behavioral Reactions o
Fishes to Temperature Change,
W77-08802 5C

THERMAL POLLUTION
Thermal and Chemical Problems of Therma
Waters, (Les Problemes Thermiques e
Chimiques des eaux Thermales),
W77-08678 5I

Some Features of the Geochemistry of Therma
Water in Platform Areas from Experimenta
Data,
W77-08679 5I

Compilation of Temperature Preference Data,
W77-08767 7C

Application of Temperature Preference Studie
to Environmental Impact Assessment,
W77-08768 5C

Thermal Acclimation, Upper Temperatur
Tolerance, and Preferred Temperature of Ju
venile Yellowtail Snappers, Ocvurus chrvsuru
(Bloch) (Pisces: Lutjanidae),
W77-08769 5C

Effect of Hot Effluent Discharge from th
Konakovo Power Plant on the Growth o
Bream in Ivan'Kovo Reservoir,
W77-08803 5C

The Effect of Warm Effluent from th
Novorossiysk Thermal Power Plan o
Zooplankton,
W77-08804 5C

A Transient, Two-Dimensional, Discrete-Ele
ment, Far-Field Model for Thermal Impac
Analysis of Power Plant Discharges in Coast
and Offshore Regions. Part I: General Descri
tion of the Mathematical Model and Results o
an Application,
W77-08905 5

Natural Stream Temperature Variations in
Catchment,
W77-09039 5

Thermal Loading of Natural Streams,
W77-09068 5

THERMAL POLLUTIONS
Effect of Temperature and Hydroxy Aluminu
Interlayers on the Adsorption of Trac
Radioactive Cesium by Sediments Near Wate
Cooled Nuclear Reactors,
W77-09024 5

THERMAL POWER
A Case for Geothermal Energy,
W77-08655 8

Geothermal Energy Development,
W77-08661 4

Physiological and Behavioral Reactions o
Fishes to Temperature Change,
W77-08802 5

THERMAL POWER PLANTS
Economics of Geothermal Energy Develo
ment (In Imperial County, California),
W77-08657 8

THERMAL STRESS
Thermal Acclimation, Upper Temperatu
Tolerance, and Preferred Temperature of Ju
venile Yellowtail Snappers, Ocvurus chrvsuru
(Bloch) (Pisces: Lutjanidae),
W77-08769 5

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Laboratory Methods for Determining Temperature Preference,
W77-08770 5C

Optimal Temperature for Growth of Juvenile Bluegills,
W77-08798 5C

THERMAL STUDIES
Indiana Stream-Temperature Characteristics,
W77-08755 7C

THERMAL TOLERANCE
Thermal Acclimation, Upper Temperature Tolerance, and Preferred Temperature of Juvenile Yellowtail Snappers, Ocvurus chrvsurus (Bloch) (Pisces: Lutjanidae),
W77-08769 5C

THERMAL WATER
Thermal and Chemical Problems of Thermal Waters, Symposium.
W77-08677 2K

Some Features of the Geochemistry of Thermal Water in Platform Areas from Experimental Data,
W77-08679 5B

The Helium Isotopes in Thermal Fluids,
W77-08680 5B

Hydrothermal Processes in the Atlantic Ocean Crust, 26 Degrees N,
W77-08681 2K

Geochemistry of Thermal Waters from Various Geothermal Provinces of India,
W77-08682 2K

Temperature and Chemism of Ground Waters in the Western Areas of the East European Platform,
W77-08683 2K

Geochemistry and Origin of Thermal Waters in Poland,
W77-08684 2K

Thermal Waters in Taiwan, A Preliminary Study,
W77-08685 4B

The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

Study of the Chemical and Gaseous Composition of Thermal Waters of the Eastern Part of the Pannonian Depression (Considerations sur la Composition Chimique et Gazeuse des eaux Thermales de la Partie Orientale de la Depression Pannonique (Roumanie)),
W77-08688 2K

Important Geothermal Sites in Greece, on the Base of Thermomineral Spring Layings, and the Possibilities of Their Exploitation and Utilisation,
W77-08690 4B

Application of Temperature Preference Studies to Environmental Impact Assessment,
W77-08768 5C

THUNDERSTORMS
Trap-Efficiency Investigation Bernalillo Floodwater Retarding Reservoir No. 1 (Piedra Lisa Arroyo) Near Bernalillo, New Mexico, Water Years 1956-1974,
W77-08741 4D

TIDAL EFFECTS
A Reconnaissance of the Hydrology of the Edisto and Ashepoo Estuaries, South Carolina,
W77-09076 2L

TIDAL MARSHES
Wetlands Protection Under the Corps of Engineer's New Dredge and Fill Jurisdiction,
W77-08977 5G

TIDES
Storm Tide Frequency Analysis for the Coast of Georgia,
W77-08914 2L

TISSUE ANALYSIS
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

TOADS
The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

TOTAL MERCURY ANALYSES
Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

TOTAL ORGANIC CARBON
Characterization of Urban Runoff in Greenfield, Massachusetts--Phase I,
W77-08939 5B

TOTAL ORGANIC CONCENTRATIONS
Reactions in the Aqueous Environment of Low Molecular Weight Organic Molecules,
W77-08754 5B

TOTAL WATERSHED RESPONSE
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

TOXIC SPONGE EXTRACT
Ecology of Toxicity in Marine Sponges,
W77-08793 5C

TOXIC SUBSTANCES
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

TOXICITY
Experimental Data on the Regulation of 1,2-Dibromopropane in Reservoir Water, (In Russian),
W77-08718 5C

The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichtys olivaceus, (In Japanese),
W77-08782 5C

Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

Ecology of Toxicity in Marine Sponges,
W77-08793 5C

Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

TOXINS
Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

Toxic Pollutant Effluent Standards for Aldrin/Dieldrin, DDT, Endrin, and Toxaphene,
W77-08983 5G

TRACE ELEMENTS
The Distribution of Trace Metals in the Western North Atlantic Off Nova Scotia,
W77-08703 5B

Trace Element Inventory for the Northern Chesapeake Bay with Emphasis on the Influence of Man,
W77-08704 5C

The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

TRACERS
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

TRACKING TECHNIQUES
Time-of-Travel Study, Black River from Lyons Falls to Dexter, New York,
W77-08747 4A

TRANSITION FLOW
Performance Characteristics of a Grassed-Waterway Transition,
W77-08849 4D

TRANSJOEN LAKE (NORWAY)
Transjoen, A Groundwater Influenced Lake with Special Redox and Sulphate Conditions,
W77-09031 2H

TRANSPIRATION
Aspects of the Daily and Seasonal Course of Transpiration Intensity in Meadow Plants, (In Russian),
W77-08709 2D

Transpiration Intensity of Meadow Plants, (In Russian),
W77-08714 2D

TRANSPIRATION INTENSITY
Aspects of the Daily and Seasonal Course of Transpiration Intensity in Meadow Plants, (In Russian),
W77-08709 2D

TRANSPORTATION
Economic Role of the Waterway in Western Europe,
W77-08860 4A

Amend the Merchant Marine Act of 1920 (Hearings on S 2422 to Include the Virgin Islands Within the Scope of the Act With Respect to Transportation of Oil and Oil Products).
W77-08982 6E

TRAP EFFICIENCY
Trap-Efficiency Investigation Bernalillo Floodwater Retarding Reservoir No. 1 (Piedra Lisa Arroyo) Near Bernalillo, New Mexico, Water Years 1956-1974,
W77-08741 4D

TRAP RESPONSES
Trap Responses of the Gray Squirrel (Sciurus carolinensis carolinensis), Raccoon (PRocyon lotor lotor), and Opossum (Didelphis virginiana virginiana) to Environmental Factors in Two Swamp Watersheds of Northeastern North Carolina,
W77-08936 6G

TRAPPING
Trap Responses of the Gray Squirrel (Sciurus carolinensis carolinensis), Raccoon (PRocyon lotor lotor), and Opossum (Didelphis virginiana virginiana) to Environmental Factors in Two Swamp Watersheds of Northeastern North Carolina,
W77-08936 6G

TRAVEL TIME
Time-of-Travel Study, Black River from Lyons Falls to Dexter, New York,
W77-08747 4A

Solute Travel Times to Wells,
W77-09042 5B

TREATMENT FACILITIES
What's Up with Oxygen/2,
W77-08627 5D

Advanced Waste Treatment Design Protects Lake Alton,
W77-08631 5G

New Plymouth Sewerage Scheme,
W77-08632 5D

Pretreatment Helps Niagara Cut Costs,
W77-08633 5D

Instrumentation Improves Waste Water Treatment Plant Control,
W77-08642 5D

Plant Size Influence on Performance in Activated Sludge Systems with Application to Regional Wastewater Treatment Planning,
W77-08928 5D

EPA Proposes Untimely Amendments,
W77-08970 5G

TRIANGULAR ROUGHNESS
Resistance of Two Dimensional Triangular Roughness,
W77-09035 8B

TRICKLING FILTERS
Trickling Filter-Activated Sludge Combinations,
W77-08868 5D

TRIFLURALIN
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

TRIS
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

TROPHIC LEVEL
An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

TROUT
Effects of Primary Treated and Biologically Stabilized Kraft Mill Effluents on the Production, Biomass and Growth Rates of Juvenile Salmonids in Three Stream Channels,
W77-08921 5C

TUBIFICIDS
Qualitative and Quantitative Changes in the Benthic Fauna of a Trout Stream, the Couze Pavin Puy-De-Dome, Caused by Agricultural and Urban Pollution, (In French),
W77-08955 5C

TURBIDITY CURRENTS
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-08752 7B

Current-Meter Recordings of Low-Speed Turbidity Currents,
W77-08847 2L

TURBIDITY PLUMES
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-08752 7B

TURBULENCE
Short Jet Impingement,
W77-09016 8B

A Mathematical Model of Steady Flow in Curved Shallow Channels,
W77-09036 8B

TURBULENT DIFFUSION MODELS
Snowmelt: A Two-Dimensional Turbulent Diffusion Model,
W77-08823 2C

TURBULENT FLOW
Snowmelt: A Two-Dimensional Turbulent Diffusion Model,
W77-08823 2C

TWEEN 80
Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

TWO-MEMBERED ALGAL ASSAY
The Effect of Secondarily Treated Sewage on the Algal Populations of the Williamantic/Shetucket Rivers,
W77-09096 5C

ULTRA-FILTRATION
Method and Apparatus for Purifying Aqueous Streams Contaminated with Organic Materials,
W77-08889 5D

UNDERGROUND STREAMS
Remote Sealing of Mine Passages Containing Flowing Water,
W77-08896 5C

UNDERGROUND WASTE DISPOSAL
Storage of Low-Level Radioactive Wastes in the Ground: Hydrogeologic and Hydrochemical Factors,
W77-09086 5E

UNDERSEEPAGE
Seepage Under Structure on N Strata of Soil,
W77-08843 2E

UNITED NATIONS
Conclusions and Recommendations for the United Nations Water Conference (Preliminary Outline),
W77-08965 6E

UNITED NATIONS WATER CONFERENCE
Conclusions and Recommendations for the United Nations Water Conference (Preliminary Outline),
W77-08965 6E

UNITED STATES
The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

Preliminary Summary of the 1976 Atlantic Margin Coring Project of the U.S. Geological Survey,
W77-09089 2E

UNIVERSAL COUPLINGS
Universal Coupling for Movable Irrigation Pipes,
W77-08875 3F

UNIVERSITY
Water Resources Research Interests in the Colleges and Universities of North Carolina.
W77-08931 9A

UNSATURATED FLOW
Finite Element Solution of the Two-Dimensional Unsaturated Flow Equation,
W77-08923 2G

UNSTEADY FLOW
Some Computational Aspects of One- and Two-Dimensional Unsteady Flow Simulation by the Method of Characteristics,
W77-08745 2E

PPER SHETUCKET RIVER SYSTEM (CONN)
Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

PPER THERMAL TOLERANCE
Thermal Acclimation, Upper Temperature Tolerance, and Preferred Temperature of Juvenile Yellowtail Snappers, Ocvurus chrvsurus (Bloch) (Pisces: Lutjanidae),
W77-08769 5C

RANIUM
The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

RBAN AREAS
Sewage Treatment in Developing Countries,
W77-08635 5D

RBAN DRAINAGE
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

RBAN GROWTH
Water--An Element of Land-Use and Urban Growth Policies,
W77-08872 6B

RBAN HYDROLOGY
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

RBAN RUNOFF
Design Efficiency of Stormwater Detention Basins,
W77-08841 4D

Characterization of Urban Runoff in Greenfield, Massachusetts--Phase I,
W77-08939 5B

Qualitative and Quantitative Changes in the Benthic Fauna of a Trout Stream, the Couze Pavin Puy-De-Dome, Caused by Agricultural and Urban Pollution, (In French),
W77-08955 5C

Urban Stormwater Pollutant Loadings: A Statistical Summary Through 1972,
W77-09046 5B

RBAN RUNOFF MODELS
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

RBANIZATION
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

Network Characteristics in Suburbanizing Streams,
W77-08830 4C

Seasonal Variations in the Impact of Suburban Development on Runoff Response: Peterborough, Ontario,
W77-08831 4C

Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

Flood-Plain Delineation for Difficult Run Basin, Fairfax County, Virginia,
W77-09071 4C

UREAS
Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Urea and Ammonium Nitrate Subcategory.
W77-08984 5G

USED MOTOR OIL
Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

USER CHARGES
User Charges in Inland Navigation Policy,
W77-08604 6C

USSR
Methods Used for Drilling Wells in the Soviet Union,
W77-08659 8C

Effect of the Boundary Surface Between Sea and Fresh Waters on the Distribution of Dissolved Oxygen in the Mouth Region of the Dnieper River,
W77-08832 5B

Some Hydrochemical Characteristics of the Mouth Reaches of the Anabar, Lena, Yana, and Indigirka Rivers,
W77-08833 2L

Effect of Ponds and Small Reservoirs on River Runoff in the Forest-Steppe and Steppe Zones of the Volga Basin,
W77-08834 4A

Effect of Agricultural and Silvicultural Practices on the Runoff from Drainage Basins of the Nizhnedevitskaya Hydrologic Station,
W77-08835 4C

Role of River Runoff and of Water Exchange in the Salinity of the Northern Caspian Sea,
W77-08836 2H

Character of Seepage of Precipitation to the Water Table in the Central Forest Steppe,
W77-09043 4B

USSR (ISELTI RIVER)
Chironomid Fauna of the Upper Course of the Iseti River, (In Russian),
W77-09048 5C

USSR (SOUTHEASTERN CISCAUCASIA)
Present-Day Slumping and Erosion Phenomena on Irrigated Lands (Exemplified by Southeastern Ciscaucasia), (In Russian),
W77-08885 2J

USSR (VINNITSA OBLAST)
Molybdenum Content in the Subsurface Waters of the Vinnitsa Oblast, (In Russian),
W77-08882 2K

UTAH
Provo-Jordan River Parkway Authority.
W77-09009 6E

UTILITIES
Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

VACUUM FILTRATION
Dewatering Chemical-Primary Sludges,
W77-08865 5D

VALVES
Pressure Reducing Valves in Pipe Network Analyses,
W77-08855 8B

VARIABILITY
Aspects of the Daily and Seasonal Course of Transpiration Intensity in Meadow Plants, (In Russian),
W77-08709 2D

VELOCITY
Reaeration and Velocity Prediction for Small Streams,
W77-08867 5B

A Mathematical Model of Steady Flow in Curved Shallow Channels,
W77-09036 8B

A Review of Velocity-Measuring Devices,
W77-09085 7B

VELOCITY MEASUREMENT
Surface Particle Orbits in Uniform Waves,
W77-08845 8B

VERMONT
Chemical Character of Headwater Streams in Vermont and New Hampshire,
W77-09027 2K

VERTICAL ELECTRIC SOUNDINGS TECHNIQUES
Geophysical Exploration for Potable Groundwater Supplies in the Kalahari Gemsbok National Park,
W77-08654 4B

VERTICAL MIGRATION
Induced Vertical Mixing in a Stratified Impoundment by a Subsurface Warm Water Discharge,
W77-08929 5B

VIRGIN ISLANDS
Amend the Merchant Marine Act of 1920 (Hearings on S 2422 to Include the Virgin Islands Within the Scope of the Act With Respect to Transportation of Oil and Oil Products).
W77-08982 6E

VIRGINIA
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

Integrated Evaluation Programs for Fairfax County, Va.,
W77-08862 6B

United States V 62.61 Acres of Land, More or Less, In City of Virginia Beach, Commonwealth of Virginia (A Compensable Property Right as Might Exist in a Wharf or Pier will not be Found in a Jetty Constructed in Navigable Waters),
W77-08990 6E

VIRUSES
Composting Destroys Pathogens in Sewage Solids,
W77-08641 5E

Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

VOLGA BASIN (USSR)
Effect of Ponds and Small Reservoirs on River Runoff in the Forest-Steppe and Steppe Zones of the Volga Basin,
W77-08834 4A

VOLGA RIVER
Role of River Runoff and of Water Exchange in the Salinity of the Northern Caspian Sea,
W77-08836 2H

VOLUMETRIC ANALYSIS
Electrochemical Determinations of Trace Quantities of Phosphate and Nitrate,
W77-08817 5A

WALWORTH COUNTY (WIS)
Ground-Water Resources and Geology of Walworth County, Wisconsin,
W77-09081 2F

WASHINGTON
Citizen Participation in Water Policy Formation,
W77-08603 6B

Hydrology of Three Recreational Lakes in Eastern Washington State,
W77-08608 5B

Water Resources Data for Washington, Water Year 1975.
W77-08737 7C

Outline of the Water Resources of the Satus Creek Basin, Yakima Indian Reservation, Washington,
W77-08740 4B

A Comparative Study of Organic Carbon and Nutrients in Lake Sediment,
W77-09065 5A

WASTE ASSIMILATIVE CAPACITY
Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

WASTE DILUTION
Mean Behavior of Buoyant Jets in a Crossflow
W77-09013 8B

WASTE DISPOSAL
Sewage Sludge Incineration Should Be Improved by Addition of Newsprint Pulp.
W77-08639 5E

Solid Waste Management: A Test of Alternative Strategies Using Optimization Techniques,
W77-08723 5E

Experimental Study of Multi-Cation Diffusion in an Artifical Quartz Sandstone,
W77-08811 2K

The Design of a System for Collecting Leachate from a Lined Landfill Site,
W77-08827 5G

Ocean Dumping in the United States - 1975, Third Annual Report of the Environmental Protection Agency on the Administration of Title I of the Marine Protection, Research, and Sanctuaries Act of 1972, as Amended.
W77-08919 5B

To Extend the Marine Protection, Research, and Sanctuaries Act (Hearing on S 3147 to Extend the Act 2 Years).
W77-08981 6E

WASTE IDENTIFICATION
Segregation and Reclamation of Household Wastewater at an Individual Residence,
W77-08806 5D

Characterization of Urban Runoff in Greenfield, Massachusetts--Phase I,
W77-08939 5B

WASTE OILS
Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

WASTE WATER DISPOSAL
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

Suitability of New England Soils in Accepting Waste Effluent - Phase I,
W77-09063 5E

Suitability of New England Soils in Accepting Waste Effluents, Phase II,
W77-09064 5E

Deer Habitat Response to Irrigation with Municipal Wastewater,
W77-09099 5C

WASTE WATER (POLLUTION)
Preliminary Study of Wastewater Movement in and Near Grand Teton National Park, Wyoming, Through October 1976,
W77-09087 5B

WASTE WATER TREATMENT
High Speed Liquid Chromatographic Analysis of Cobalamin Productivity and Distribution in Activated Sewage Sludge Treatment,
W77-08621 5A

Removal of Fluorine from Waste Waters. III. Fundamental Tests with Chemical Reagents (Haisuichu no fusso jokyo nikansuru kenkyu. III. Shiyaku kei niyoru kisoshiken),
W77-08626 5D

What's Up with Oxygen/2,
W77-08627 5D

Waste Water Aeration System Produces Small Bubbles.
W77-08630 5D

Advanced Waste Treatment Design Protects Lake Alton,
W77-08631 5G

New Plymouth Sewerage Scheme,
W77-08632 5D

Pretreatment Helps Niagara Cut Costs,
W77-08633 5D

Application of Physico-Chemical Treatment as a Method of Achieving Partial Standards on Sewage Effluents Discharged in Estuarial and Coastal Situations,
W77-08634 5D

Sewage Treatment in Developing Countries,
W77-08635 5D

Controlling Sludge Bulking,
W77-08636 5D

The Use of Packed Beds in Water Pollution Control,
W77-08637 5D

Ozone Disinfection of Secondary Effluent,
W77-08638 5D

Sludge Treatment: Problems and Solutions, Part 1,
W77-08640 5D

Composting Destroys Pathogens in Sewage Solids,
W77-08641 5E

Rational Design of Aerobic Digestion Systems,
W77-08643 5D

New Directions in Ion Exchange,
W77-08719 5D

Segregation and Reclamation of Household Wastewater at an Individual Residence,
W77-08806 5D

Dewatering Chemical-Primary Sludges,
W77-08865 5D

Trickling Filter-Activated Sludge Combinations,
W77-08868 5D

Role of Nitrogen in Activated Sludge Process,
W77-08869 5D

Method of Purifying Waste Water,
W77-08881 5D

Method for Purifying Water of Organic Compounds Not Readily Biodegradable,
W77-08883 5D

Method and Apparatus for Purifying Aqueous Streams Contaminated with Organic Materials,
W77-08889 5D

Polluted Water Purification,
W77-08890 5D

Method for Purifying Waste Waters which Contain Anionic-Type Organic Compounds,
W77-08891 5D

Flocculant Use on Tankers,
W77-08906 5C

Plant Size Influence on Performance in Activated Sludge Systems with Application to Regional Wastewater Treatment Planning,
W77-08928 5D

Enzymatic Treatment of Dairy Effluents,
W77-08937 5D

Real-Time Measurements of Aquatic Nitrogen,
W77-09095 5D

Phosphate and Nitrate Removal by a Grass Filtration System for Final Treatment of Municipal Waste Water,
W77-09100 5D

WASTEWATER IRRIGATION
Population Response and Heavy Metal Concentrations in Cottontail Rabbits and Small Mammals in Wastewater Irrigated Habitats,
W77-09097 5D

The Effects of Wastewater Irrigation on the Activities and Movements of Songbirds,
W77-09098 5C

Deer Habitat Response to Irrigation with Municipal Wastewater,
W77-09099 5C

ATER ALLOCATION (POLICY)
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

Proceedings of the International Conference on Global Water Law Systems, September 1-9, 1975, Valencia, Spain.
W77-08966 6E

Distribution of Water Among Appropriators.
W77-08998 6E

ATER ANALYSIS
NPDES Permits and Water Analyses.
W77-08953 5G

ATER BALANCE
Hydrology of Three Recreational Lakes in Eastern Washington State,
W77-08608 5B

ATER CHEMISTRY
Some Hydrochemical Characteristics of the Mouth Reaches of the Anabar, Lena, Yana, and Indigirka Rivers,
W77-08833 2L

Chemical Character of Headwater Streams in Vermont and New Hampshire,
W77-09027 2K

Hydrologic Reconnaissance of the Geothermal Area Near Klamath Falls, Oregon, with a Section on Preliminary Interpretation of Geophysical Data,
W77-09070 4B

ATER CONSERVATION
North Carolina Conference on Water Conservation.
W77-08820 3D

Provo-Jordan River Parkway Authority.
W77-09009 6E

ATER-COOLED NUCLEAR REACTORS
Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

ATER DEMAND
Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

ATER DISTRIBUTION (APPLIED)
Water as an Environmental Constraint in Land Use Planning,
W77-08721 6G

Pressure Reducing Valves in Pipe Network Analyses,
W77-08855 8B

Philadelphia's Water System Automation Plan,
W77-08864 5F

Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

Improved Methodology for Design and Operation of Water Distribution Systems, Part IV, Program Documentation,
W77-08941 4A

Prototype Software for On-Line Storage Forecasting Supported by Load Forecasting and Reduced System Representation for Water Distribution Systems,
W77-08942 7C

WATSIM - A Fortran Program for 24 Hour Simulation of Flows and Reservoir Fluctuations in Water Distribution Networks,
W77-08943 7C

Headgates and Measuring Devices: Distribution of Stored Water.
W77-08997 6E

Distribution of Water Among Appropriators.
W77-08998 6E

WATER DISTRICTS
Distribution of Water Among Appropriators.
W77-08998 6E

WATER FLEAS
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

WATER INFILTRATION RATES
Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

WATER LEVEL FLUCTUATIONS
Annual Summary of Ground-Water Conditions in Arizona, Spring 1975 to Spring 1976,
W77-08732 7C

Water-Level Changes in Northwestern Kansas, 1950-76,
W77-08742 4B

Ground-Water Data for Michigan, 1975,
W77-08753 7C

Observation Records of Ground Water Level, (In Japanese),
W77-08904 4B

Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

Water-Level Records for the San Luis Valley of Colorado, 1973-77,
W77-09088 7C

WATER LEVEL RECORDERS
Headgates and Measuring Devices: Distribution of Stored Water.
W77-08997 6E

WATER LEVELS
Distribution of Corn Roots in Sandy Soil with a Declining Water Table,
W77-08676 2I

Records of Wells, Water-Level Measurements, and Drillers' Logs, Red River Valley, Louisiana,
W77-08734 7C

Water-Level Records for the San Luis Valley of Colorado, 1973-77,
W77-09088 7C

WATER MANAGEMENT
In Re City of White Bear Lake (Standard for Granting of Permits Under the Minnesota Water Management Law).
W77-08993 6E

Water Rights Adjudication Act.
W77-08994 6E

WATER MANAGEMENT (APPLIED)
Groundwater Policies Now Lean Towards Management.
W77-08660 4B

Proceedings of the International Conference on Global Water Law Systems, September 1-9, 1975, Valencia, Spain.
W77-08966 6E

Unlawful Use, Diversion or Waste of State Water.
W77-08995 6E

Headgates and Measuring Devices: Distribution of Stored Water.
W77-08997 6E

Distribution of Water Among Appropriators.
W77-08998 6E

Water Resources and Water Utilization in Israel,
W77-09011 6E

WATER MEASUREMENT
Headgates and Measuring Devices: Distribution of Stored Water.
W77-08997 6E

WATER PERMITS
United States V. GAF Corporation: A Leak in the FWPCA,
W77-08979 5G

WATER POLICY
Citizen Participation in Water Policy Formation,
W77-08603 6B

Groundwater Policies Now Lean Towards Management.
W77-08660 4B

Policy Innovation and Institutional Fragmentation,
W77-09053 6E

WATER POLLUTION
Mussels (Mytilus Sp.) as an Indicator of Lead Pollution,
W77-08693 5C

Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

Cooperative Gulf of Mexico Estuarine Inventory and Study--Texas: Area Description,
W77-08916 2L

WATER POLLUTION CONTROL
Control of Non-Point Sources of Water Pollution Within an Ecological Framework: The Case of the Tri-County Region, Michigan,
W77-08625 6E

Advanced Waste Treatment Design Protects Lake Alton,
W77-08631 5G

New Plymouth Sewerage Scheme,
W77-08632 5D

Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

Role of Nitrogen in Activated Sludge Process,
W77-08869 5D

Barrier for Water Carried Pollutants,
W77-08878 5G

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

WATER POLLUTION CONTROL

Fending Device for Oil Containment Boom,
W77-08892 5G

Skimmer Fence,
W77-08893 5G

Flocculant Use on Tankers,
W77-08906 5G

Agents, Methods and Devices for Amelioration of Discharges of Hazardous Chemicals on Water,
W77-08910 5G

Analytical Models for the Evaluation of Supplemental Aeration in Texas Estuaries,
W77-08917 5B

Ocean Dumping in the United States - 1975, Third Annual Report of the Environmental Protection Agency on the Administration of Title I of the Marine Protection, Research, and Sanctuaries Act of 1972, as Amended.
W77-08919 5B

Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

A Consultant's View of PL 92-500.
W77-08958 5G

When You Think About Polluted Waters, Think About Your Streams and Rivers.
W77-08960 5G

Changes Urged at NCWQ Hearings,
W77-08967 6E

Say Goodbye to Ocean Dumping,
W77-08969 5G

United States V. GAF Corporation: A Leak in the FWPCA,
W77-08979 5G

Storage of Low-Level Radioactive Wastes in the Ground: Hydrogeologic and Hydrochemical Factors,
W77-09086 5E

WATER POLLUTION CONTROL FEDERATION

Many Changes Urged for PL 92-500,
W77-08950 5G

PL 92-500: A Dose of Chaos,
W77-08959 5G

Changes Urged at NCWQ Hearings,
W77-08967 6E

WATER POLLUTION EFFECTS

Heavy Metal Tolerance of Marine Phytoplankton. III. Combined Effects of Copper and Zinc Ions on Cultures of Four Common Species,
W77-08692 5C

The Role of Methylmercury Production in the Transfer of Mercury in a Salt Marsh Ecosystem,
W77-08697 5C

Dose-Dependent Effects of Methylmercury on Limb Regeneration of Newts (Triturus Viridescens),
W77-08699 5C

Methylmercury Induced Injury of Single Barnacle Muscle Fibers,
W77-08700 5C

Effects of Mercury, Cadmium, and Lead Salts on Regeneration and Ecdysis in the Fiddler Crab, UCA Pugilator,
W77-08702 5C

Trace Element Inventory for the Northern Chesapeake Bay with Emphasis on the Influence of Man,
W77-08704 5C

Transport of Molybdenum in Mountainous Streams, Colorado,
W77-08705 5B

Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichtys olivaceus, (In Japanese),
W77-08782 5C

Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

Physiological and Behavioral Reactions of Fishes to Temperature Change,
W77-08802 5C

Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

Effects of Temperature and Kelthane on Grass Shrimp,
W77-08874 5C

Analysis of Pollution from Marine Engines and Effects on the Environment.
W77-08902 5B

An Examination of Some Physical and Biological Impacts of Dredging in Estuaries,
W77-08918 5C

Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

WATER POLLUTION SOURCES

Hydrology of Three Recreational Lakes in Eastern Washington State,
W77-08608 5B

Control of Non-Point Sources of Water Pollution Within an Ecological Framework: The Case of the Tri-County Region, Michigan,
W77-08625 6E

Carbon Isotopic Study of the Fate of Landfill Leachate in Groundwater,
W77-08670 5B

Results of a Microbiological Investigation of the Danube River by One Point Profile (1969-1971), (In German),
W77-08694 5B

The Distribution of Trace Metals in the Western North Atlantic Off Nova Scotia,
W77-08703 5B

Trace Element Inventory for the Northern Chesapeake Bay with Emphasis on the Influence of Man,
W77-08704 5C

Transport of Molybdenum in Mountainous Streams, Colorado,
W77-08705 5B

Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connectituct Rivers,
W77-08814 5B

Identification of Weathered Oil Films Found in the Marine Environment,
W77-08901 5A

Characterization of Urban Runoff in Greenfield, Massachusetts--Phase I,
W77-08939 5B

Frequency of Organic Compounds Identified in Water,
W77-08944 5A

To Extend the Marine Protection, Research, and Sanctuaries Act (Hearing on S 3147 to Extend the Act 2 Years).
W77-08981 6E

Solute Travel Times to Wells,
W77-09042 5B

WATER POLLUTION TREATMENT

Polluted Water Purification,
W77-08890 5D

Method for Purifying Waste Waters which Contain Anionic-Type Organic Compounds,
W77-08891 5D

A Biodegradation of Oil on Water Surfaces,
W77-08909 5G

Agents, Methods and Devices for Amelioration of Discharges of Hazardous Chemicals on Water,
W77-08910 5G

WATER PROPERTIES
The Use and Misuse of Pure Water PVT Properties for Lake Waters,
W77-08840 2H

WATER PURIFICATION
Method for Purifying Water of Organic Compounds Not Readily Biodegradable,
W77-08883 5D

Method and Apparatus for Purifying Aqueous Streams Contaminated with Organic Materials,
W77-08889 5D

Polluted Water Purification,
W77-08890 5D

WATER QUALITY
Clearcutting in Pennsylvania,
W77-08712 4C

Availability of Ground Water in the Middle Merrimack River Basin, Central and Southern New Hampshire,
W77-08733 7C

Water Resources Data for Washington, Water Year 1975.
W77-08737 7C

Water Resources Data for Montana, Water Year 1975.
W77-08738 7C

Water for Industrial and Agricultural Development in Attala, Holmes, Humphreys, Issaquena, Sharkey, and Yazoo Counties, Mississippi,
W77-08748 4B

The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

Philadelphia's Water System Automation Plan,
W77-08864 5F

Systematic Identification of DO-BOD Model Structure,
W77-08866 5B

Reaeration and Velocity Prediction for Small Streams,
W77-08867 5B

Induced Vertical Mixing in a Stratified Impoundment by a Subsurface Warm Water Discharge,
W77-08929 5B

Computer Modeling for the Prediction of Water Quality from Agricultural Drainage,
W77-08934 5B

Frequency of Organic Compounds Identified in Water,
W77-08944 5A

Biscayne Bay Symposium II,
W77-08961 5G

Say Goodbye to Ocean Dumping,
W77-08969 5G

Chemical Character of Headwater Streams in Vermont and New Hampshire,
W77-09027 2K

Nonlinear Estimation in Stream Quality Modeling,
W77-09047 5B

Optimal Estimation in Stream Quality Modeling,
W77-09052 5B

Limnological Investigation of Six Lakes in Southeast Alaska,
W77-09069 7C

Report on Preliminary Data for Madison Limestone Test Well No. 1, NE1/4SE1/4 Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming,
W77-09072 4B

Water Resources Data for Mississippi, Water Year 1975.
W77-09074 7C

Water Resources Data for North Dakota, Water Year 1975.
W77-09075 7C

Ground-Water Resources and Geology of Walworth County, Wisconsin,
W77-09081 2F

Ground-Water Hydrology of Berkeley County, West Virginia,
W77-09083 4B

WATER QUALITY ACT
Porter--Cologne Water Quality Control Act.
W77-08978 6E

WATER QUALITY CONTROL
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

Method of Purifying Waste Water,
W77-08881 5D

Detergent Composition for Dispersing Oil Spills,
W77-08884 5G

Fending Device for Oil Containment Boom,
W77-08892 5G

Skimmer Fence,
W77-08893 5G

Section 208 and Section 303 Water Quality Planning and Management: Where is it Now,
W77-08949 5G

Proceedings of the International Conference on Global Water Law Systems, September 1-9, 1975, Valencia, Spain.
W77-08966 6E

United States V. GAF Corporation: A Leak in the FWPCA,
W77-08979 5G

WATER QUALITY STANDARDS
Application of Physico-Chemical Treatment as a Method of Achieving Partial Standards on Sewage Effluents Discharged in Estuarial and Coastal Situations,
W77-08634 5D

PL 92-500: A Dose of Chaos,
W77-08959 5G

EPA Proposes Untimely Amendments,
W77-08970 5G

United States V. GAF Corporation: A Leak in the FWPCA,
W77-08979 5G

Toxic Pollutant Effluent Standards for Aldrin/Dieldrin, DDT, Endrin, and Toxaphene,
W77-08983 5G

WATER REQUIREMENTS
Effect of Water Deficiency on the Growth Rate of Some Winter Soft Wheat Cultivars, (In Bulgarian),
W77-08716 3F

WATER RESOURCES
Water for Industrial and Agricultural Development in Attala, Holmes, Humphreys, Issaquena, Sharkey, and Yazoo Counties, Mississippi,
W77-08748 4B

Research Benefits in Water Resources Construction,
W77-08858 6B

Water--An Element of Land-Use and Urban Growth Policies,
W77-08872 6B

Water Resources Research Interests in the Colleges and Universities of North Carolina.
W77-08931 9A

A 'Rough Cut' Model of a South Florida Water Supply Plan,
W77-08980 4B

Water-Resources Investigations in Kentucky, 1976.
W77-09078 7C

Water-Resources Investigations in Wisconsin, 1976.
W77-09079 7C

WATER RESOURCES DEVELOPMENT
Analysis of Supply and Demand of Urban Oriented Nonreservoir Recreation.
W77-08871 6B

Conclusions and Recommendations for the United Nations Water Conference (Preliminary Outline),
W77-08965 6E

As an Incident of National Sovereignty, the United States Has Paramount Rights and Power in the Seabed and Subsoil of the Outer Continental Shelf,
W77-08974 6E

Snake River Interstate Compact.
W77-08996 6E

WATER REUSE
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

Segregation and Reclamation of Household Wastewater at an Individual Residence,
W77-08806 5D

North Carolina Conference on Water Conservation.
W77-08820 3D

Effects of Treated Municipal Wastewater and Commercial Fertilizer on Growth, Fiber, Acid-

WATER REUSE

Soluble Nucleotides, Protein and Amino Acid Content in Wheat Hay,
W77-08876 5C

WATER RIGHTS
Unlawful Use, Diversion or Waste of State Water.
W77-08995 6E

Water-Use Leasing Act.
W77-09010 6E

Selected Problems in Idaho Ground Water Law,
W77-09049 6E

WATER SAVING DEVICES
North Carolina Conference on Water Conservation.
W77-08820 3D

WATER SHORTAGE
Water Resources and Water Utilization in Israel,
W77-09011 6E

WATER SOFTENING
Experimental Study of Multi-Cation Diffusion in an Artifical Quartz Sandstone,
W77-08811 2K

WATER-SOLUBLE FRACTIONS
Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

WATER SPREADING
Density Currents and Their Applications,
W77-08844 5B

WATER SUPPLY
Sewage Treatment in Developing Countries,
W77-08635 5D

Get Ready for Dual Water Systems,
W77-08645 5G

Experimental Data on the Regulation of 1,2-Dibromopropane in Reservoir Water, (In Russian),
W77-08718 5C

Water as an Environmental Constraint in Land Use Planning,
W77-08721 6G

Economic Evaluation of Idaho's Water Supply,
W77-08816 6B

Water Supply Economics,
W77-08863 6B

Observation Records of Ground Water Level, (In Japanese),
W77-08904 4B

Molokai Irrigation and Water Utilization Project.
W77-09000 6E

WATER SUPPLY DEVELOPMENT
PLANASA--A National Plan for Water Supply and Sewerage in Brazil,
W77-08646 6E

WATER TABLE
Fault Control of Subsidence, Houston, Texas,
W77-08662 4B

Distribution of Corn Roots in Sandy Soil with a Declining Water Table,
W77-08676 2I

Shape of a Streamline Water Table Near Inflow and Outflow Boundaries,
W77-09023 2F

Character of Seepage of Precipitation to the Water Table in the Central Forest Steppe,
W77-09043 4B

WATER TABLE AQUIFERS
Guide for Data Collection to Calibrate a Predictive Digital Ground-Water Model of the Unconfined Aquifer in and Near the City of Modesto, California,
W77-08735 2F

WATER TEMPERATURE
Indiana Stream-Temperature Characteristics,
W77-08755 7C

Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

Thermal Acclimation, Upper Temperature Tolerance, and Preferred Temperature of Juvenile Yellowtail Snappers, Ocvurus chrvsurus (Bloch) (Pisces: Lutjanidae),
W77-08769 5C

Laboratory Methods for Determining Temperature Preference,
W77-08770 5C

Optimal Temperature for Growth of Juvenile Bluegills,
W77-08798 5C

Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

The Effect of Warm Effluent from the Novorossiysk Thermal Power Plan on Zooplankton,
W77-08804 5C

Coupled Dynamic Streamflow-Temperature Models,
W77-09014 2E

Natural Stream Temperature Variations in a Catchment,
W77-09039 5B

WATER TREATMENT
Influence of Initial Mixing on Direct Filtration,
W77-08809 5F

Direct Filtration of Lake Michigan Water,
W77-08812 5F

Photochemical Dechlorination of Water Supply for Fish Tanks with Commercial Water Sterilizers,
W77-08842 5F

Philadelphia's Water System Automation Plan,
W77-08864 5F

Method for Purifying Waste Waters which Contain Anionic-Type Organic Compounds,
W77-08891 5D

WATER USERS
Water-Use Leasing Act.
W77-09010 6E

WATER UTILIZATION
Annual Summary of Ground-Water Conditions in Arizona, Spring 1975 to Spring 1976,
W77-08732 7C

Water-Level Changes in Northwestern Kansas, 1950-76,
W77-08742 4B

Water for Industrial and Agricultural Development in Attala, Holmes, Humphreys, Issaquena, Sharkey, and Yazoo Counties, Mississippi,
W77-08748 4B

Biscayne Bay Symposium II,
W77-08961 5G

Water Rights Adjudication Act.
W77-08994 6E

Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

Ground-Water Resources and Geology of Walworth County, Wisconsin,
W77-09081 2F

WATER WELLS
Land Subsidence,
W77-08653 4B

Self-Pressurizing Seals Keep Submersible Motors Dry,
W77-08672 8C

Records of Wells, Water-Level Measurements, and Drillers' Logs, Red River Valley, Louisiana,
W77-08734 7C

Digital Model Studies of Steady-State Radial Flow to Partially Penetrating Wells in Alluvial Plains,
W77-08838 2F

Water-Level Records for the San Luis Valley of Colorado, 1973-77,
W77-09088 7C

WATER YIELD
Ground Water Budget of the Mountainous Regions of Hungary, (In Hungarian),
W77-08663 2F

Clearcutting in Pennsylvania,
W77-08712 4C

WATER YIELD IMPROVEMENT
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W77-08933 3B

WATERSHED MANAGEMENT
The Hydrology of a Small Catchment Basin at Samaru, Nigeria: IV: Assessment of Soil Erosion Under Varied Land Management and Vegetation Cover;
W77-08698 4D

Water as an Environmental Constraint in Land Use Planning,
W77-08721 6G

Unlawful Use, Diversion or Waste of State Water.
W77-08995 6E

WATERSHEDS (BASINS)
Natural Stream Temperature Variations in a Catchment,
W77-09039 5B

LIBRARY U. OF I. URBANA-CHAMPAIGN

WATERWAYS
Economic Role of the Waterway in Western Europe,
W77-08860 4A

WATERWORKS
Pressure Reducing Valves in Pipe Network Analyses,
W77-08855 8B

WAVE ENERGY
Estimating Wave Generation on Restricted Fetches,
W77-09021 2L

WAVE FORECASTING
Estimating Wave Generation on Restricted Fetches,
W77-09021 2L

WAVE HEIGHT MEASUREMENT
Wave Height Measuring Device,
W77-08897 7B

WAVE REFRACTION
Wave Refraction Diagrams for the Baltimore Canyon Region of the Mid-Atlantic Continental Shelf Computed by Using Three Bottom Topography Approximation Techniques,
W77-08912 2L

WAVE SPECTRA
Comparison of Remotely Sensed Continental-Shelf Wave Spectra with Spectra Computed by Using a Wave Refraction Computer Model,
W77-08911 2L

WAVES (WATER)
Surface Particle Orbits in Uniform Waves,
W77-08845 8B

Wave Height Measuring Device,
W77-08897 7B

WELL CASINGS
Methods Used for Drilling Wells in the Soviet Union,
W77-08659 8C

WELL DATA
Records of Wells, Water-Level Measurements, and Drillers' Logs, Red River Valley, Louisiana,
W77-08734 7C

WELL SCREENS
Methods Used for Drilling Wells in the Soviet Union,
W77-08659 8C

WEST VIRGINIA
Ground-Water Hydrology of Berkeley County, West Virginia,
W77-09083 4B

WESTERN EUROPE
Economic Role of the Waterway in Western Europe,
W77-08860 4A

WETLANDS
Wetlands Protection Under the Corps of Engineer's New Dredge and Fill Jurisdiction,
W77-08977 5G

WETTABILITY
Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

WHEAT
Effect of Water Deficiency on the Growth Rate of Some Winter Soft Wheat Cultivars, (In Bulgarian),
W77-08716 3F

Effects of Treated Municipal Wastewater and Commercial Fertilizer on Growth, Fiber, Acid-Soluble Nucleotides, Protein and Amino Acid Content in Wheat Hay,
W77-08876 5C

Evaluation of Wheat Plants with Regard to Drought- and Heat-Resistance Under Field Conditions, (In Russian),
W77-08877 3F

WILDERNESS PRESERVATION
Chippewa Flowage Investigations. Part 3B: Appendixes.
W77-08727 6B

WILDLIFE
Population Response and Heavy Metal Concentrations in Cottontail Rabbits and Small Mammals in Wastewater Irrigated Habitats,
W77-09097 5B

Deer Habitat Response to Irrigation with Municipal Wastewater,
W77-09099 5C

WILDLIFE HABITATS
Trap Responses of the Gray Squirrel (Sciurus carolinensis carolinensis), Raccoon (PRocyon lotor lotor), and Opossum (Didelphis virginiana virginiana) to Environmental Factors in Two Swamp Watersheds of Northeastern North Carolina,
W77-08936 6G

WILLIAMS LAKE BASIN (WASH)
Hydrology of Three Recreational Lakes in Eastern Washington State,
W77-08608 5B

WILLIMANTIC RIVER (CONN)
Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

WILLIMANTIC/SHETUCKET RIVERS (CONN)
Effects of Primary Sewage Effluent from the City of Willimantic on the Benthic Invertebrate Fauna of the Willimantic/Shetucket Rivers,
W77-09093 5C

The Effect of Secondarily Treated Sewage on the Algal Populations of the Willimantic/Shetucket Rivers,
W77-09096 5C

WILROADS GARDENS (KS)
Special Flood Hazard Information: Arkansas River, Fort Dodge - Wilroads Gardens, Vicinity of Dodge City, Kansas.
W77-08612 4A

WIND STRESS
Harbor and Nearshore Currents, Oswego Harbor, New York,
W77-08913 2L

WINDMILLS
Today's Windmills: A Blend of Old and New,
W77-08650 8C

WINDS
Estimation of Winds Over the Great Lakes,
W77-09022 2H

WISCONSIN
The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

Chippewa Flowage Investigations. Part 3A: Appendixes.
W77-08726 6B

Chippewa Flowage Investigations. Part 3B: Appendixes.
W77-08727 6B

Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W77-09059 5C

WITHDRAWAL
Water-Level Changes in Northwestern Kansas, 1950-76,
W77-08742 4B

Artificial Recharge for Subsidence Abatement at the NASA-Johnson Space Center, Phase I,
W77-08744 4B

WYOMING
Snake River Interstate Compact.
W77-08996 6E

Report on Preliminary Data for Madison Limestone Test Well No. 1, NE1/4SE1/4 Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming,
W77-09072 4B

Preliminary Study of Wastewater Movement in and Near Grand Teton National Park, Wyoming, Through October 1976,
W77-09087 5B

YAKIMA INDIAN RESERVATION (WASH)
Outline of the Water Resources of the Satus Creek Basin, Yakima Indian Reservation, Washington,
W77-08740 4B

YAKUTIA (USSR)
Some Hydrochemical Characteristics of the Mouth Reaches of the Anabar, Lena, Yana, and Indigirka Rivers,
W77-08833 2L

YAMPA RIVER (CO)
Flood Hazard Information: Yampa River and Tributaries, Steamboat Springs, Colorado.
W77-08619 4A

YUMA AREA (ARIZ)
Analog Simulation of the Ground-Water System, Yuma, Arizona,
W77-09067 2F

ZINC
The Behaviour of Dissolved Iron, Manganese and Zinc in the Beaulieu Estuary, S. England,
W77-08701 5B

Effects of a Parasite, Eubothrium salvelini (Cestoda: Pseudophyllidea), on the Resistance of Juvenile Sockeye Salmon, Oncorhynchus nerka, to Zinc,
W77-08791 5C

ZINC

Adsorption and Vertical Movement of the Zinc and Manganese Ions in Three Types of Soil,
W77-09054 5B

ZONED EMBANKMENTS
Load Transfer and Hydraulic Fracturing in Zoned Dams,
W77-08857 8B

ZONING
Integrated Evaluation Programs for Fairfax County, Va.,
W77-08862 6B

ZOOPLANKTON
The Effect of Warm Effluent from the Novorossiysk Thermal Power Plan on Zooplankton,
W77-08804 5C

Inland Waters. Monographs from Limnology and Related Areas, Vol. 26, Part 1. The Zooplankton of Inland Waters,
W77-08861 2H

Zooplankton Development in Intensively Exploited Fishery Ponds, (In Russian),
W77-08945 2I

Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

LIBRARY U. OF I. URBANA-CHAMPAIGN

AUTHOR INDEX

ABDULLAEV, M. A.
Fish Fauna of Lakes of the Lower Reaches of the Zarafshan River and its Fishery Use, (In Russian),
W77-08708 2H

ABRAMS, D. E.
Tests of Oil Recovery Devices in Broken Ice Fields. Phase I,
W77-08915 5G

ADAMS, D. B.
Evaporation from Seven Reservoirs in the Denver Water-Supply System, Central Colorado,
W77-08736 2D

ADRIAN, D. D.
Suitability of New England Soils in Accepting Waste Effluent - Phase I,
W77-09063 5E

Suitability of New England Soils in Accepting Waste Effluents, Phase II,
W77-09064 5E

AFFLECK, S. B.
Solute Travel Times to Wells,
W77-09042 5B

AHMED, K. Y.
Survival of Bacteria in Turbid and Polluted Waters,
W77-08606 5C

AHMED, R.
Surface-Groundwater Interactions and the Conjunctive Use of the Water Resources of the Mullica River Basin, New Jersey,
W77-08810 4B

AHREM, V. D.
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

ALEKSEENKO, L. N.
Aspects of the Daily and Seasonal Course of Transpiration Intensity in Meadow Plants, (In Russian),
W77-08709 2D

Transpiration Intensity of Meadow Plants, (In Russian),
W77-08714 2D

ALLMARAS, R. R.
Distribution of Corn Roots in Sandy Soil with a Declining Water Table,
W77-08676 2I

ALLUM, M. O.
An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

ALSTON, F.
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

ANDERSON, D. E.
A Comparative Study of Organic Carbon and Nutrients in Lake Sediment,
W77-09065 5A

ANDERSON, W.
Hydrologic Considerations in Dewatering and Refilling Lake Carlton, Orange and Lake Counties, Florida,
W77-09080 5G

ANDO, J.
Removal of Fluorine from Waste Waters. III. Fundamental Tests with Chemical Reagents (Haisuichu no fusso jokyo nikansuru kenkyu. III. Shiyaku kei niyoru kisoshiken),
W77-08626 5D

ANTONOVA, V. I.
Experimental Data on the Regulation of 1,2-Dibromopropane in Reservoir Water, (In Russian),
W77-08718 5C

AOYAMA, I.
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem: I. An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W77-08695 5C

ARKHIPOVA, YE. G.
Role of River Runoff and of Water Exchange in the Salinity of the Northern Caspian Sea,
W77-08836 2H

ARMSTRONG, F. A. J.
Photochemical Dechlorination of Water Supply for Fish Tanks with Commercial Water Sterilizers,
W77-08842 5F

ARNOLD, T. B.
Effluent Limitations and NPDES: Federal and State Implementation of the Federal Water Pollution Control Act Amendments of 1972,
W77-08956 5G

ARON, G.
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

BABCOCK, H. M.
Annual Summary of Ground-Water Conditions in Arizona, Spring 1975 to Spring 1976,
W77-08732 7C

BAGGALEY, A.
Kinetic Response of Perturbed Marine Nitrification Systems,
W77-08946 5C

BAILEY, P. J.
Enzymatic Treatment of Dairy Effluents,
W77-08937 5D

BAILEY, W. C.
Economic Evaluation of Idaho's Water Supply,
W77-08816 6B

BAKER, J. H.
Suitability of New England Soils in Accepting Waste Effluent - Phase I,
W77-09063 5E

Suitability of New England Soils in Accepting Waste Effluents, Phase II,
W77-09064 5E

BANDRABUR, T.
Study of the Chemical and Gaseous Composition of Thermal Waters of the Eastern Part of the Pannonian Depression (Considerations sur la Composition Chimique et Gazeuse des eaux Thermales de la Partie Orientale de la Depression Pannonique (Roumanie)),
W77-08688 2K

BARNES, R. O.
N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

BARTHA, R.
A Biodegradation of Oil on Water Surfaces,
W77-08909 5G

BARTON, D. R.
New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

BASS, M. L.
Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

BATTY, J. C.
An Energy Accounting Evaluation of Several Alternatives for Hydropower and Geothermal Development,
W77-09057 6B

BAUER, W. H.
Agents, Methods and Devices for Amelioration of Discharges of Hazardous Chemicals on Water,
W77-08910 5G

BAUMANN, E. R.
Trickling Filter-Activated Sludge Combinations,
W77-08868 5D

BECK, B.
Systematic Identification of DO-BOD Model Structure,
W77-08866 5B

BECK, R. A.
High Speed Liquid Chromatographic Analysis of Cobalamin Productivity and Distribution in Activated Sewage Sludge Treatment,
W77-08621 5A

BEECHER, H. A.
Florida's Barge Canal Prospects for the Future,
W77-08964 4A

BELL, D. A.
An Energy Accounting Evaluation of Several Alternatives for Hydropower and Geothermal Development,
W77-09057 6B

BELLA, D. A.
An Examination of Some Physical and Biological Impacts of Dredging in Estuaries,
W77-08918 5C

BENSON, C. A.
Analytical Models for the Evaluation of Supplemental Aeration in Texas Estuaries,
W77-08917 5B

BERGER, B. B.
Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

BERNHAGEN, W.
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

BERTINE, K. K.
N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

BESSEY, W. E.
Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

BETTANDROFF, J. M.
Water for Industrial and Agricultural Development in Attala, Holmes, Humphreys, Issaquena, Sharkey, and Yazoo Counties, Mississippi,
W77-08748 4B

BEWERS, J. M.
The Distribution of Trace Metals in the Western North Atlantic Off Nova Scotia,
W77-08703 5B

BEYERS, R. J.
Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

BIEREI, G. R.
Population Response and Heavy Metal Concentrations in Cottontail Rabbits and Small Mammals in Wastewater Irrigated Habitats,
W77-09097 5B

BINANDO, J.
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

BLAKE, B. F.
The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

BLANCHARD, P. M.
Detergent Composition for Dispersing Oil Spills,
W77-08884 5G

BLANKENNAGEL, R. K.
Report on Preliminary Data for Madison Limestone Test Well No. 1, NE1/4SE1/4 Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming,
W77-09072 4B

BLOMQUIST, G. J.
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

BOAST, C. W.
Shape of a Streamline Water Table Near Inflow and Outflow Boundaries,
W77-09023 2F

BOERSMA, L.
Total Energy Use in an Urban-Agricultural Power Plant Complex,
W77-08691 5G

BOGOMOLOV, G. V.
Temperature and Chemism of Ground Waters in the Western Areas of the East European Platform,
W77-08683 2K

BOGOMOLV, Y. G.
Temperature and Chemism of Ground Waters in the Western Areas of the East European Platform,
W77-08683 2K

BOLLYKY, L. J.
Ozone Disinfection of Secondary Effluent,
W77-08638 5D

BORMAN, R. G.
Ground-Water Resources and Geology of Walworth County, Wisconsin,
W77-09081 2F

BORN, S. M.
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

BORTON, D. L.
Effects of Primary Treated and Biologically Stabilized Kraft Mill Effluents on the Production, Biomass and Growth Rates of Juvenile Salmonids in Three Stream Channels,
W77-08921 5C

BOWDEN, G.
Legal Battles on the California Coast: A Review of the Rules,
W77-08963 6E

BOWLES, D. S.
Coupled Dynamic Streamflow-Temperature Models,
W77-09014 2E

BOZHENKO, V. G.
Effect of Agricultural and Silvicultural Practices on the Runoff from Drainage Basins of the Nizhnedevitskaya Hydrologic Station,
W77-08835 4C

BRACKEN, B. D.
What's Up with Oxygen/2,
W77-08627 5D

BRADFORD, W. L.
Urban Stormwater Pollutant Loadings: A Statistical Summary Through 1972,
W77-09046 5B

BRAEK, G. S.
Heavy Metal Tolerance of Marine Phytoplankton. III. Combined Effects of Copper and Zinc Ions on Cultures of Four Common Species,
W77-08692 5C

BRANSON, F. A.
Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

BRAY, C. J.
Hydrothermal Fluids of Seawater Salinity in Ophiolitic Sulphide Ore Deposits in Cyprus,
W77-08854 2L

BREE, D. JR.
Prototype Software for On-Line Storage Forecasting Supported by Load Forecasting and Reduced System Representation for Water Distribution Systems,
W77-08942 7C

WATSIM - A Fortran Program for 24 Hour Simulation of Flows and Reservoir Fluctuations in Water Distribution Networks,
W77-08943 7C

BREE, D. W. JR.
Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

BREMMENG, G. S.
Transjoen, A Groundwater Influenced Lake with Special Redox and Sulphate Conditions,
W77-09031 2H

BRISTOL, A.
Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

BROOME, S. W.
Dune Stabilization with Panicum Amarum Along the North Carolina Coast,
W77-08908 2L

BROWN, D. L.
Artificial Recharge to a Freshwater-Sensitive Brackish-Water Sand Aquifer, Norfolk, Virginia,
W77-09066 4B

Report on Preliminary Data for Madison Limestone Test Well No. 1, NE1/4SE1/4 Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming,
W77-09072 4B

BRUCH, J. C. JR.
Finite Element Solution of the Two-Dimensional Unsaturated Flow Equation,
W77-08923 2G

BUBENZER, G. D.
Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

BUDENAERS, D. H.
Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

BULLOFF, J. J.
Agents, Methods and Devices for Amelioration of Discharges of Hazardous Chemicals on Water,
W77-08910 5G

BURGE, M. M.
Gravitational Irrigation System and Method of Installing,
W77-08895 3F

BURGE, W. D.
Composting Destroys Pathogens in Sewage Solids,
W77-08641 5E

BURGER, J.
Make Money by Computer,
W77-08730 5D

BUSATH, A. L.
Species Differences in Breakdown of Tree Leaves in Streams--Significance for Composition of Stream Communities,
W77-09056 5B

BUTLER, J. R.
A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

BUTTERMORE, R. E.
Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

BUXTON, K. S.
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

BYRNE, C. J.
Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

CAIN, J. R.
Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

CAIRO, P. R.
Philadelphia's Water System Automation Plan,
W77-08864 5F

CALDER, J. A.
Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

CALMON, C.
New Directions in Ion Exchange,
W77-08719 5D

CAPONERA, D. A.
Conclusions and Recommendations for the United Nations Water Conference (Preliminary Outline),
W77-08965 6E

CARUANA, J.
Solid Waste Management: A Test of Alternative Strategies Using Optimization Techniques,
W77-08723 5E

CHANG, L. W.
Dose-Dependent Effects of Methylmercury on Limb Regeneration of Newts (Triturus Viridescens),
W77-08699 5C

CHAPLIN, J. R.
Surface Particle Orbits in Uniform Waves,
W77-08845 8B

CHEN, C.
Thermal Waters in Taiwan, A Preliminary Study,
W77-08685 4B

CHEN, C. S.
Suitability of New England Soils in Accepting Waste Effluent - Phase I,
W77-09063 5E

CHEN, C-T.
The Use and Misuse of Pure Water PVT Properties for Lake Waters,
W77-08840 2H

CHEN, J. C.
A Certain Marine Catenate Dinoflagellate Tentatively Applied for Detecting Carcinogens,
W77-08795 5A

Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

CHIDLEY, T. R. E.
A Mathematical Model Study of Fresh-Water Lenses,
W77-08837 2F

CHIPIK, I. N.
Molybdenum Content in the Subsurface Waters of the Vinnitsa Oblast, (In Russian),
W77-08882 2K

CHODYNIECKI, A.
Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

CHOW, T. J.
Mussels (Mytilus Sp.) as an Indicator of Lead Pollution,
W77-08693 5C

CHRISTIAN, R. T.
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

CIRELLO, J.
Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

CLAPPERTON, C. M.
The Maximum Extent of Glaciers in Part of West Falkland,
W77-09032 2C

CLARK, C. S.
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

CLARK, R. M.
Water Supply Economics,
W77-08863 6B

CLAYTON, J. T.
Suitability of New England Soils in Accepting Waste Effluent - Phase I,
W77-09063 5E

Suitability of New England Soils in Accepting Waste Effluents, Phase II,
W77-09064 5E

CLEMENT, C.
Additives Tailor Cement to Individual Wells,
W77-08665 8F

CLEMENTS, L. W.
Irrigation Drain Valve,
W77-08887 3F

CLUFF, C. B.
Development of a Low Cost Asphalt-Rubber Membrane for Water Harvesting Catchments and Reservoir Seepage Control,
W77-08601 3B

CODY, T. E.
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

COHEN, D. B.
Controlling Sludge Bulking,
W77-08636 5D

COLE, D. W.
Atmospheric Sulfate Additions and Cation Leaching in a Douglas Fir Ecosystem,
W77-08822 2K

COLLIS-GEORGE, N.
Infiltration Equations for Simple Soil Systems,
W77-09025 2G

COLYER, P. J.
The Effect of Surcharging on Discharge Through a Pipe,
W77-08644 8B

CONFER, J. C.
Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

CONVERSE, J. C.
Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

COOPER, L. W.
Air, Mist and Foam Drilling, A Look at Latest Techniques,
W77-08669 8C

COOPER-RUSKA, C.
User Charges in Inland Navigation Policy,
W77-08604 6C

COPLEN, T. B.
Chemical and Isotopic Investigations of Groundwater in Potential Geothermal Areas in Hawaii,
W77-09082 2K

COPP, H. D.
Hydrology of Three Recreational Lakes in Eastern Washington State,
W77-08608 5B

CORBETT, E. S.
Clearcutting in Pennsylvania,
W77-08712 4C

COREY, A. T.
Soil and Rock Strata to Trap, Filter and Store Water for Rural Domestic use,
W77-08821 3B

CORTELL, B.
Ground Water - Solar Heat,
W77-08652 8C

COSTA, P. A.
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

COTTON, J. E.
Availability of Ground Water in the Middle Merrimack River Basin, Central and Southern New Hampshire,
W77-08733 7C

COUTANT, C. C.
Compilation of Temperature Preference Data,
W77-08767 7C

COX, E. R.
Preliminary Study of Wastewater Movement in and Near Grand Teton National Park, Wyoming, Through October 1976,
W77-09087 5B

COX, W. E.
Water--An Element of Land-Use and Urban Growth Policies,
W77-08872 6B

CRACIUN, P.
Study of the Chemical and Gaseous Composition of Thermal Waters of the Eastern Part of the Pannonian Depression (Considerations sur

CRACIUN, P.
la Composition Chimique et Gazeuse des eaux Thermales de la Partie Orientale de la Depression Pannonique (Roumanie)),
W77-08688 2K

CRAMER, W. N.
Composting Destroys Pathogens in Sewage Solids,
W77-08641 5E

CRAWSHAW, L. I.
Physiological and Behavioral Reactions of Fishes to Temperature Change,
W77-08802 5C

CROW, W. L.
Cement-Mud Spacer System Improves Illinois Wells,
W77-08647 8F

CUMBERLAND, J. H.
Effects of Economic Development on Water Resources,
W77-09051 5G

CURTIS, D. C.
Design Efficiency of Stormwater Detention Basins,
W77-08841 4D

CUSHING, E. M.
Report on Preliminary Data for Madison Limestone Test Well No. 1, NE1/4SE1/4 Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming,
W77-09072 4B

DANDLIKER, W. B.
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

DANIELSON, T. W.
Evaporation from Seven Reservoirs in the Denver Water-Supply System, Central Colorado,
W77-08736 2D

DAUBNER, I.
Results of a Microbiological Investigation of the Danube River by One Point Profile (1969-1971), (In German),
W77-08694 5B

DAVANIPOUR, T.
Short Jet Impingement,
W77-09016 8B

DAVIS, A. L.
Pressure Reducing Valves in Pipe Network Analyses,
W77-08855 8B

DAVIS, D.
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6G

DAVIS, L. R.
Total Energy Use in an Urban-Agricultural Power Plant Complex,
W77-08691 5G

DAY, A. D.
Effects of Treated Municipal Wastewater and Commercial Fertilizer on Growth, Fiber, Acid-Soluble Nucleotides, Protein and Amino Acid Content in Wheat Hay,
W77-08876 5C

DAY, R. E.
Philadelphia's Water System Automation Plan,
W77-08864 5F

DE VRIEND, H. J.
A Mathematical Model of Steady Flow in Curved Shallow Channels,
W77-09036 8B

DEB, A. K.
Get Ready for Dual Water Systems,
W77-08645 5G

DEMAS, C. R.
Analyses of Native Water, Bed Material, and Elutriate Samples of Major Louisiana Water Waterways, 1975,
W77-09084 5A

DENTON, G. H.
Was There a Late-Wurm Arctic Ice Sheet,
W77-08839 2C

DESLAURIERS, P. C.
Tests of Oil Recovery Devices in Broken Ice Fields. Phase I,
W77-08915 5G

DHANDAPANI, K. R.
Effect of Sediment Load on Stable Sand Canal Dimensions,
W77-09020 8B

DI GREGORIO, D.
Dewatering Chemical-Primary Sludges,
W77-08865 5D

DIAMANT, R. M. E.
A Case for Geothermal Energy,
W77-08655 8C

DIENER, R. A.
Cooperative Gulf of Mexico Estuarine Inventory and Study--Texas: Area Description,
W77-08916 2L

DIGIANO, F. A.
Characterization of Urban Runoff in Greenfield, Massachusetts--Phase I,
W77-08939 5B

Suitability of New England Soils in Accepting Waste Effluents, Phase II,
W77-09064 5E

DIGIANO, M. A.
Suitability of New England Soils in Accepting Waste Effluent - Phase I,
W77-09063 5E

DIMITROULIAS, C.
Important Geothermal Sites in Greece, on the Base of Thermomineral Spring Layings, and the Possibilities of Their Exploitation and Utilisation,
W77-08690 4B

DOERKSEN, H. R.
Citizen Participation in Water Policy Formation,
W77-08603 6B

DOLAN, R.
Water Resources and Water Utilization in Israel,
W77-09011 6E

DOMINGUEZ, J. G.
Retention and Flow Characteristics of Polymer Solutions in Porous Media,
W77-08850 2G

DONAHUE, M. P.
Characterization of Urban Runoff in Greenfield, Massachusetts--Phase I,
W77-08939 5B

DONLEY, D. L.
Section 208 and Section 303 Water Quality Planning and Management: Where is it Now,
W77-08949 5G

DORFMAN, R.
Incidence of the Benefits and Costs of Environmental Programs,
W77-08870 6G

DOWGIALLO, J.
Geochemistry and Origin of Thermal Waters in Poland,
W77-08684 2K

DRESSLER, R. L.
Deer Habitat Response to Irrigation with Municipal Wastewater,
W77-09099 5C

DRORI, M.
Sprinkler Having Improved Water Distribution,
W77-08899 3F

DUCKSTEIN, L.
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6G

DUGAN, G. L.
Nitrogen Removal from Secondary Effluent by a Laboratory Soil Column,
W77-08607 5B

DWORSKY, L. B.
The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

ECHAUBARD, M.
Qualitative and Quantitative Changes in the Benthic Fauna of a Trout Stream, the Couze Pavin Puy-De-Dome, Caused by Agricultural and Urban Pollution, (In French),
W77-08955 5C

ECKHARDT, R. C.
A Rational National Policy on Public Use of the Beaches,
W77-08976 6E

EDMUNDS, S.
Economics of Geothermal Energy Development (In Imperial County, California),
W77-08657 8C

EKERN, P. C.
Nitrogen Removal from Secondary Effluent by a Laboratory Soil Column,
W77-08607 5B

EL-SABH, M. I.
Oceanographic Features, Currents, and Transport in Cabot Strait,
W77-08851 2L

ELDER, J. A.
A Conceptual Representation of the New York Bight Ecosystem,
W77-08900 5B

ELLIS, A. J.
Some Geochemical Problems in the Utilization of Geothermal Waters,
W77-08687 5B

ELPRINCE, A. M.
Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

ENOS, P.
Flow Regimes in Debris Flow,
W77-09045 2J

EPSTEIN, H. I.
Seismic Design of Liquid-Storage Tanks,
W77-08859 8D

ERASLAN, A. H.
A Transient, Two-Dimensional, Discrete-Element, Far-Field Model for Thermal Impact Analysis of Power Plant Discharges in Coastal and Offshore Regions. Part I: General Description of the Mathematical Model and Results of an Application,
W77-08905 5B

EVANS, G. W.
Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

EVENSON, D. E.
A Conceptual Representation of the New York Bight Ecosystem,
W77-08900 5B

FABRE, B.
Study of an Ice Core to the Bedrock in the Accumulation Zone of an Alpine Glacier,
W77-08846 2C

FAN, P. F.
Chemical and Isotopic Investigations of Groundwater in Potential Geothermal Areas in Hawaii,
W77-09082 2K

FAST, A. W.
Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

Hyperoxygen Concentrations in the Hypolimnion Produced by Injection of Liquid Oxygen,
W77-09028 5G

FICKE, J. F.
Evaporation from Seven Reservoirs in the Denver Water-Supply System, Central Colorado,
W77-08736 2D

FIELD, J. B.
Drag and Inertia Forces on a Cylinder in Periodic Flow,
W77-09017 8B

FINSTEIN, M. S.
Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

FITZMAURICE, J. R.
New Plymouth Sewerage Scheme,
W77-08632 5D

FOERSTER, H.
Method for Purifying Water of Organic Compounds Not Readily Biodegradable,
W77-08883 5D

FOGEL, M.
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6G

FOLLETT, R. F.
Distribution of Corn Roots in Sandy Soil with a Declining Water Table,
W77-08676 2I

FOREE, E. G.
Reaeration and Velocity Prediction for Small Streams,
W77-08867 5B

FOSTER, J. L.
Drill String Makeup, Past, Present, Future,
W77-08648 8C

FRANKENFELD, J. W.
Identification of Weathered Oil Films Found in the Marine Environment,
W77-08901 5A

FREAD, D. L.
Coupled Dynamic Streamflow-Temperature Models,
W77-09014 2E

FREEMAN, R. C. JR.
Water as an Environmental Constraint in Land Use Planning,
W77-08721 6G

FRIND, E. O.
Simulation of Two-Dimensional Contaminant Transport with Isoparametric Hermitian Finite Elements,
W77-08829 5B

FROBEL, R. K.
Development of a Low Cost Asphalt-Rubber Membrane for Water Harvesting Catchments and Reservoir Seepage Control,
W77-08601 3B

FUNDERBURG, D. E.
Trap-Efficiency Investigation Bernalillo Floodwater Retarding Reservoir No. 1 (Piedra Lisa Arroyo) Near Bernalillo, New Mexico, Water Years 1956-1974,
W77-08741 4D

FUSCO, R.
Method for Purifying Waste Waters which Contain Anionic-Type Organic Compounds,
W77-08891 5D

GAINES, J. L.
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

GAKSTATTER, J. H.
An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

GAMES, L. M.
Carbon Isotopic Study of the Fate of Landfill Leachate in Groundwater,
W77-08670 5B

GARAGOUINS, C.
Important Geothermal Sites in Greece, on the Base of Thermomineral Spring Layings, and the Possibilities of Their Exploitation and Utilisation,
W77-08690 4B

GARDE, R. J.
Resistance of Two Dimensional Triangular Roughness,
W77-09035 8B

GARDNER, W.
The Role of Methylmercury Production in the Transfer of Mercury in a Salt Marsh Ecosystem,
W77-08697 5C

GARLING, T.
The Structural Analysis of Environmental Perception and Cognition: A Multidimensional Scaling Approach,
W77-08722 6B

GARNER, L. L.
Recent Advances in Rotary Drill Bits,
W77-08649 8G

GARRELL, M. H.
Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

GARRISON, C. J.
Drag and Inertia Forces on a Cylinder in Periodic Flow,
W77-09017 8B

GARTSIDE, P. S.
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

GARZA, S.
Artificial Recharge for Subsidence Abatement at the NASA-Johnson Space Center, Phase I,
W77-08744 4B

GASS, T. E.
Land Subsidence,
W77-08653 4B

GEISZLER, P. C.
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

GIBSON, D. T.
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

GIBSON, R. J.
Added Mass of Pile Group,
W77-09018 8B

GIFT, J. J.
Application of Temperature Preference Studies to Environmental Impact Assessment,
W77-08768 5C

GINZBURG, M. E.
Problems of Optimum Soil Moisture Level: Determination and Control, (In Russian),
W77-08952 2G

GLESSNER, R. E.
An Evaluation of the National Eutrophication Survey Data,
W77-08710 5C

GOEDL, L.
The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

GOLD, H.
New Directions in Ion Exchange,
W77-08719 5D

GOLDBERG, E. D.
N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

GOLDBERG, M. C.
Reactions in the Aqueous Environment of Low Molecular Weight Organic Molecules,
W77-08754 5B

GOLDSTEIN, R. M.
Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

GORES, K. X.
Auxiliary Air System for Use in Laboratory Experiments,
W77-08800 7B

GORYAYNOVA, L. I.
The Effect of Warm Effluent from the Novorossiysk Thermal Power Plan on Zooplankton,
W77-08804 5C

GOTTSCHALK, L. T.
Multivariate Distributions in Hydrology and River Regulation,
W77-09029 2E

GOULD, W. L.
Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

GRAF, W. L.
Network Characteristics in Suburbanizing Streams,
W77-08830 4C

GRAHAM, M. J.
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

GRANT, D. L.
Selected Problems in Idaho Ground Water Law,
W77-09049 6E

GRANTHAM, B. J.
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

GREEN, F. A. JR.
Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

GREEN, G.
Ecology of Toxicity in Marine Sponges,
W77-08793 5C

GREENBERG, M.
Solid Waste Management: A Test of Alternative Strategies Using Optimization Techniques,
W77-08723 5E

GRENNEY, W. J.
Coupled Dynamic Streamflow-Temperature Models,
W77-09014 2E

An Energy Accounting Evaluation of Several Alternatives for Hydropower and Geothermal Development,
W77-09057 6B

GRIFFIN, T. J.
Cement-Mud Spacer System Improves Illinois Wells,
W77-08647 8F

GRIN, A. M.
Character of Seepage of Precipitation to the Water Table in the Central Forest Steppe,
W77-09043 4B

GRITZ, R. L.
A Comparison of Methods of Hydrocarbon Analysis of Marine Biota,
W77-08789 5A

GROENEVELT, P. H.
Water and Ice Potentials in Frozen Soils,
W77-08828 2C

GROSECLOSE, W. R.
Research Benefits in Water Resources Construction,
W77-08858 6B

GROSSWALD, M. G.
Was There a Late-Wurm Arctic Ice Sheet,
W77-08839 2C

GROVHOUG, T. R.
Plant Size Influence on Performance in Activated Sludge Systems with Application to Regional Wastewater Treatment Planning,
W77-08928 5D

GUARINO, C. F.
Philadelphia's Water System Automation Plan,
W77-08864 5F

GUPTA, M. L.
Geochemistry of Thermal Waters from Various Geothermal Provinces of India,
W77-08682 2K

GURTOWSKI, T. M.
Load Transfer and Hydraulic Fracturing in Zoned Dams,
W77-08857 8B

HABAN, L.
The Effect of Soil Moisture on the Development of Soil Microflora in Conditions of Field Experiments, (In Slovak),
W77-08696 5B

HAJASH, A. JR.
Hydrothermal Processes in the Atlantic Ocean Crust, 26 Degrees N,
W77-08681 2K

HALL, K. L.
Section 208 and Section 303 Water Quality Planning and Management: Where is it Now,
W77-08949 5G

HALSTAD, O. M.
Tests of Oil Recovery Devices in Broken Ice Fields. Phase I,
W77-08915 5G

HANCOCK, D. R.
An Examination of Some Physical and Biological Impacts of Dredging in Estuaries,
W77-08918 5C

HANN, R. W. JR.
Analytical Models for the Evaluation of Supplemental Aeration in Texas Estuaries,
W77-08917 5B

HANSEN, D.
Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

HANSEN, J. E.
Universal Coupling for Movable Irrigation Pipes,
W77-08875 3F

HARDY, J. T.
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

HARR, R. G.
Longitudinal Analysis of Change in Levels of Affiliation and Participation in Voluntary Formal Organizations,
W77-09058 6B

HARRINGTON, R. A.
Principles of Graphical Gradually Varied Flow Model,
W77-09015 2E

HARRIS, D. D.
Hydrologic Changes After Logging in Two Small Oregon Coastal Watersheds,
W77-08746 4C

HARSHBARGER, J. C.
Neoplastic and Possibly Related Skin Lesions in Neotenic Tiger Salamanders from a Sewage Lagoon,
W77-08729 5C

HATHAWAY, J. C.
Preliminary Summary of the 1976 Atlantic Margin Coring Project of the U.S. Geological Survey,
W77-09089 2L

HAUPT, U.
Method of Purifying Waste Water,
W77-08881 5D

HAYES, J. M.
Carbon Isotopic Study of the Fate of Landfill Leachate in Groundwater,
W77-08670 5B

HAZEL, W.
Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

HEATH, A. G.
Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

HEBRAND, P.
Theoretical and Experimental Study of Flow Separation After a Sudden Increase in the Cross-Section of a Circular Pipe (Etude Theorique Et Experimentale D' Un Ecoulement Decolle En Aval D'Un Elargissement Brusque De Revolution),
W77-09034 8B

HECKROTH, C. W.
Many Changes Urged for PL 92-500,
W77-08950 5G

HEID, A. S.
EPA Proposes Untimely Amendments,
W77-08970 5G

LIBRARY U. OF ILLINOIS-URBANA-CHAMPAIGN

PL 92-500: New Federalism or Federal Takeover,
W77-08972 6E

HEINITZ, A. J.
Floods in the Big Creek Basin, Linn County, Iowa,
W77-08731 2E

HEIRTZLER, P. L.
Characterization of Urban Runoff in Greenfield, Massachusetts--Phase I,
W77-08939 5B

HEISEY, R. M.
Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connectituct Rivers,
W77-08814 5B

HELZ, G. R.
Trace Element Inventory for the Northern Chesapeake Bay with Emphasis on the Influence of Man,
W77-08704 5C

HENION, J. D.
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

HENKEL, K. V. R. JR.
Induced Vertical Mixing in a Stratified Impoundment by a Subsurface Warm Water Discharge,
W77-08929 5B

HERRING, W. M.
Method and Apparatus for Purifying Aqueous Streams Contaminated with Organic Materials,
W77-08889 5D

HERZOG, H. W. JR.
Effects of Economic Development on Water Resources,
W77-09051 5G

HESS, A.
Philadelphia's Water System Automation Plan,
W77-08864 5F

HICKS, L. J.
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

HIEU, H. M.
Theoretical and Experimental Study of Flow Separation After a Sudden Increase in the Cross-Section of a Circular Pipe (Etude Theorique Et Experimentale D' Un Ecoulement Decolle En Aval D'Un Elargissement Brusque De Revolution),
W77-09034 8B

HIFT, H.
Methylmercury Induced Injury of Single Barnacle Muscle Fibers,
W77-08700 5C

HO, F. P.
Storm Tide Frequency Analysis for the Coast of Georgia,
W77-08914 2L

HOBBA, W. A. JR.
Ground-Water Hydrology of Berkeley County, West Virginia,
W77-09083 4B

HODGES, J. W.
International Law and Radioactive Pollution by Ocean Dumping: 'With All Their Genius and With All Their Skill...'
W77-08957 5G

HOEHN, R. C.
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

HOLLIDAY, L. M.
The Behaviour of Dissolved Iron, Manganese and Zinc in the Beaulieu Estuary, S. England,
W77-08701 5B

HOLLISTER, T. A.
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

HOLTZ, H. D.
Polluted Water Purification,
W77-08890 5D

HOOK, R. A.
Air, Mist and Foam Drilling, A Look at Latest Techniques,
W77-08669 8C

HORGAN, D. N. JR.
Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

HOWMILLER, R. P.
Species Differences in Breakdown of Tree Leaves in Streams--Significance for Composition of Stream Communities,
W77-09056 5B

HUFFMAN, G. C.
Ground-Water Data for Michigan, 1975,
W77-08753 7C

HUGHES, G. H.
Hydrologic Considerations in Dewatering and Refilling Lake Carlton, Orange and Lake Counties, Florida,
W77-09080 5G

HUGHES, T.
Was There a Late-Wurm Arctic Ice Sheet,
W77-08839 2C

HUTNIK, R. J.
Clearcutting in Pennsylvania,
W77-08712 4C

INGRAM, JAMES W.
Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

INGRAM, M.
Policy Innovation and Institutional Fragmentation,
W77-09053 6E

INOUE, Y.
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem: I. An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W77-08695 5C

ISAACS, L. T.
Numerical Solution for Flow Under Sluice Gates,
W77-09012 8B

ISHIO, S.
A Certain Marine Catenate Dinoflagellate Tentatively Applied for Detecting Carcinogens,
W77-08795 5A

Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

IWAJI, I.
Studies by the Dynamic Method on the Reaction of Rock with Hot Spring Water of the Tamagawa Hot Springs in Japan,
W77-08689 2K

IWASAKI, Y.
Removal of Fluorine from Waste Waters. III. Fundamental Tests with Chemical Reagents (Haisuichu no fusso jokyo nikansuru kenkyu. III. Shiyaku kei niyoru kisoshiken),
W77-08626 5D

JACKMAN, A. P.
Thermal Loading of Natural Streams,
W77-09068 5B

JACKNOW, J.
Sludge Incineration,
W77-08717 5E

JACKSON, L.
Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

JACOB, C. M.
Transient Analysis of Phreatic Aquifers Lying Between Two Open Channels,
W77-09026 2F

JENKINS, E. D.
Water-Level Changes in Northwestern Kansas, 1950-76,
W77-08742 4B

JENSEN, A.
Heavy Metal Tolerance of Marine Phytoplankton. III. Combined Effects of Copper and Zinc Ions on Cultures of Four Common Species,
W77-08692 5C

JENSEN, VARON
Effects of Treated Municipal Wastewater and Commercial Fertilizer on Growth, Fiber, Acid-Soluble Nucleotides, Protein and Amino Acid Content in Wheat Hay,
W77-08876 5C

JEPPSON, R. W.
Pressure Reducing Valves in Pipe Network Analyses,
W77-08855 8B

JIMENEZ, R. A.
Development of a Low Cost Asphalt-Rubber Membrane for Water Harvesting Catchments and Reservoir Seepage Control,
W77-08601 3B

JOHNSON, A. H.
Chemical Character of Headwater Streams in Vermont and New Hampshire,
W77-09027 2K

JOHNSON, D. W.
Atmospheric Sulfate Additions and Cation Leaching in a Douglas Fir Ecosystem,
W77-08822 2K

JOHNSON, F. A.
A Reconnaissance of the Hydrology of the Edisto and Ashepoo Estuaries, South Carolina,
W77-09076 2L

A Reconnaissance of the Hydrology of the Intracoastal Waterway from Bucksport to Little River Inlet, South Carolina,
W77-09077 2L

JOHNSON, N. L. JR.
Economics of Permanent Flood-Plain Evacuation,
W77-08856 6B

JOHNSON, T. L.
Pumping Tests Provide Useful Data,
W77-08658 8G

JOHNSTON, W.
Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

JORDAN, M.
The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

JORGENSEN, S. E.
An Ecological Model for Heavy Metal Contamination of Crops and Ground Water,
W77-08706 5B

JUBAYLI, Z.
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

JURAN, J.
Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

KABACK, D. S.
Transport of Molybdenum in Mountainous Streams, Colorado,
W77-08705 5B

KANIA, H. J.
Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

KAO, T. W.
Density Currents and Their Applications,
W77-08844 5B

KAPKOV, V. I.
Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

KARTVELISHVILI, N. A.
Multivariate Distributions in Hydrology and River Regulation,
W77-09029 2E

KATTERMAN, F. R. H.
Effects of Treated Municipal Wastewater and Commercial Fertilizer on Growth, Fiber, Acid-Soluble Nucleotides, Protein and Amino Acid Content in Wheat Hay,
W77-08876 5C

KATUNIN, D. N.
Role of River Runoff and of Water Exchange in the Salinity of the Northern Caspian Sea,
W77-08836 2H

KATZMAN, O.
Rotary Water Sprinkler,
W77-08888 3F

KAVVAS, M. L.
Point Stochastic Analysis of Daily Rainfall Occurrence with Application to Indiana,
W77-08935 2B

KAWATA, K.
Composting Destroys Pathogens in Sewage Solids,
W77-08641 5E

KAY, B. D.
Water and Ice Potentials in Frozen Soils,
W77-08828 2C

KEITH, L. H.
Frequency of Organic Compounds Identified in Water,
W77-08944 5A

KHABARIN, L. V.
The Helium Isotopes in Thermal Fluids,
W77-08680 5B

KHALEEL, R.
Simulation of Pollutant Movement in Groundwater Aquifers,
W77-08807 5B

KHAZOVA, G. P.
Experimental Data on the Regulation of 1,2-Dibromopropane in Reservoir Water, (In Russian),
W77-08718 5C

KHOBOT'YEV, V. G.
Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

KHORRAM, S.
Effects of Temperature and Kelthane on Grass Shrimp,
W77-08874 5C

KHVATSKAYA, YU. A.
Role of River Runoff and of Water Exchange in the Salinity of the Northern Caspian Sea,
W77-08836 2H

KIBLER, D. F.
A Conceptual Representation of the New York Bight Ecosystem,
W77-08900 5B

KIM, G. G.
Evaluation of Wheat Plants with Regard to Drought- and Heat-Resistance Under Field Conditions, (In Russian),
W77-08877 3F

KIRILLOVA, YE. P.
Effect of the Boundary Surface Between Sea and Fresh Waters on the Distribution of Dissolved Oxygen in the Mouth Region of the Dnieper River,
W77-08832 5B

KIRKHAM, D.
Solute Travel Times to Wells,
W77-09042 5B

Strength of Soil Aggregates: Influence of Size, Density and Clay and Organic Matter Content,
W77-08707 2G

KIRPENKO, YU. A.
Biologically Active Metabolites of Blue-Green Algae and Their Effect on Experimental Animals, (In Russian),
W77-08749 5C

KIRSCHNER, D.
Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

KISSIN, I. G.
Some Features of the Geochemistry of Thermal Water in Platform Areas from Experimental Data,
W77-08679 5B

KLATTENBERG, R. P.
Effects of Primary Sewage Effluent from the City of Willimantic on the Benthic Invertebrate Fauna of the Willimantic/Shetucket Rivers,
W77-09093 5C

KLEIN, A. E.
A Study of Heavy Metals in Lake Abbaya, Ethiopia, and the Incidence of Non-Parasitic Elephantiasis,
W77-08774 5A

KLEIN, H.
Simulations of Water-Level Drawdowns in Proposed Well-Field Areas, Dade County, Florida,
W77-08739 4B

KLINGINER, S.
Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

KLOSTER, A. E.
Transjoen, A Groundwater Influenced Lake with Special Redox and Sulphate Conditions,
W77-09031 2H

KLOTZ, R. L.
The Effect of Secondarily Treated Sewage on the Algal Populations of the Willimantic/Shetucket Rivers,
W77-09096 5C

KLUMB, A.
PLANASA--A National Plan for Water Supply and Sewerage in Brazil,
W77-08646 6E

KNIGHT, A. W.
Effects of Temperature and Kelthane on Grass Shrimp,
W77-08874 5C

KNIGHT, R. L.
Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

KOMAR, P. D.
Beach Sand Transport: Distribution and Total Drift,
W77-09019 2L

KONDAP, D. M.
Effect of Sediment Load on Stable Sand Canal Dimensions,
W77-09020 8B

KONONOV, V. I.
The Helium Isotopes in Thermal Fluids,
W77-08680 5B

KORKISCH, J.
The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

KOUWEN, N.
Principles of Graphical Gradually Varied Flow Model,
W77-09015 2E

KOWAL, J.
The Hydrology of a Small Catchment Basin at Samaru, Nigeria: IV: Assessment of Soil Erosion Under Varied Land Management and Vegetation Cover;
W77-08698 4D

KREITLER, C. W.
Fault Control of Subsidence, Houston, Texas,
W77-08662 4B

KRUGMAN, B.
Solid Waste Management: A Test of Alternative Strategies Using Optimization Techniques,
W77-08723 5E

KRYUKOV, V. V.
Role of River Runoff and of Water Exchange in the Salinity of the Northern Caspian Sea,
W77-08836 2H

KUENZLER, E. J.
Seasonal Patterns of Dissolved Oxygen, Nutrients, and Metals in Natural and Channelized Swamp Streams,
W77-08932 5B

KUK, YU. V.
Character of Seepage of Precipitation to the Water Table in the Central Forest Steppe,
W77-09043 4B

KULAWY, F. H.
Load Transfer and Hydraulic Fracturing in Zoned Dams,
W77-08857 8B

KURPIOS, M.
Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

KUSLER, J. A.
Lake-Shoreland Management Programs: Selected Papers,
W77-08924 2H

KWASNIEWSKA, K.
Controlling Sludge Bulking,
W77-08636 5D

LADHA, K. K.
Method and Apparatus for Purifying Aqueous Streams Contaminated with Organic Materials,
W77-08889 5D

LAI, C.
Some Computational Aspects of One- and Two-Dimensional Unsteady Flow Simulation by the Method of Characteristics,
W77-08745 2E

LAILAS, N.
Complying with Discharge Regulations,
W77-08954 5G

LAKSHMINARAYANA, V.
Digital Model Studies of Steady-State Radial Flow to Partially Penetrating Wells in Alluvial Plains,
W77-08838 2F

LAMBERT, F. J. JR.
Water Turbine Pump Failure,
W77-08656 8G

LAMPERT, W.
Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

LATKINA, L. L.
Experimental Data on the Regulation of 1,2-Dibromopropane in Reservoir Water, (In Russian),
W77-08718 5C

LAWSON, J. D.
Natural Stream Temperature Variations in a Catchment,
W77-09039 5B

LEAKE, S. A.
Water for Industrial and Agricultural Development in Attala, Holmes, Humphreys, Issaquena, Sharkey, and Yazoo Counties, Mississippi,
W77-08748 4B

LEE, E. S.
Nonlinear Estimation in Stream Quality Modeling,
W77-09047 5B

Optimal Estimation in Stream Quality Modeling,
W77-09052 5B

LEIBOVITZ, L.
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

LEMELSHTRICH, M.
Flow Restrictor and Trickle Emitter,
W77-08879 3F

LEMKE, A. E.
Optimal Temperature for Growth of Juvenile Bluegills,
W77-08798 5C

LENAU, C. W.
Seepage Under Structure on N Strata of Soil,
W77-08843 2F

LEVISON, S. A.
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

LEWIS, F. G. III
Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

LINDBERG, M. A.
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

LINDER, W. M.
Designing for Sediment Transport,
W77-08962 4D

LINDNER, H. E.
Irrigation Sprinkling Apparatus with Adjustable Ground Contacting Elements,
W77-08886 3F

LISS, P. S.
The Behaviour of Dissolved Iron, Manganese and Zinc in the Beaulieu Estuary, S. England,
W77-08701 5B

LIU, D.
Controlling Sludge Bulking,
W77-08636 5D

LIVINGSTON, R. J.
Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

LLOYD, J. W.
A Mathematical Model Study of Fresh-Water Lenses,
W77-08837 2F

LOCKHART, W. L.
Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

LOCKWOOD, A. P. M.
Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

LONG, D. A.
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

LORD, W. B.
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

LOUVAR, J. F.
Method and Apparatus for Purifying Aqueous Streams Contaminated with Organic Materials,
W77-08889 5D

LUKENS, H. R.
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

LUNDQUIST, GARY L.
Electrochemical Determinations of Trace Quantities of Phosphate and Nitrate,
W77-08817 5A

LUNDQUIST, J. B.
A Primer on Limnology,
W77-08605 2H

LUXMOORE, R. J.
Effects of Spatial Variability of Soil Hydraulic Properties in Water Budget Modeling,
W77-08825 2G

LYES, M.
Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

LYNCH, J. A.
Clearcutting in Pennsylvania,
W77-08712 4C

MACEK, K. A.
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

MACGRADY, G. J.
Florida's Sovereignty Submerged Lands: What Are They, Who Owns Them and Where is the Boundary,
W77-08951 6E

MAK, L. L. M.
Dose-Dependent Effects of Methylmercury on Limb Regeneration of Newts (Triturus Viridescens),
W77-08699 5C

MAKI, T. E.
Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

MAL'TSMAN, T. S.
Zooplankton Development in Intensively Exploited Fishery Ponds, (In Russian),
W77-08945 2I

MAMONOV, L. K.
Evaluation of Wheat Plants with Regard to Drought- and Heat-Resistance Under Field Conditions, (In Russian),
W77-08877 3F

MAMYRIN, B.
The Helium Isotopes in Thermal Fluids,
W77-08680 5B

MARAN, E.
Advanced Waste Treatment Design Protects Lake Alton,
W77-08631 5G

MARCHAL, M.
Economic Role of the Waterway in Western Europe,
W77-08860 4A

MARGUS, E.
Pump Construction Materials,
W77-08675 8G

MARKEL, L. C.
Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

MARSHALL, N. F.
Current-Meter Recordings of Low-Speed Turbidity Currents,
W77-08847 2L

MARTENS, D. C.
Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

MARTIN, A. H.
Dose-Dependent Effects of Methylmercury on Limb Regeneration of Newts (Triturus Viridescens),
W77-08699 5C

MARTINELLI, E.
Geophysical Exploration for Potable Groundwater Supplies in the Kalahari Gemsbok National Park,
W77-08654 4B

MARYANSKA, A.
The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

MASER, K. R.
Remote Sealing of Mine Passages Containing Flowing Water,
W77-08896 5G

MATSON, E. A.
The Effect of the Willimantic Sewage Treatment Plant on the Microflora and Metabolism of the Shetucket River,
W77-09094 5C

MATTHEWS, P. J.
Application of Physico-Chemical Treatment as a Method of Achieving Partial Standards on Sewage Effluents Discharged in Estuarial and Coastal Situations,
W77-08634 5D

MAUCK, W. L.
Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

MAY, M. D.
Drag and Inertia Forces on a Cylinder in Periodic Flow,
W77-09017 8B

MAYLIN, G. A.
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

MAYNARD, A. W.
The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

MAZUREK, J. S.
Real-Time Measurements of Aquatic Nitrogen,
W77-09095 5D

MCCAULEY, J. E.
An Examination of Some Physical and Biological Impacts of Dredging in Estuaries,
W77-08918 5C

MCCAULEY, R. W.
Laboratory Methods for Determining Temperature Preference,
W77-08770 5C

MCCOY, G. A.
Limnological Investigation of Six Lakes in Southeast Alaska,
W77-09069 7C

MCCUEN, R. H.
Design Efficiency of Stormwater Detention Basins,
W77-08841 4D

MCELVAIN, R. E.
Selection of Slurry Pumps for Severe Applications,
W77-08673 8C

MCHUGH, J. D.
Self-Pressurizing Seals Keep Submersible Motors Dry,
W77-08672 8C

MCKENRY, C. E. B.
Biscayne Bay Symposium II,
W77-08961 5G

MCLAUGHLIN, D.
A Conceptual Representation of the New York Bight Ecosystem,
W77-08900 5B

MCLEAY, D. J.
Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

MCLOUGHLIN, P. A.
Current-Meter Recordings of Low-Speed Turbidity Currents,
W77-08847 2L

MCMURTRY, G. M.
Chemical and Isotopic Investigations of Groundwater in Potential Geothermal Areas in Hawaii,
W77-09082 2K

MCNOWN, J. S.
Sinkage and Resistance for Ships in Channels,
W77-08873 8B

MCVIE, A.
Fine Screening of Raw Sewage,
W77-08629 8G

MEEKS, D. G.
Detergent Composition for Dispersing Oil Spills,
W77-08884 5G

MERTAUGH, J. E.
Irrigation Sprinkling Apparatus with Adjustable Ground Contacting Elements,
W77-08886 3F

METNER, D. A.
Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

MICHAELSON, A. P.
Sludge Disposal in the North West,
W77-08628 5E

MILLAR, D. J.
Recent Advances in Rotary Drill Bits,
W77-08649 8G

MILLER, A. C.
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

MILLER, G. R.
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

MILLER, G. S.
Harbor and Nearshore Currents, Oswego Harbor, New York,
W77-08913 2L

MILLER, W. R.
Report on Preliminary Data for Madison Limestone Test Well No. 1, NE1/4SE1/4 Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming,
W77-09072 4B

MILLERO, F. J.
The Use and Misuse of Pure Water PVT Properties for Lake Waters,
W77-08840 2H

MISHINA, N. E.
Experimental Data on the Regulation of 1,2-Dibromopropane in Reservoir Water, (In Russian),
W77-08718 5C

MISRA, P. K.
Nonlinear Estimation in Stream Quality Modeling,
W77-09047 5B

Optimal Estimation in Stream Quality Modeling,
W77-09052 5B

MIURA, H.
Removal of Fluorine from Waste Waters. III. Fundamental Tests with Chemical Reagents (Haisuichu no fusso jokyo nikansuru kenkyu. III. Shiyaku kei niyoru kisoshiken),
W77-08626 5D

MIYAMOTO, S.
Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

MOLENAAR, D.
Outline of the Water Resources of the Satus Creek Basin, Yakima Indian Reservation, Washington,
W77-08740 4B

MOREL-SEYTOUX, H. J.
Integral Equation for the Description of Stream-Aquifer Interaction,
W77-09092 2F

MORI, M.
Removal of Fluorine from Waste Waters. III. Fundamental Tests with Chemical Reagents (Haisuichu no fusso jokyo nikansuru kenkyu. III. Shiyaku kei niyoru kisoshiken),
W77-08626 5D

MORRIS, E. M.
An Experimental Study of the Motion of Ice Past Obstacles by the Process of Regelation,
W77-09033 2C

MORRIS, M. L.
Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

MOTT, G. E.
Wave Height Measuring Device,
W77-08897 7B

MUROMTSEV, N. A.
Problems of Optimum Soil Moisture Level: Determination and Control, (In Russian),
W77-08952 2G

MURRAY, M. A.
Polymerization of Concrete Fights Cavitation,
W77-09044 8F

MURYAMA, D.
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

NARAIN, H.
Geochemistry of Thermal Waters from Various Geothermal Provinces of India,
W77-08682 2K

NEFF, J. M.
Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

NELSON, C. S.
Grain-Size Parameters of Insoluble Residues in Mixxed Terrigenous-Skeletal Carbonate Sediments and Sedimentary Rocks: Some New Zealand Examples,
W77-08848 2L

NELSON, W. T.
Polluted Water Purification,
W77-08890 5D

NEVEU, A.
Qualitative and Quantitative Changes in the Benthic Fauna of a Trout Stream, the Couze Pavin Puy-De-Dome, Caused by Agricultural and Urban Pollution, (In French),
W77-08955 5C

NIELSEN, E. C.
Fending Device for Oil Containment Boom,
W77-08892 5G

NORTEY, P. A.
Control of Non-Point Sources of Water Pollution Within an Ecological Framework: The Case of the Tri-County Region, Michigan,
W77-08625 6E

O'BRIEN, M. J.
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

OBRO, H.
Ground Water Model for the Island of Anholt, Denmark,
W77-09030 2F

OCIEPA, A.
Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

OHBA, N.
Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

OLIVE, J. H.
Benthic Macroinvertebrates as Indexes of Water Quality in the Scioto River Basin, Ohio,
W77-08925 5A

New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

OLSON, J. R.
High Sensitivity Flowmeter,
W77-08898 7B

OLSON, L. E.
Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

ORLOB, G. T.
A Conceptual Representation of the New York Bight Ecosystem,
W77-08900 5B

ORLOVSKII, V. M.
Biologically Active Metabolites of Blue-Green Algae and Their Effect on Experimental Animals, (In Russian),
W77-08749 5C

OVERHOLTZ, W. J.
Hyperoxygen Concentrations in the Hypolimnion Produced by Injection of Liquid Oxygen,
W77-09028 5G

OZAKI, T.
Observation Records of Ground Water Level, (In Japanese),
W77-08904 4B

OZBURN, G. W.
A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

PABST, M. E.
Water-Level Changes in Northwestern Kansas, 1950-76,
W77-08742 4B

PAGE, R. W.
Guide for Data Collection to Calibrate a Predictive Digital Ground-Water Model of the Unconfined Aquifer in and Near the City of Modesto, California,
W77-08735 2F

PAKHOMOV, S. I.
Some Features of the Geochemistry of Thermal Water in Platform Areas from Experimental Data,
W77-08679 5B

PAPADOPULOS, S. S.
Storage of Low-Level Radioactive Wastes in the Ground: Hydrogeologic and Hydrochemical Factors,
W77-09086 5E

PARISH, P. R.
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

PARKER, P. N.
Additives Tailor Cement to Individual Wells,
W77-08665 8F

Specialty Cements Can Solve Special Problems,
W77-08664 8F

PARKHURST, J. D.
PL 92-500: A Dose of Chaos,
W77-08959 5G

PARKS, R. W.
Physical and Chemical Parameters Associated with Phytoplankton Abundance and Periodicity in a Fertilized Fish Pond,
W77-08922 5C

PATEL, R. J.
Adsorption and Vertical Movement of the Zinc and Manganese Ions in Three Types of Soil,
W77-09054 5B

PATTEN, E. P. JR.
Analog Simulation of the Ground-Water System, Yuma, Arizona,
W77-09067 2F

PAYNE, B. R.
Air, Mist and Foam Drilling, A Look at Latest Techniques,
W77-08669 8C

PECK, A. J.
Effects of Spatial Variability of Soil Hydraulic Properties in Water Budget Modeling,
W77-08825 2G

PENLEY, R. D.
Water-Level Records for the San Luis Valley of Colorado, 1973-77,
W77-09088 7C

PERRY, H. R. JR.
Trap Responses of the Gray Squirrel (Sciurus carolinensis carolinensis), Raccoon (PRocyon lotor lotor), and Opossum (Didelphis virginiana virginiana) to Environmental Factors in Two Swamp Watersheds of Northeastern North Carolina,
W77-08936 6G

PETERSON, D. L.
Hydrologic Reconnaissance of the Geothermal Area Near Klamath Falls, Oregon, with a Section on Preliminary Interpretation of Geophysical Data,
W77-09070 4B

PETIT, J-R.
Study of an Ice Core to the Bedrock in the Accumulation Zone of an Alpine Glacier,
W77-08846 2C

PHELPS, R. P.
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

PICCARDO, M.
Improved Methodology for Design and Operation of Water Distribution Systems, Part IV, Program Documentation,
W77-08941 4A

PICKFORD, J.
Sewage Treatment in Developing Countries,
W77-08635 5D

PIERCE, J. C.
Citizen Participation in Water Policy Formation,
W77-08603 6B

PINDER, G. F.
Simulation of Two-Dimensional Contaminant Transport with Isoparametric Hermitian Finite Elements,
W77-08829 5B

PLOETZ, T.
Method of Purifying Waste Water,
W77-08881 5D

PLUHOWSKI, E. J.
Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-08752 7B

PLUMB, J. A.
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

POAG, C. W.
Preliminary Summary of the 1976 Atlantic Margin Coring Project of the U.S. Geological Survey,
W77-09089 2L

POJASEK, R. B.
NPDES Permits and Water Analyses.
W77-08953 5G

POLAK, B. G.
The Helium Isotopes in Thermal Fluids,
W77-08680 5B

POLIMBETOVA, F. A.
Evaluation of Wheat Plants with Regard to Drought- and Heat-Resistance Under Field Conditions, (In Russian),
W77-08877 3F

POLS, A. C.
Rock Type Decides Jetting Economics,
W77-08666 8C

Tests Show Jet-Drilling Hard Rock Potential,
W77-08667 8E

POOLE, L. R.
Comparison of Remotely Sensed Continental-Shelf Wave Spectra with Spectra Computed by Using a Wave Refraction Computer Model,
W77-08911 2L

Wave Refraction Diagrams for the Baltimore Canyon Region of the Mid-Atlantic Continental Shelf Computed by Using Three Bottom Topography Approximation Techniques,
W77-08912 2L

PORTER, K. E.
The Use of Packed Beds in Water Pollution Control,
W77-08637 5D

POULOVASSILIS, A.
Flow Characteristics During Infiltration into a Horizontal Sand Column,
W77-08826 2G

PRATER, B. L.
New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

PRENTICE, E. F.
Auxiliary Air System for Use in Laboratory Experiments,
W77-08800 7B

PREUS, P.
Barrier fo. Water Carried Pollutants,
W77-08878 5G

PROTASOWICKI, M.
Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

PUTNEY, A. W.
Cement-Mud Spacer System Improves Illinois Wells,
W77-08647 8F

RADZIUL, J. V.
Philadelphia's Water System Automation Plan,
W77-08864 5F

RAHMAN, ABDUL
Effects of Treated Municipal Wastewater and Commercial Fertilizer on Growth, Fiber, Acid-Soluble Nucleotides, Protein and Amino Acid Content in Wheat Hay,
W77-08876 5C

RAJAGOPALAN, S. P.
Digital Model Studies of Steady-State Radial Flow to Partially Penetrating Wells in Alluvial Plains,
W77-08838 2F

RAJU, K. G. R.
Effect of Sediment Load on Stable Sand Canal Dimensions,
W77-09020 8B

RANGA RAJU, K. G.
Resistance of Two Dimensional Triangular Roughness,
W77-09035 8B

RAPAPORT, R. A.
Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

RASSIER, P. J.
Energy Plant Siting Legislation,
W77-09050 6E

RATLIFF, D.
Wetlands Protection Under the Corps of Engineer's New Dredge and Fill Jurisdiction,
W77-08977 5G

RAVID, R.
Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

REDDELL, D. L.
Simulation of Pollutant Movement in Groundwater Aquifers,
W77-08807 5B

REE, W. O.
Performance Characteristics of a Grassed-Waterway Transition,
W77-08849 4D

REICHMAN, G. A.
Distribution of Corn Roots in Sandy Soil with a Declining Water Table,
W77-08676 2I

REID, J.
Integrated Evaluation Programs for Fairfax County, Va.,
W77-08862 6B

RESIO, D. T.
Estimation of Winds Over the Great Lakes,
W77-09022 2H

REYNOLDS, R. C. JR.
Chemical Character of Headwater Streams in Vermont and New Hampshire,
W77-09027 2K

REYNOLDS, T. W.
Analytical Models for the Evaluation of Supplemental Aeration in Texas Estuaries,
W77-08917 5B

RICH, C. I.
Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

RICH, L. G.
Rational Design of Aerobic Digestion Systems,
W77-08643 5D

RICHARDS, P. A.
Nitrification and Heavy Metal Removal in the Activated Sludge Treatment Process,
W77-08623 5D

RICHARDSON, E. C.
Pretreatment Helps Niagara Cut Costs,
W77-08633 5D

RICK, H.
Inland Waters. Monographs from Limnology and Related Areas, Vol. 26, Part 1. The Zooplankton of Inland Waters,
W77-08861 2H

RILEY, J. P.
Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

An Energy Accounting Evaluation of Several Alternatives for Hydropower and Geothermal Development,
W77-09057 6B

RINGLE, J. C.
Total Energy Use in an Urban-Agricultural Power Plant Complex,
W77-08691 5G

RODIONOV, V. Z.
Effect of Ponds and Small Reservoirs on River Runoff in the Forest-Steppe and Steppe Zones of the Volga Basin,
W77-08834 4A

ROGERS, W. A.
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

ROGOWSKI, A. S.
Strength of Soil Aggregates: Influence of Size, Density and Clay and Organic Matter Content,
W77-08707 2G

ROSE, C. D.
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

ROSE, F. L.
Neoplastic and Possibly Related Skin Lesions in Neotenic Tiger Salamanders from a Sewage Lagoon,
W77-08729 5C

ROSKOPF, R. F.
Trickling Filter-Activated Sludge Combinations,
W77-08868 5D

ROWLEY, J. C.
Geothermal Energy Development,
W77-08661 4B

ROY, M. B.
Predicting Performance of Pipe Culverts Buried in Soil,
W77-08622 8B

RUKHADZE, YE. G.
Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

RYALS, G. L. JR.
Density and Distribution of Benthos in Lake Keowee, South Carolina,
W77-08818 5C

RZEHAK, K.
The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

SAMA, R. R.
Influence of Initial Mixing on Direct Filtration,
W77-08809 5F

SAMI, S.
Short Jet Impingement,
W77-09016 8B

SAMMEL, E. A.
Hydrologic Reconnaissance of the Geothermal Area Near Klamath Falls, Oregon, with a Section on Preliminary Interpretation of Geophysical Data,
W77-09070 4B

SANDHU, S. S.
Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

SAPOZHNIKOV, N. G.
Methods Used for Drilling Wells in the Soviet Union,
W77-08659 8C

SAPPO, G. B.
Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

SAUTER, S.
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

SAXENA, V. K.
Geochemistry of Thermal Waters from Various Geothermal Provinces of India,
W77-08682 2K

SCHACHTE, J. H. JR.
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

SCHAFER, C. J.
Complying with Discharge Regulations,
W77-08954 5G

SCHAFER, P. E.
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

SCHLEE, J. S.
Preliminary Summary of the 1976 Atlantic Margin Coring Project of the U.S. Geological Survey,
W77-09089 2L

SCHMIDT, A. E.
Limnological Investigation of Six Lakes in Southeast Alaska,
W77-09069 7C

SCHMITT, C. R.
Water Turbine Pump Failure,
W77-08656 8G

SCHNEIDER, J. J.
Geologic Data from Test Drilling in Palm Beach County, Florida Since 1970,
W77-09073 7C

SCHOBER, U.
Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

SCHOELLER, H. J.
Thermal and Chemical Problems of Thermal Waters, (Les Problemes Thermiques et Chimiques des eaux Thermales),
W77-08678 5B

SCHOELLER, M.
The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

SCHRODER, N.
Ground Water Model for the Island of Anholt, Denmark,
W77-09030 2F

SCHULTHEIS, V. F.
Polymerization of Concrete Fights Cavitation,
W77-09044 8F

SCHULTZ, L. A.
Tests of Oil Recovery Devices in Broken Ice Fields. Phase I,
W77-08915 5G

SCHULTZ, R.
Methylmercury Induced Injury of Single Barnacle Muscle Fibers,
W77-08700 5C

SCHULZ, W.
Identification of Weathered Oil Films Found in the Marine Environment,
W77-08901 5A

SCOTT, D. P.
Photochemical Dechlorination of Water Supply for Fish Tanks with Commercial Water Sterilizers,
W77-08842 5F

SCOTT, R. B.
Hydrothermal Processes in the Atlantic Ocean Crust, 26 Degrees N,
W77-08681 2K

SEIKO, Y.
Studies by the Dynamic Method on the Reaction of Rock with Hot Spring Water of the Tamagawa Hot Springs in Japan,
W77-08689 2K

SENECA, E. D.
Dune Stabilization with Panicum Amarum Along the North Carolina Coast,
W77-08908 2L

SERNS, S. L.
Effects of Dipotassium Endothall on Rooted Aquatics and Adult and First Generation Bluegills,
W77-08785 5C

SEYMOUR, R. J.
Estimating Wave Generation on Restricted Fetches,
W77-09021 2L

SHACKELFORD, W. M.
Frequency of Organic Compounds Identified in Water,
W77-08944 5A

SHAMPINE, W. J.
Indiana Stream-Temperature Characteristics,
W77-08755 7C

SHAW, D. G.
A Comparison of Methods of Hydrocarbon Analysis of Marine Biota,
W77-08789 5A

SHEARMAN, J. O.
Computer Applications for Step-Backwater and Floodway Analyses,
W77-09090 4A

SHEKEL, Y.
Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

SHELL, G. L.
Dewatering Chemical-Primary Sludges,
W77-08865 5D

SHEPARD, F. P.
Current-Meter Recordings of Low-Speed Turbidity Currents,
W77-08847 2L

SHEWMAKER, J. E.
Flocculant Use on Tankers,
W77-08906 5G

SHIDLOVSKAYA, N. A.
Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

SHIH, C. S.
Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

SHINDEL, H. L.
Time-of-Travel Study, Black River from Lyons Falls to Dexter, New York,
W77-08747 4A

SHOWN, L. M.
Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

SIEGEL, B.
Ozone Disinfection of Secondary Effluent,
W77-08638 5D

SIEGEL, R.
Improved Methodology for Design and Operation of Water Distribution Systems, Part IV, Program Documentation,
W77-08941 4A

SILVEY, W. D.
Artificial Recharge to a Freshwater-Sensitive Brackish-Water Sand Aquifer, Norfolk, Virginia,
W77-09066 4B

SIMMONS, W. P.
Research Benefits in Water Resources Construction,
W77-08858 6B

SINEL'NIKOV, V. E.
Bituminoid Formation in the Mud Sediments of Domestic Sewage, (In Russian),
W77-08618 5A

SINGH, S. R.
Transient Analysis of Phreatic Aquifers Lying Between Two Open Channels,
W77-09026 2F

SIRIANNI, J.
Pretreatment Helps Niagara Cut Costs,
W77-08633 5D

SIZEMORE, D. R.
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

SKAGGS, R. L.
Wave Height Measuring Device,
W77-08897 7B

SKELTON, J.
Missouri Stream and Springflow Characteristics Low-Flow Frequency and Flow Duration,
W77-08743 2E

SKODJE, M. T.
Instrumentation Improves Waste Water Treatment Plant Control,
W77-08642 5D

SKRIPKA, S. A.
Evaluation of Wheat Plants with Regard to Drought- and Heat-Resistance Under Field Conditions, (In Russian),
W77-08877 3F

SLITER, J. T.
Enforcement of Municipal Permits: Portent of Problems,
W77-08971 6E

Spill Penalties Draw Criticism,
W77-08973 6E

SLOSS, J. M.
Finite Element Solution of the Two-Dimensional Unsaturated Flow Equation,
W77-08923 2G

SLOTTA, L. S.
An Examination of Some Physical and Biological Impacts of Dredging in Estuaries,
W77-08918 5C

SMITH, A. D.
A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

SMITH, D. W.
Environmental Planning for an Alaskan Water-Oriented Recreation Area,
W77-08805 6B

SMITH, G. L.
Soil and Rock Strata to Trap, Filter and Store Water for Rural Domestic use,
W77-08821 3B

SMITH, J. E. JR.
Sludge Treatment: Problems and Solutions, Part 1,
W77-08640 5D

SMITH, K. R.
Benthic Macroinvertebrates as Indexes of Water Quality in the Scioto River Basin, Ohio,
W77-08925 5A

SMITH, S. A.
The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

SMOOT, G. F.
A Review of Velocity-Measuring Devices,
W77-09085 7B

SNIDER, J. R.
The Effects of Wastewater Irrigation on the Activities and Movements of Songbirds,
W77-09098 5C

SNODGRASS, W. J.
A Predictive Phosphorus Model for Lakes - Development and Testing,
W77-08930 5C

SNYDER, C. B.
Mussels (Mytilus Sp.) as an Indicator of Lead Pollution,
W77-08693 5C

SNYDER, H. G.
Mussels (Mytilus Sp.) as an Indicator of Lead Pollution,
W77-08693 5C

SOKOLOVA, G. A.
Chironomid Fauna of the Upper Course of the Iseti River, (In Russian),
W77-09048 5C

SOLBACH, H.
Method for Purifying Water of Organic Compounds Not Readily Biodegradable,
W77-08883 5D

SOLICH, E.
Method of Purifying Waste Water,
W77-08881 5D

SOLLITT, C. K.
An Examination of Some Physical and Biological Impacts of Dredging in Estuaries,
W77-08918 5C

SOLOMON, J.
Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

SOLOMON, R. M.
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W77-08933 3B

SOLOMON, S. I.
Principles of Graphical Gradually Varied Flow Model,
W77-09015 2E

SOMLYODY, L.
Dispersion Measurement on the Danube,
W77-09040 5B

SOULE, P. L.
Flood-Plain Delineation for Difficult Run Basin, Fairfax County, Virginia,
W77-09071 4C

SPINKS, S. O.
As an Incident of National Sovereignty, the United States Has Paramount Rights and Power in the Seabed and Subsoil of the Outer Continental Shelf,
W77-08974 6E

SPOONER, E. T. C.
Hydrothermal Fluids of Seawater Salinity in Ophiolitic Sulphide Ore Deposits in Cyprus,
W77-08854 2L

SRNA, R. F.
Kinetic Response of Perturbed Marine Nitrification Systems,
W77-08946 5C

ST CLAIR, J. C.
Easily Movable Irrigation Sprinkler System,
W77-08880 3F

STANKOVA, P. G.
Effect of Water Deficiency on the Growth Rate of Some Winter Soft Wheat Cultivars, (In Bulgarian),
W77-08716 3F

STANLEY, A. B.
Today's Windmills: A Blend of Old and New,
W77-08650 8C

STEPHENS, J.
The Role of Methylmercury Production in the Transfer of Mercury in a Salt Marsh Ecosystem,
W77-08697 5C

STEPHENS, J. W.
Records of Wells, Water-Level Measurements, and Drillers' Logs, Red River Valley, Louisiana,
W77-08734 7C

STEPHENSON, D. A.
The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

STOESSELL, R. K.
Experimental Study of Multi-Cation Diffusion in an Artifical Quartz Sandstone,
W77-08811 2K

STOLINSKI, T. J. JR.
Computer Modeling for the Prediction of Water Quality from Agricultural Drainage,
W77-08934 5B

STOLZY, J. L.
Effects of Spatial Variability of Soil Hydraulic Properties in Water Budget Modeling,
W77-08825 2G

STORCH, W. V.
A 'Rough Cut' Model of a South Florida Water Supply Plan,
W77-08980 4B

STRATTON, H.
Liquid Jet Eductors, The 'Pumps' with No Moving Parts,
W77-08671 8C

STROM, P. F.
Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

SU, Y-S.
Prediction of Nitrogen Transformations in the Storage Lagoon of a Land Treatment System,
W77-08624 5D

SUDNITSIN, I. I.
Problems of Optimum Soil Moisture Level: Determination and Control, (In Russian),
W77-08952 2G

SUGDEN, D. E.
The Maximum Extent of Glaciers in Part of West Falkland,
W77-09032 2C

SULICK, D. J.
Advanced Waste Treatment Design Protects Lake Alton,
W77-08631 5G

SULLIVAN, G. G.
Current-Meter Recordings of Low-Speed Turbidity Currents,
W77-08847 2L

SUNDRY, B.
The Distribution of Trace Metals in the Western North Atlantic Off Nova Scotia,
W77-08703 5B

SURBER, E. W.
Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

SYMES, G. L.
Sludge Disposal in the North West,
W77-08628 5E

SZEBENYI, L.
Ground Water Budget of the Mountainous Regions of Hungary, (In Hungarian),
W77-08663 2F

TANNER, R. D.
Direct Filtration of Lake Michigan Water,
W77-08812 5F

TARPLEE, W. H. JR.
Studies of the Fish Populations in Two Eastern North Carolina Swamp Streams,
W77-09062 2I

TAUMAN, N.
United States V. GAF Corporation: A Leak in the FWPCA,
W77-08979 5G

TAYLOR, C. H.
Seasonal Variations in the Impact of Suburban Development on Runoff Response: Peterborough, Ontario,
W77-08831 4C

TAYLOR, F.
The Role of Methylmercury Production in the Transfer of Mercury in a Salt Marsh Ecosystem,
W77-08697 5C

TEIKO, O.
Studies by the Dynamic Method on the Reaction of Rock with Hot Spring Water of the Tamagawa Hot Springs in Japan,
W77-08689 2K

THOMANN, G. C.
Testing of a Technique for Remotely Measuring Water Salinity in an Estuarine Environment,
W77-08903 2L

TIMMERMAN, L. B.
Avoiding the Perils of Cavitation,
W77-08674 8C

TOLSTIKHIN, I. N.
The Helium Isotopes in Thermal Fluids,
W77-08680 5B

TRAINOR, F. R.
Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

TRZILOVA, B.
Results of a Microbiological Investigation of the Danube River by One Point Profile (1969-1971), (In German),
W77-08694 5B

TSUTSUI, R. T.
Nitrogen Removal from Secondary Effluent by a Laboratory Soil Column,
W77-08607 5B

TSYPLAKOV, E. P.
Expansion of the Range of Some Fish Species in Connection with Hydraulic Engineering Construction on the Volga and Acclimatization Works, (In Russian),
W77-08715 8I

TUBB, R. A.
Hyperoxygen Concentrations in the Hypolimnion Produced by Injection of Liquid Oxygen,
W77-09028 5G

TURNER, B. W.
Mineral Distribution Within the Sediments of Pearl Harbor,
W77-08815 2L

TURUNINA, N. V.
Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

ULLERY, J.
Policy Innovation and Institutional Fragmentation,
W77-09053 6E

URCHINOV, D.
Fish Fauna of Lakes of the Lower Reaches of the Zarafshan River and its Fishery Use, (In Russian),
W77-08708 2H

UTSUMI, Y.
Removal of Fluorine from Waste Waters. III. Fundamental Tests with Chemical Reagents (Haisuichu no fusso jokyo nikansuru kenkyu. III. Shiyaku kei niyoru kisoshiken),
W77-08626 5D

VAL'CHUK, N. K.
Molybdenum Content in the Subsurface Waters of the Vinnitsa Oblast, (In Russian),
W77-08882 2K

VALENTINE, P. C.
Preliminary Summary of the 1976 Atlantic Margin Coring Project of the U.S. Geological Survey,
W77-09089 2L

VALLON, M.
Study of an Ice Core to the Bedrock in the Accumulation Zone of an Alpine Glacier,
W77-08846 2C

VAN GENUCHTEN, M. T.
Simulation of Two-Dimensional Contaminant Transport with Isoparametric Hermitian Finite Elements,
W77-08829 5B

VASIL'EV, V. A.
Present-Day Slumping and Erosion Phenomena on Irrigated Lands (Exemplified by Southeastern Ciscaucasia), (In Russian),
W77-08885 2J

VIGERS, G. A.
The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

VINCENT, C. L.
Estimation of Winds Over the Great Lakes,
W77-09022 2H

VINOKUROVA, T. V.
Experimental Data on the Regulation of 1,2-Dibromopropane in Reservoir Water, (In Russian),
W77-08718 5C

VITTAL, N.
Resistance of Two Dimensional Triangular Roughness,
W77-09035 8B

VOELKER, R. P.
Tests of Oil Recovery Devices in Broken Ice Fields. Phase I,
W77-08915 5G

VOROB'EVA, E. A.
Evaluation of Wheat Plants with Regard to Drought- and Heat-Resistance Under Field Conditions, (In Russian),
W77-08877 3F

WAGNER, L. A.
Time-of-Travel Study, Black River from Lyons Falls to Dexter, New York,
W77-08747 4A

WAHBY, S.
Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

WALKER, J. H.
Natural Stream Temperature Variations in a Catchment,
W77-09039 5B

WALKER, W. R.
Water--An Element of Land-Use and Urban Growth Policies,
W77-08872 6B

WALLACE, R. K. JR.
Thermal Acclimation, Upper Temperature Tolerance, and Preferred Temperature of Juvenile Yellowtail Snappers, Ocvurus chrvsurus (Bloch) (Pisces: Lutjanidae),
W77-08769 5C

WALTER, J. N.
Phosphate and Nitrate Removal by a Grass Filtration System for Final Treatment of Municipal Waste Water,
W77-09100 5D

WALTER, M. F.
Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

WANG, H.
Added Mass of Pile Group,
W77-09018 8B

WARD, D. M.
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W77-09059 5C

WARD, P. S.
Changes Urged at NCWQ Hearings,
W77-08967 6E

Say Goodbye to Ocean Dumping,
W77-08969 5G

What 208 Planning Can Do: A Local and Federal View,
W77-08968 6E

WARNICK, C. C.
Energy Plant Siting Legislation,
W77-09050 6E

WATKINS, E.
Make Money by Computer,
W77-08730 5D

WEARE, T. J.
The Third London Airport Study,
W77-09037 2L

WEBER, A. J.
Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

WEBER, J.
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6G

WEED, E. G. A.
Preliminary Summary of the 1976 Atlantic Margin Coring Project of the U.S. Geological Survey,
W77-09089 2L

WEEKS, M. E.
Suitability of New England Soils in Accepting Waste Effluents, Phase II,
W77-09064 5E

WEIS, J. S.
Effects of Mercury, Cadmium, and Lead Salts on Regeneration and Ecdysis in the Fiddler Crab, UCA Pugilator,
W77-08702 5C

WEISMAN, R. N.
Snowmelt: A Two-Dimensional Turbulent Diffusion Model,
W77-08823 2C

WENNER, A. M.
Species Differences in Breakdown of Tree Leaves in Streams--Significance for Composition of Stream Communities,
W77-09056 5B

WIGGINS, W. W.
Limnological Investigation of Six Lakes in Southeast Alaska,
W77-09069 7C

WILLHITE, G. P.
Retention and Flow Characteristics of Polymer Solutions in Porous Media,
W77-08850 2G

WILLIAMS, C. B.
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

WILLIAMS, W. G.
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

WINDOM, H.
The Role of Methylmercury Production in the Transfer of Mercury in a Salt Marsh Ecosystem,
W77-08697 5C

WINKLER, W.
Improved Methodology for Design and Operation of Water Distribution Systems, Part IV, Program Documentation,
W77-08941 4A

WINOGRAD, I. J.
Storage of Low-Level Radioactive Wastes in the Ground: Hydrogeologic and Hydrochemical Factors,
W77-09086 5E

WINTER, T. C.
Paleohydrologic Phenomena Recorded by Lake Sediments,
W77-08750 2J

WISER, E. H.
Development of a Hydrologic Information Storage and Retrieval System,
W77-08609 7C

HISARS - Hydrologic Information Storage and Retrieval System - Reference Manual,
W77-08610 7C

WITHEE, C. C.
Segregation and Reclamation of Household Wastewater at an Individual Residence,
W77-08806 5D

WITHERUP, S.
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

WONG, J.
The Design of a System for Collecting Leachate from a Lined Landfill Site,
W77-08827 5G

WOODHOUSE, W. W. JR.
Dune Stabilization with Panicum Amarum Along the North Carolina Coast,
W77-08908 2L

WORMALD, A. P.
Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

WRIGHT, H. E. JR.
Paleohydrologic Phenomena Recorded by Lake Sediments,
W77-08750 2J

WRIGHT, S. J.
Mean Behavior of Buoyant Jets in a Crossflow
W77-09013 8B

WU, Y. C.
Role of Nitrogen in Activated Sludge Process,
W77-08869 5D

YANO, T.
A Certain Marine Catenate Dinoflagellate Tentatively Applied for Detecting Carcinogens,
W77-08795 5A

YASUNAGA, Y.
The Influence of Some Pollutants on the Survival of Eggs and Larvae of Two Species of Flatfish, Limanda Yokohamae and Paralichtys olivaceus, (In Japanese),
W77-08782 5C

YEATS, P. A.
The Distribution of Trace Metals in the Western North Atlantic Off Nova Scotia,
W77-08703 5B

YEVLAKHINA, S. I.
Character of Seepage of Precipitation to the Water Table in the Central Forest Steppe,
W77-09043 4B

YOTSUKURA, N.
Thermal Loading of Natural Streams,
W77-09068 5B

YOUNG, J. C.
Trickling Filter-Activated Sludge Combinations,
W77-08868 5D

YOUNG, P.
Systematic Identification of DO-BOD Model Structure,
W77-08866 5B

YUZO, Y.
Studies by the Dynamic Method on the Reaction of Rock with Hot Spring Water of the Tamagawa Hot Springs in Japan,
W77-08689 2K

ZIEGLER, C. T.
Means and Method for Controlling Beach and Sandbar Erosion,
W77-08894 8B

ZIMMERMANN, C.
Roughness Effects on the Flow Direction Near Curved Stream Beds,
W77-09038 8B

ZITKO, V.
The Accumulation of Polybominated Biphenyls by Fish,
W77-08777 5C

ZUBAKINA, A. N.
Some Hydrochemical Characteristics of the Mouth Reaches of the Anabar, Lena, Yana, and Indigirka Rivers,
W77-08833 2L

ZYVOLOSKI, G.
Finite Element Solution of the Two-Dimensional Unsaturated Flow Equation,
W77-08923 2G

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

ORGANIZATIONAL INDEX

ABERDEEN UNIV. (SCOTLAND). DEPT. OF GEOGRAPHY.
The Maximum Extent of Glaciers in Part of West Falkland,
W77-09032 2C

ADELPHI UNIV., GARDEN CITY, N.Y.; AND ADELPHI UNIV., OAKDALE, N.Y. INST. OF MARINE SCIENCE.
Effects of Hypolimnetic Aeration on Nitrogen and Phosphorus in a Eutrophic Lake,
W77-08824 5C

AGRICULTURAL RESEARCH COUNCIL, CAMBRIDGE (ENGLAND). UNIT OF SOIL PHYSICS.
Flow Characteristics During Infiltration into a Horizontal Sand Column,
W77-08826 2G

AGRICULTURAL RESEARCH SERVICE, MANDAN, N.D. NORTHERN GREAT PLAINS RESEARCH CENTER.
Distribution of Corn Roots in Sandy Soil with a Declining Water Table,
W77-08676 2I

AGRICULTURAL RESEARCH SERVICE, STILLWATER, OKLA. WATER CONSERVATION STRUCTURES LAB.
Performance Characteristics of a Grassed-Waterway Transition,
W77-08849 4D

AGRICULTURAL RESEARCH SERVICE, UNIVERSITY PARK, PA. NORTHEAST WATERSHED RESEARCH CENTER.
Strength of Soil Aggregates: Influence of Size, Density and Clay and Organic Matter Content,
W77-08707 2G

AKADEMIYA NAUK KAZAKHSKOI SSR, ALMA-ATA. INSTITUT BOTANIKI.
Evaluation of Wheat Plants with Regard to Drought- and Heat-Resistance Under Field Conditions, (In Russian),
W77-08877 3F

AKADEMIYA NAUK SSR, MOSCOW. GEOLOGICHESKII INSTITUT.
The Helium Isotopes in Thermal Fluids,
W77-08680 5B

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT BIOLOGII VNUTRENNYKH VOD.
Bituminoid Formation in the Mud Sediments of Domestic Sewage, (In Russian),
W77-08618 5A

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT GEOGRAFII.
Character of Seepage of Precipitation to the Water Table in the Central Forest Steppe,
W77-09043 4B

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT VODNYKH PROBLEM.
Some Features of the Geochemistry of Thermal Water in Platform Areas from Experimental Data,
W77-08679 5B

AKADEMIYA NAUK SSSR, MOSCOW. INTERAGENCY GEOPHYSICAL COMMITTEE.
Temperature and Chemism of Ground Waters in the Western Areas of the East European Platform,
W77-08683 2K

AKRON UNIVERSITY, AKRON, OHIO, DEPARTMENT OF BIOLOGY.
Benthic Macroinvertebrates as Indexes of Water Quality in the Scioto River Basin, Ohio,
W77-08925 5A

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
A Comparison of Methods of Hydrocarbon Analysis of Marine Biota,
W77-08789 5A

ALASKA UNIV., COLLEGE. INST. OF WATER RESOURCES.
Environmental Planning for an Alaskan Water-Oriented Recreation Area,
W77-08805 6B

AMERICAN UNIV., BEIRUT (LEBANON). DEPT. OF BIOLOGY.
Phytoplankton Standing Crop and Sewage Nutrient Enrichment Along the Central Coast of Lebanon,
W77-08762 5C

ANGLIAN WATER AUTHORITY, HUNTINGDON (ENGLAND). DIRECTORATE OF SCIENTIFIC SERVICES.
Application of Physico-Chemical Treatment as a Method of Achieving Partial Standards on Sewage Effluents Discharged in Estuarial and Coastal Situations,
W77-08634 5D

ANIC S.P.A., PALERMO (ITALY). (ASSIGNEE).
Method for Purifying Waste Waters which Contain Anionic-Type Organic Compounds,
W77-08891 5D

ARCTEC, INC., COLUMBIA, MD.
Tests of Oil Recovery Devices in Broken Ice Fields. Phase I,
W77-08915 5G

ARIZONA AGRICULTURAL EXPERIMENT STATION, TUCSON.
Effects of Treated Municipal Wastewater and Commercial Fertilizer on Growth, Fiber, Acid-Soluble Nucleotides, Protein and Amino Acid Content in Wheat Hay,
W77-08876 5C

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES; AND ARIZONA UNIV., TUCSON. DEPT. OF SYSTEMS AND INDUSTRIAL ENGINEERING.
Practical use of Decision Theory to Assess Uncertainties about Actions Affecting the Environment,
W77-08927 6G

ARIZONA UNIV., TUCSON. DEPT. OF WATERSHED MANAGEMENT.
An Assessment of Snowpack Depletion-Surface Runoff Relationships on Forested Watersheds,
W77-08933 3B

ARIZONA UNIV., TUCSON. INST. OF GOVERNMENT RESEARCH.
Policy Innovation and Institutional Fragmentation,
W77-09053 6E

ARIZONA WATER RESOURCES RESEARCH CENTER, TUCSON.
Development of a Low Cost Asphalt-Rubber Membrane for Water Harvesting Catchments and Reservoir Seepage Control,
W77-08601 3B

ARMY ENGINEER DISTRICT, ALBUQUERQUE, NEW MEX.
Flood Plain Information: Albuquerque Arroyas, Part V, Albuquerque, New Mexico.
W77-08611 4A

Special Flood Hazard Information: Arkansas River, Fort Dodge - Wilroads Gardens, Vicinity of Dodge City, Kansas.
W77-08612 4A

ARMY ENGINEER DISTRICT, HUNTINGTON, W. VA.
Flood Plain Information: Ohio River, Lawrence County, Ohio.
W77-08614 4A

ARMY ENGINEER DISTRICT, KANSAS CITY, KANS.
Special Flood Hazard Information Report: Missouri and Kansas Rivers, Kansas City, Kansas.
W77-08613 4A

ARMY ENGINEER DISTRICT, KANSAS CITY, MO.
Designing for Sediment Transport,
W77-08962 4D

ARMY ENGINEER DISTRICT, OMAHA, NEBR.
Special Flood Hazard Report: Buffalo Creek, Meadow Grove, Nebraska.
W77-08616 4A

ARMY ENGINEER DISTRICT, ROCK ISLAND, ILL.
Flood Plain Information Report, Indian and Dry Creeks, Linn County, Iowa.
W77-08617 4A

ARMY ENGINEER DISTRICT, SACRAMENTO, CALIF.
Flood Hazard Information: Yampa River and Tributaries, Steamboat Springs, Colorado.
W77-08619 4A

ARMY ENGINEER DISTRICT, SAN FRANCISCO, CALIF.
Flood Plain Information: Llagas Creek Unit I, Including Edmundson (Little Llagas), Church, San Martin, New, Center, Corralitos, Tennant, Maple, and Foothill Creeks, Santa Clara County, California.
W77-08620 4A

ARMY ENGINEER DISTRICT, WALTHAM, MASS. NEW ENGLAND DIV.
Flood Plain Information: Ashuelot River, City of Keene, New Hampshire.
W77-08615 4A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. HYDRAULICS LAB.
Estimation of Winds Over the Great Lakes,
W77-09022 2H

ASTON UNIV., BIRMINGHAM (ENGLAND). DEPT. OF CIVIL ENGINEERING.
A Mathematical Model Study of Fresh-Water Lenses,
W77-08837 2F

ATLANTA CITY DEPT. OF ENVIRONMENT AND STREETS, GA. OFFICE OF ENGINEERING.
Economics of Permanent Flood-Plain Evacuation,
W77-08856 6B

AUBURN UNIV., ALA. DEPT. OF FISHERIES AND ALLIED AQUACULTURES.
Parasites and Diseases of Cultured Catfish for the Period July 1, 1972 Through June 20, 1975,
W77-08756 5C

Thermal Acclimation, Upper Temperature Tolerance, and Preferred Temperature of Juvenile Yellowtail Snappers, Ocvurus chrvsurus (Bloch) (Pisces: Lutjanidae),
W77-08769 5C

AUBURN UNIVERSITY, AUBURN, ALABAMA, DEPT. OF FISHERIES AND ALLIED AQUACULTURES.
Physical and Chemical Parameters Associated with Phytoplankton Abundance and Periodicity in a Fertilized Fish Pond,
W77-08922 5C

BANCO NACIONAL DA HABITACAO, RIO DE JANEIRO (BRAZIL).
PLANASA--A National Plan for Water Supply and Sewerage in Brazil,
W77-08646 6E

BASF WYANDOTTE CORP., MICH. (ASSIGNEE).
Method and Apparatus for Purifying Aqueous Streams Contaminated with Organic Materials,
W77-08889 5D

BEDFORD INST. OF OCEANOGRAPHY, DARTMOUTH (NOVA SCOTIA). ATLANTIC OCEANOGRAPHIC LAB.
The Distribution of Trace Metals in the Western North Atlantic Off Nova Scotia,
W77-08703 5B

BLACK AND VEATCH, KANSAS CITY, MO.
Comprehensive Oceanographic Baseline Study at Barceloneta, Puerto Rico.
W77-08853 5B

BORDEAUX UNIV., TALENCE (FRANCE). CENTRE D'HYDROGEOLOGIE.
Thermal and Chemical Problems of Thermal Waters, (Les Problemes Thermiques et Chimiques des eaux Thermales),
W77-08678 5B

The Content of Silica in Hot Mineral Waters of France in Relation to Temperature, Sodium Content and Bicarbonates (La Teneur en Silice des eaux Thermominerales de France en Relation Avec la Temperature, la Teneur en Sodium et en Bicarbonates),
W77-08686 2K

BRISTOL UNIV. (ENGLAND). H. H. WILLIS PHYSICS LAB.
An Experimental Study of the Motion of Ice Past Obstacles by the Process of Regelation,
W77-09033 2C

BRITISH COLUMBIA RESEARCH COUNCIL, VANCOUVER. DIV. OF APPLIED BIOLOGY.
Development of a Blood Sugar Bioassay for Rapidly Measuring Stressful Levels of Pulpmill Effluent to Salmonid Fish,
W77-08779 5A

BRITISH PETROLEUM CO. LTD., LONDON (ENGLAND). (ASSIGNEE).
Detergent Composition for Dispersing Oil Spills,
W77-08884 5G

BROWN AND CALDWELL, WALNUT CREEK, CALIF.
What's Up with Oxygen/2,
W77-08627 5D

BUFFALO FORGE CO., N.Y.
Avoiding the Perils of Cavitation,
W77-08674 8C

BUKHARSKII GOSUDARSTVENNYI PEDAGOGICHESKII INSTITUT (USSR).
Fish Fauna of Lakes of the Lower Reaches of the Zarafshan River and its Fishery Use, (In Russian),
W77-08708 2H

BULGARIAN ACADEMY OF SCIENCES, SADOVO. AGRICULTURAL EXPERIMENTAL STATION.
Effect of Water Deficiency on the Growth Rate of Some Winter Soft Wheat Cultivars, (In Bulgarian),
W77-08716 3F

BUREAU OF OUTDOOR RECREATION, WASHINGTON, D.C.
Recreational Water Resources Problems.
W77-08711 6B

BUREAU OF RECLAMATION, DENVER, COLO. ENGINEERING AND RESEARCH CENTER.
Research Benefits in Water Resources Construction,
W77-08858 6B

CALIFORNIA INST. OF TECH. PASADENA.
Mean Behavior of Buoyant Jets in a Crossflow
W77-09013 8B

CALIFORNIA STATE DEPT. OF NAVIGATION AND OCEAN DEVELOPMENT, SACRAMENTO; AND SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
Estimating Wave Generation on Restricted Fetches,
W77-09021 2L

CALIFORNIA UNIV., DAVIS. DEPT. OF AGRICULTURAL ECONOMICS.
Economic Development and Environmental Quality in the Northeastern Plateau Region of California,
W77-09055 6B

CALIFORNIA UNIV., DAVIS. WATER SCIENCE AND ENGINEERING SECTION.
Effects of Temperature and Kelthane on Grass Shrimp,
W77-08874 5C

CALIFORNIA UNIV., RIVERSIDE. GRADUATE SCHOOL OR ADMINISTRATION.
Economics of Geothermal Energy Development (In Imperial County, California),
W77-08657 8C

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF MECHANICAL AND ENVIRONMENTAL ENGINEERING.
Finite Element Solution of the Two-Dimensional Unsaturated Flow Equation,
W77-08923 2G

CALIFORNIA UNIV., SANTA BARBARA, MARINE SCIENCE INST.
Species Differences in Breakdown of Tree Leaves in Streams--Significance for Composition of Stream Communities,
W77-09056 5B

CALIFORNIA UNIVERSITY, DAVIS, DEPARTMENT OF CIVIL ENGINEERING.
Plant Size Influence on Performance in Activated Sludge Systems with Application to Regional Wastewater Treatment Planning,
W77-08928 5D

CAMBRIDGE UNIV. (ENGLAND). CONTROL DIV.
Systematic Identification of DO-BOD Model Structure,
W77-08866 5B

CANTERBURY UNIV., CHRISTCHURCH (NEW ZEALAND).
Snowmelt: A Two-Dimensional Turbulent Diffusion Model,
W77-08823 2C

CATHOLIC UNIV. OF AMERICA, WASHINGTON, D. C. DEPT. OF CIVIL ENGINEERING.
Density Currents and Their Applications,
W77-08844 5B

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT, WEST PALM BEACH.
A 'Rough Cut' Model of a South Florida Water Supply Plan,
W77-08980 4B

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, GRENOBLE (FRANCE). LABORATOIRE DE GLACIOLOGIE.
Study of an Ice Core to the Bedrock in the Accumulation Zone of an Alpine Glacier,
W77-08846 2C

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, TOULOUSE (FRANCE). INSTITUT DE MECANIQUE DES FLUIDES.
Theoretical and Experimental Study of Flow Separation After a Sudden Increase in the Cross-Section of a Circular Pipe (Etude Theorique Et Experimentale D' Un Ecoulement Decolle En Aval D'Un Elargissement Brusque De Revolution),
W77-09034 8B

CHINESE UNIV. OF HONG KONG. DEPT. OF BIOLOGY.
Effects of a Spill of Marine Diesel Oil on the Meiofauna of a Sandy Beach at Picnic Bay, Hong Kong,
W77-08760 5C

CINCINNATI UNIV., OHIO. COLL. OF MEDICINE.
The Development of a Test for the Potability of Water Treated by a Direct Reuse System,
W77-08758 5A

CLARK UNIV., WORCESTER, MASS.
High Speed Liquid Chromatographic Analysis of Cobalamin Productivity and Distribution in Activated Sewage Sludge Treatment,
W77-08621 5A

CLEMSON UNIV., S.C. DEPT. OF ENVIRONMENTAL SYSTEMS ENGINEERING.
Rational Design of Aerobic Digestion Systems,
W77-08643 5D

CLEMSON UNIV., S.C. DEPT. OF ZOOLOGY.
Density and Distribution of Benthos in Lake Keowee, South Carolina,
W77-08818 5C

COAST GUARD, WASHINGTON, D.C.
Control of Pollution by Oil and Hazardous Substances, Discharge Removal.
W77-08987 5G

Site Evaluation and Preconstruction Testing at Potential Deepwater Port Locations.
W77-08989 6E

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Integral Equation for the Description of Stream-Aquifer Interaction,
W77-09092 2F

COLORADO STATE UNIV., FORT COLLINS. ENVIRONMENTAL RESOURCES CENTER.
Soil and Rock Strata to Trap, Filter and Store Water for Rural Domestic use,
W77-08821 3B

COLORADO UNIV., BOULDER. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Segregation and Reclamation of Household Wastewater at an Individual Residence,
W77-08806 5D

COLORADO UNIV., BOULDER. DEPT. OF GEOLOGICAL SCIENCES.
Transport of Molybdenum in Mountainous Streams, Colorado,
W77-08705 5B

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, WEMBLEY (AUSTRALIA). DIV. OF LAND RESOURCES MANAGEMENT.
Effects of Spatial Variability of Soil Hydraulic Properties in Water Budget Modeling,
W77-08825 2G

CONNECTICUT UNIV., STORRS.
Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connectituct Rivers,
W77-08814 5B

Environmental Regulation of Gametogenesis in Scenedesmus Obliquus,
W77-09060 5C

Man's Effect on the Fishes of the Upper Shetucket River System,
W77-09061 5C

Effects of Primary Sewage Effluent from the City of Willimantic on the Benthic Invertebrate Fauna of the Willimantic/Shetucket Rivers,
W77-09093 5C

The Effect of the Willimantic Sewage Treatment Plant on the Microflora and Metabolism of the Shetucket River,
W77-09094 5C

Real-Time Measurements of Aquatic Nitrogen,
W77-09095 5D

The Effect of Secondarily Treated Sewage on the Algal Populations of the Willimantic/Shetucket Rivers,
W77-09096 5C

CONNECTICUT UNIV., STORRS. DEPT. OF CIVIL ENGINEERING.
Seismic Design of Liquid-Storage Tanks,
W77-08859 8D

CONNECTICUT UNIV., STORRS, INST. OF WATER RESOURCES.
Willimantic River Organisms Grown in Media with Natural Substrate Levels as Inocula for Algal Assays,
W77-09091 5C

CORNELL UNIV., ITHACA, N.Y. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
The Management of International Boundary Waters of Canada and the United States: A Comparative Study,
W77-08720 6E

CORNELL UNIV., ITHACA, N.Y., DEPT. OF VETERINARY PATHOLOGY.
Toxicity to Fish of Flame Retardant Fabrics Immersed in Their Water. Part I,
W77-08765 5C

CORNELL UNIV., ITHACA, N. Y. SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Load Transfer and Hydraulic Fracturing in Zoned Dams,
W77-08857 8B

DARTMOUTH COLL., HANOVER, N.H.
Chemical Character of Headwater Streams in Vermont and New Hampshire,
W77-09027 2K

DELAWARE UNIV., NEWARK. COLL. OF MARINE STUDIES.
Kinetic Response of Perturbed Marine Nitrification Systems,
W77-08946 5C

DELAWARE UNIV., NEWARK, DEPT. OF CIVIL ENGINEERING.
Added Mass of Pile Group,
W77-09018 8B

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, WELLINGTON (NEW ZEALAND). CHEMISTRY DIV.
Some Geochemical Problems in the Utilization of Geothermal Waters,
W77-08687 5B

DEPARTMENT OF THE INTERIOR, WASHINGTON, D.C. OFFICE OF THE SECRETARY.
Remote Sealing of Mine Passages Containing Flowing Water,
W77-08896 5G

DOW CHEMICAL CO., LOS ANGELES, CALIF. DOWELL DIV.
Cement-Mud Spacer System Improves Illinois Wells,
W77-08647 8F

E. V. S. CONSULTANTS LTD., COQUITLAM, (BRITISH COLUMBIA).
The Residual Oxygen Bioassay: A Rapid Procedure to Predict Effluent Toxicity to Rainbow Trout,
W77-08766 5A

ECOLOGICAL ANALYSTS, INC., MELVILLE, N.Y.
Application of Temperature Preference Studies to Environmental Impact Assessment,
W77-08768 5C

EG AND G, BIONOMICS, WAREHAM, MASS.
Toxicity of Four Pesticides to Water Fleas and Fathead Minnows,
W77-08948 5C

EG AND G ENVIRONMENTAL CONSULTANTS, WALTHAM, MASS.
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

ENVIRONMENT PROTECTION AUTHORITY, VICTORIA (AUSTRALIA).
Natural Stream Temperature Variations in a Catchment,
W77-09039 5B

ENVIRONMENTAL CONTROL TECHNOLOGY CORP., ANN ARBOR, MICH.
Analysis of Pollution from Marine Engines and Effects on the Environment.
W77-08902 5B

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C.
Toxic Pollutant Effluent Standards for Aldrin/Dieldrin, DDT, Endrin, and Toxaphene,
W77-08983 5G

Effluent Guidelines and Standards for Fertilizer Manufacturing Point Source Category, Urea and Ammonium Nitrate Subcategory.
W77-08984 5G

Interim Primary Drinking Water Regulations: Promulgation of Regulations on Radionuclides.
W77-08985 5G

Effluent Guidelines and Standards for Iron and Steel Manufacturing Point Source Category.
W77-08986 5G

Permit Program Regulations For Concentrated Animal Feeding Operations.
W77-08988 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C. OFFICE OF WATER AND HAZARDOUS MATERIALS.
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W77-08919 5B

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C. OFFICE OF WATER ENFORCEMENT.
Complying with Discharge Regulations,
W77-08954 5G

ENVIRONMENTAL RESEARCH LAB., ATHENS, GA.
Frequency of Organic Compounds Identified in Water,
W77-08944 5A

ENVIRONMENTAL RESEARCH LAB-DULUTH, MINN.
Optimal Temperature for Growth of Juvenile Bluegills,
W77-08798 5C

ENVIROTECH CORP., SALT LAKE CITY, UTAH. EIMCO BSP DIV.
Dewatering Chemical-Primary Sludges,
W77-08865 5D

EPSTEIN, SALLOWAY, AND KAPLAN, BOSTON, MASS.
Effluent Limitations and NPDES: Federal and State Implementation of the Federal Water Pollution Control Act Amendments of 1972,
W77-08956 5G

EXXON PRODUCTION RESEARCH CO., HOUSTON, TEX. (ASSIGNEE).
Skimmer Fence,
W77-08893 5G

EXXON RESEARCH AND ENGINEERING CO., FLORHAM PARK, N.J. ENVIRONMENTAL CONTROL AND SAFETY DIV.
Flocculant Use on Tankers,
W77-08906 5G

EXXON RESEARCH AND ENGINEERING CO., LINDEN, N. J. GOVERNMENTAL RESEARCH LAB.
Identification of Weathered Oil Films Found in the Marine Environment,
W77-08901 5A

FAIRFAX COUNTY OFFICE OF COMPREHENSIVE PLANNING, VA. DIRECTOR'S OFFICE.
Integrated Evaluation Programs for Fairfax County, Va.,
W77-08862 6B

FELDMUHLE ANLAGEN- UND PRODUKTIONS-GESELLSCHAFT M.B.H., DUESSELDORF-OBERKASSEL (WEST GERMANY). (ASSIGNEE).
Method of Purifying Waste Water,
W77-08881 5D

FELDMUHLE ANLAGEN- UND PRODUKTIONS-GESELLSCHAFT N.B.H., DUESSELDORF-OBERKASSEL (WEST GERMANY). (ASSIGNEE).
Method for Purifying Water of Organic Compounds Not Readily Biodegradable,
W77-08883 5D

FISH AND WILDLIFE SERVICE LA. CROSSE, WIS. FISH PESTICIDE RESEARCH UNIT.
Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

FISHERIES AND MARINE SERVICE, NANIMO (BRITISH COLUMBIA). BIOLOGICAL STATION.
Effects of a Parasite, Eubothrium salvelini (Cestoda: Pseudophyllidea), on the Resistance of Juvenile Sockeye Salmon, Oncorhynchus nerka, to Zinc,
W77-08791 5C

FISHERIES AND MARINE SERVICE, ST. ANDREWS (NEW BRUNSWICK). BIOLOGICAL STATION.
The Accumulation of Polybominated Biphenyls by Fish,
W77-08777 5C

FISHERIES AND MARINE SERVICE, WINNIPEG (MANITOBA). FRESHWATER INST.
Methoxychlor Residue Studies in Caged and Wild Fish from the Athabasca River, Alberta, Following a Single Application of Blackfly Larvicide,
W77-08797 5C

Photochemical Dechlorination of Water Supply for Fish Tanks with Commercial Water Sterilizers,
W77-08842 5F

FLORIDA STATE UNIV., TALLAHASSEE. DEPT. OF BIOLOGICAL SCIENCES.
Avoidance of Bleached Kraft Pulpmill Effluent by Pinfish (Lagodon Rhomboides) and Gulf Killifish (Fundulus Grandis),
W77-08780 5C

FLORIDA STATE UNIV., TALLAHASSEE. DEPT. OF ICHTHYOLOGY.
Florida's Barge Canal Prospects for the Future,
W77-08964 4A

FLORIDA STATE UNIV., TALLAHASSEE. DEPT. OF OCEANOGRAPHY.
Effect of the Water-Soluble Fractions of Crude, Refined and Waste Oils on the Embryonic and Larval Stages of the Quahog Clam Mercenaria sp.,
W77-08794 5C

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY); AND INTERNATIONAL ASSOCIATION FOR WATER LAW. EXECUTIVE COUNCIL.
Conclusions and Recommendations for the United Nations Water Conference (Preliminary Outline),
W77-08965 6E

FREIBURG UNIV. (WEST GERMANY). LIMNOLOGISCHES INSTITUT.
Effects of Sublethal Concentrations of the Herbicide Atrazin on Growth and Reproduction of Daphnia Pulex,
W77-08786 5C

GENERAL ELECTRIC CO., SCHENECTADY, N.Y.
Self-Pressurizing Seals Keep Submersible Motors Dry,
W77-08672 8C

GEOLOGICAL SURVEY, ALBANY, N. Y. WATER RESOURCES DIV.
Time-of-Travel Study, Black River from Lyons Falls to Dexter, New York,
W77-08747 4A

GEOLOGICAL SURVEY, ALBUQUERQUE, N. MEX. WATER RESOURCES DIV.
Trap-Efficiency Investigation Bernalillo Floodwater Retarding Reservoir No. 1 (Piedra Lisa Arroyo) Near Bernalillo, New Mexico, Water Years 1956-1974,
W77-08741 4D

GEOLOGICAL SURVEY, ANCHORAGE, ALASKA. WATER RESOURCES DIV.; AND ALASKA DEPT. OF FISH AND GAME, ANCHORAGE.
Limnological Investigation of Six Lakes in Southeast Alaska,
W77-09069 7C

GEOLOGICAL SURVEY, AUSTIN, TEX. WATER RESOURCES DIV.
Artificial Recharge for Subsidence Abatement at the NASA-Johnson Space Center, Phase I,
W77-08744 4B

GEOLOGICAL SURVEY, BATON ROUGE, LA. WATER RESOURCES DIV.
Analyses of Native Water, Bed Material, and Elutriate Samples of Major Louisiana Water Waterways, 1975,
W77-09084 5A

GEOLOGICAL SURVEY, BAY SAINT LOUIS, MISS. WATER RESOURCES DIV.
Computer Applications for Step-Backwater and Floodway Analyses,
W77-09090 4A

GEOLOGICAL SURVEY, BISMARCK, N. DAK. WATER RESOURCES DIV.
Water Resources Data for North Dakota, Water Year 1975.
W77-09075 7C

GEOLOGICAL SURVEY, CHEYENNE, WYO. WATER RESOURCES DIV.
Preliminary Study of Wastewater Movement in and Near Grand Teton National Park, Wyoming, Through October 1976,
W77-09087 5B

GEOLOGICAL SURVEY, COLUMBIA, S.C. WATER RESOURCES DIV.
A Reconnaissance of the Hydrology of the Edisto and Ashepoo Estuaries, South Carolina,
W77-09076 2L

A Reconnaissance of the Hydrology of the Intracoastal Waterway from Bucksport to Little River Inlet, South Carolina,
W77-09077 2L

GEOLOGICAL SURVEY, CONCORD, N. H. WATER RESOURCES DIV.
Availability of Ground Water in the Middle Merrimack River Basin, Central and Southern New Hampshire,
W77-08733 7C

GEOLOGICAL SURVEY, HELENA, MONT. WATER RESOURCES DIV.
Water Resources Data for Montana, Water Year 1975.
W77-08738 7C

GEOLOGICAL SURVEY, INDIANAPOLIS, IND. WATER RESOURCES DIV.
Indiana Stream-Temperature Characteristics,
W77-08755 7C

GEOLOGICAL SURVEY, IOWA CITY, IOWA. WATER RESOURCES DIV.
Floods in the Big Creek Basin, Linn County, Iowa,
W77-08731 2E

GEOLOGICAL SURVEY, JACKSON, MISS. WATER RESOURCES DIV.
Water for Industrial and Agricultural Development in Attala, Holmes, Humphreys, Issaquena, Sharkey, and Yazoo Counties, Mississippi,
W77-08748 4B

Water Resources Data for Mississippi, Water Year 1975.
W77-09074 7C

GEOLOGICAL SURVEY, LAKEWOOD, COL. WATER RESOURCES DIV.
Soil-Moisture Stress as Related to Plant-Moisture Stress in Big Sagebrush,
W77-08751 2G

GEOLOGICAL SURVEY, LAKEWOOD, COLO. WATER RESOURCES DIV.
Paleohydrologic Phenomena Recorded by Lake Sediments,
W77-08750 2J

Reactions in the Aqueous Environment of Low Molecular Weight Organic Molecules,
W77-08754 5B

Report on Preliminary Data for Madison Limestone Test Well No. 1, NE1/4SE1/4 Sec. 15, T. 57 N., R. 65 W., Crook County, Wyoming,
W77-09072 4B

Water-Level Records for the San Luis Valley of Colorado, 1973-77,
W77-09088 7C

GEOLOGICAL SURVEY, LANSING, MICH. WATER RESOURCES DIV.
Ground-Water Data for Michigan, 1975,
W77-08753 7C

GEOLOGICAL SURVEY, LAWRENCE, KANS. WATER RESOURCES DIV.
Water-Level Changes in Northwestern Kansas, 1950-76,
W77-08742 4B

GEOLOGICAL SURVEY, LITTLE ROCK, ARK. WATER RESOURCES DIV.
Records of Wells, Water-Level Measurements, and Drillers' Logs, Red River Valley, Louisiana,
W77-08734 7C

GEOLOGICAL SURVEY, LOUISVILLE, KY. WATER RESOURCES DIV.
Water-Resources Investigations in Kentucky, 1976.
W77-09078 7C

GEOLOGICAL SURVEY, MADISON, WIS. WATER RESOURCES DIV.
Water-Resources Investigations in Wisconsin, 1976.
W77-09079 7C

Ground-Water Resources and Geology of Walworth County, Wisconsin,
W77-09081 2F

GEOLOGICAL SURVEY, MENLO PARK, CALIF. WATER RESOURCES DIV.
Guide for Data Collection to Calibrate a Predictive Digital Ground-Water Model of the Unconfined Aquifer in and Near the City of Modesto, California,
W77-08735 2F

Hydrologic Reconnaissance of the Geothermal Area Near Klamath Falls, Oregon, with a Section on Preliminary Interpretation of Geophysical Data,
W77-09070 4B

GEOLOGICAL SURVEY, MENLO PARK, CALIF. WATER RESOURCES DIV.; AND GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
Thermal Loading of Natural Streams,
W77-09068 5B

GEOLOGICAL SURVEY, MORGANTOWN, W. VA. WATER RESOURCES DIV.
Ground-Water Hydrology of Berkeley County, West Virginia,
W77-09083 4B

GEOLOGICAL SURVEY OF JAPAN, KAWASAKI.
Observation Records of Ground Water Level, (In Japanese),
W77-08904 4B

GEOLOGICAL SURVEY, PORTLAND, OREG. WATER RESOURCES DIV.
Hydrologic Changes After Logging in Two Small Oregon Coastal Watersheds,
W77-08746 4C

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCE DIV.; AND GEOLOGICAL SURVEY, LAKEWOOD, COLO.
Evaporation from Seven Reservoirs in the Denver Water-Supply System, Central Colorado,
W77-08736 2D

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
Some Computational Aspects of One- and Two-Dimensional Unsteady Flow Simulation by the Method of Characteristics,
W77-08745 2E

Remote Sensing of Turbidity Plumes in Lake Ontario,
W77-08752 7B

Artificial Recharge to a Freshwater-Sensitive Brackish-Water Sand Aquifer, Norfolk, Virginia,
W77-09066 4B

Analog Simulation of the Ground-Water System, Yuma, Arizona,
W77-09067 2F

Flood-Plain Delineation for Difficult Run Basin, Fairfax County, Virginia,
W77-09071 4C

A Review of Velocity-Measuring Devices,
W77-09085 7B

Storage of Low-Level Radioactive Wastes in the Ground: Hydrogeologic and Hydrochemical Factors,
W77-09086 5E

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.; AND GEOLOGICAL SURVEY, RESTON, VA. GEOLOGIC DIV.
Preliminary Summary of the 1976 Atlantic Margin Coring Project of the U.S. Geological Survey,
W77-09089 2L

GEOLOGICAL SURVEY, ROLLA, MO. WATER RESOURCES DIV.
Missouri Stream and Springflow Characteristics Low-Flow Frequency and Flow Duration,
W77-08743 2E

GEOLOGICAL SURVEY, TACOMA, WASH. WATER RESOURCES DIV.
Water Resources Data for Washington, Water Year 1975.
W77-08737 7C

Outline of the Water Resources of the Satus Creek Basin, Yakima Indian Reservation, Washington,
W77-08740 4B

GEOLOGICAL SURVEY, TALLAHASSEE, FLA. WATER RESOURCES DIV.
Simulations of Water-Level Drawdowns in Proposed Well-Field Areas, Dade County, Florida,
W77-08739 4B

Geologic Data from Test Drilling in Palm Beach County, Florida Since 1970,
W77-09073 7C

Hydrologic Considerations in Dewatering and Refilling Lake Carlton, Orange and Lake Counties, Florida,
W77-09080 5G

GEOLOGICAL SURVEY, TUCSON, ARIZ. WATER RESOURCES DIV.
Annual Summary of Ground-Water Conditions in Arizona, Spring 1975 to Spring 1976,
W77-08732 7C

GIFFORD-HILL AND CO., INC., DALLAS, TEX. (ASSIGNEE).
Universal Coupling for Movable Irrigation Pipes,
W77-08875 3F

GIFFORD-HILL AND CO., INC., SPOKANE, WASH. (ASSIGNEE).
Irrigation Sprinkling Apparatus with Adjustable Ground Contacting Elements,
W77-08886 3F

GUELPH UNIV. (ONTARIO). DEPT. OF LAND RESOURCE SCIENCE.
Water and Ice Potentials in Frozen Soils,
W77-08828 2C

HARVARD UNIV., CAMBRIDGE, MASS.
Incidence of the Benefits and Costs of Environmental Programs,
W77-08870 6G

HAWAII INST. OF GEOPHYSICS, HONOLULU; AND GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
Chemical and Isotopic Investigations of Groundwater in Potential Geothermal Areas in Hawaii,
W77-09082 2K

HAWAII UNIV., HONOLULU. DEPT. OF GEOLOGY AND GEOPHYSICS.
Mineral Distribution Within the Sediments of Pearl Harbor,
W77-08815 2L

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
Nitrogen Removal from Secondary Effluent by a Laboratory Soil Column,
W77-08607 5B

HEIDELBERG COLL. TIFFIN, OHIO. RIVER STUDIES LAB.
New Sampler for Shallow-Water Benthic Macroinvertebrates,
W77-08801 7B

HOUSE, WASHINGTON, D.C.
A Rational National Policy on Public Use of the Beaches,
W77-08976 6E

HUNGARIAN STATE GEOLOGICAL INST., BUDAPEST.
Ground Water Budget of the Mountainous Regions of Hungary, (In Hungarian),
W77-08663 2F

HYDRAULICS RESEARCH STATION, WALLINGFORD (ENGLAND).
The Effect of Surcharging on Discharge Through a Pipe,
W77-08644 8B

The Third London Airport Study,
W77-09037 2L

IDAHO UNIV., MOSCOW. COLL. OF LAW.
Selected Problems in Idaho Ground Water Law,
W77-09049 6E

IDAHO UNIV., MOSCOW. DEPT. OF AGRICULTURAL ECONOMICS.
Economic Evaluation of Idaho's Water Supply,
W77-08816 6B

IDAHO UNIV., MOSCOW. DEPT. OF CIVIL ENGINEERING.
Energy Plant Siting Legislation,
W77-09050 6E

ILLINOIS INST. OF TECH., CHICAGO. DEPT. OF ENVIRONMENTAL ENGINEERING.
Influence of Initial Mixing on Direct Filtration,
W77-08809 5F

Direct Filtration of Lake Michigan Water,
W77-08812 5F

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF AGRONOMY.
Shape of a Streamline Water Table Near Inflow and Outflow Boundaries,
W77-09023 2F

INDIAN INST. OF TECH. KANPUR. DEPT. OF CIVIL ENGINEERING.
Digital Model Studies of Steady-State Radial Flow to Partially Penetrating Wells in Alluvial Plains,
W77-08838 2F

INDIANA UNIV., BLOOMINGTON. DEPT. OF CHEMISTRY.
Carbon Isotopic Study of the Fate of Landfill Leachate in Groundwater,
W77-08670 5B

INDUSTRIAL RESEARCH INST. OF ENGINEERING, SURVEY AND CONSTRUCTION, STAVROPOL (USSR).
Present-Day Slumping and Erosion Phenomena on Irrigated Lands (Exemplified by Southeastern Ciscaucasia), (In Russian),
W77-08885 2J

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W77-08955 5C

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The Hydrology of a Small Catchment Basin at Samaru, Nigeria: IV: Assessment of Soil Erosion Under Varied Land Management and Vegetation Cover;
W77-08698 4D

INSTITUTE FOR WATER RESOURCES (ARMY), FORT BELVOIR, VA.
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W77-08871 6B

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W77-08781 5C

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W77-08688 2K

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W77-08677 2K

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Solute Travel Times to Wells,
W77-09042 5B

IOWA UNIV., IOWA CITY. DEPT. OF GEOGRAPHY.
Network Characteristics in Suburbanizing Streams,
W77-08830 4C

IRECO INDUSTRIES, INC., EUGENE, OREG. (ASSIGNEE).
Irrigation Drain Valve,
W77-08887 3F

IRT CORP., SAN DIEGO, CALIF.
A Fluorescence Immunoassay Technique for Detecting Organic Environmental Contaminants,
W77-08947 5A

ISRAEL PETROLEUM INST., TEL-AVIV.
Sources of Tar Pollution on Israeli Mediterranean Coast,
W77-08852 5B

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF ENVIRONMENTAL HEALTH.
Composting Destroys Pathogens in Sewage Solids,
W77-08641 5E

KANSAS STATE UNIV., MANHATTAN. DEPT. OF INDUSTRIAL ENGINEERING.
Nonlinear Estimation in Stream Quality Modeling,
W77-09047 5B

Optimal Estimation in Stream Quality Modeling,
W77-09052 5B

KANSAS UNIV., LAWRENCE.
Retention and Flow Characteristics of Polymer Solutions in Porous Media,
W77-08850 2G

KANSAS UNIV., LAWRENCE. DEPT. OF CIVIL ENGINEERING.
Sinkage and Resistance for Ships in Channels,
W77-08873 8B

KARLSRUHE UNIV. (WEST GERMANY). INSTITUT FUER HYDROMECHANIK.
Roughness Effects on the Flow Direction Near Curved Stream Beds,
W77-09038 8B

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W77-08867 5B

KIEV RESEARCH INST. OF GENERAL COMMUNAL HYGIENE (USSR).
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W77-08749 5C

KONINKLIJKE SHELL EXPLORATIE EN PRODUCTIE LABORATORIUM, RIJSWIJK (NETHERLANDS).
Rock Type Decides Jetting Economics,
W77-08666 8C

Tests Show Jet-Drilling Hard Rock Potential,
W77-08667 8E

KUBAN STATE UNIV., NOVOROSSISK (USSR). MARINE BIOLOGY RESEARCH STATION.
The Effect of Warm Effluent from the Novorossiysk Thermal Power Plan on Zooplankton,
W77-08804 5C

KYOTO UNIV. (JAPAN). DEPT. OF SANITARY ENGINEERING.
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem: I. An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W77-08695 5C

KYUSHU UNIV., FUKUOKA (JAPAN). LAB. OF FISHERIES AND CHEMISTRY.
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W77-08795 5A

Incorporation of Benzathrone into the Nuclei of Gyrodinium sp. and the Heredity of Consequent Mitotic Delays,
W77-08796 5C

LAKEHEAD UNIV., THUNDER BAY (ONTARIO). DEPT. OF BIOLOGY.
A Pneumatic Dosing Apparatus for Flow-Through Bioassays,
W77-08763 5A

LENINGRAD STATE UNIV. (USSR).
Aspects of the Daily and Seasonal Course of Transpiration Intensity in Meadow Plants, (In Russian),
W77-08709 2D

Transpiration Intensity of Meadow Plants, (In Russian),
W77-08714 2D

LIMNOLOGICAL ASSOCIATES, OJAI, CALIF.
Hyperoxygen Concentrations in the Hypolimnion Produced by Injection of Liquid Oxygen,
W77-09028 5G

LIVERPOOL UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.
Surface Particle Orbits in Uniform Waves,
W77-08845 8B

LIVERPOOL UNIV. (ENGLAND). DEPT. OF OCEANOGRAPHY.
Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

LONDON UNIV. (ENGLAND). DEPT. OF PHARMACEUTICS.
A Study of Heavy Metals in Lake Abbaya, Ethiopia, and the Incidence of Non-Parasitic Elephantiasis,
W77-08774 5A

LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Geothermal Energy Development,
W77-08661 4B

LOUGHBOROUGH UNIV. OF TECHNOLOGY (ENGLAND).
Sewage Treatment in Developing Countries,
W77-08635 5D

LOUISIANA STATE UNIV., BATON ROUGE. DEPT. OF GEOLOGY.
Experimental Study of Multi-Cation Diffusion in an Artifical Quartz Sandstone,
W77-08811 2K

MAINE UNIV. AT ORONO. DEPT. OF GEOLOGICAL; AND MAINE UNIV. AT ORONO. INST. FOR QUATERNARY STUDIES.
Was There a Late-Wurm Arctic Ice Sheet,
W77-08839 2C

MARYLAND UNIV., COLLEGE PARK. DEPT. OF CHEMISTRY.
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W77-08704 5C

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W77-09051 5G

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Prediction of Nitrogen Transformations in the Storage Lagoon of a Land Treatment System,
W77-08624 5D

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W77-08939 5B

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W77-09063 5E

Suitability of New England Soils in Accepting Waste Effluents, Phase II,
W77-09064 5E

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W77-08924 2H

MIAMI UNIV., FLA. SEA GRANT INSTITUTIONAL PROGRAM.
Biscayne Bay Symposium II,
W77-08961 5G

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Control of Non-Point Sources of Water Pollution Within an Ecological Framework: The Case of the Tri-County Region, Michigan,
W77-08625 6E

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Rotary Water Sprinkler,
W77-08888 3F

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W77-08685 4B

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W77-08605 2H

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W77-08843 2F

MOSCOW STATE UNIV. (USSR).
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W77-08792 5C

Zooplankton Development in Intensively Exploited Fishery Ponds, (In Russian),
W77-08945 2I

Problems of Optimum Soil Moisture Level: Determination and Control, (In Russian),
W77-08952 2G

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Water Supply Economics,
W77-08863 6B

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Testing of a Technique for Remotely Measuring Water Salinity in an Estuarine Environment,
W77-08903 2L

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Comparison of Remotely Sensed Continental-Shelf Wave Spectra with Spectra Computed by Using a Wave Refraction Computer Model,
W77-08911 2L

Wave Refraction Diagrams for the Baltimore Canyon Region of the Mid-Atlantic Continental Shelf Computed by Using Three Bottom Topography Approximation Techniques,
W77-08912 2L

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W77-08640 5D

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W77-08710 5C

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W77-08682 2K

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W77-08916 2L

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W77-08800 7B

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W77-08913 2L

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W77-08963 6E

NATIONAL RESOURCE DEFENSE COUNCIL, WASHINGTON, D.C.
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W77-08949 5G

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W77-08690 4B

NATIONAL WATER WELL ASSOCIATION, WORTHINGTON, OHIO.
Land Subsidence,
W77-08653 4B

NATIONAL WEATHER SERVICE, SILVER SPRING, MD., HYDROLOGIC RESEARCH LAB.
Design Efficiency of Stormwater Detention Basins,
W77-08841 4D

NATIONAL WEATHER SERVICE, SILVER SPRING, MD. OFFICE OF HYDROLOGY.
Storm Tide Frequency Analysis for the Coast of Georgia,
W77-08914 2L

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF. DEPT. OF MECHANICAL ENGINEERING.
Drag and Inertia Forces on a Cylinder in Periodic Flow,
W77-09017 8B

NEBRASKA UNIV., LINCOLN. DEPT. OF CIVIL ENGINEERING.
Computer Modeling for the Prediction of Water Quality from Agricultural Drainage,
W77-08934 5B

NEBRASKA UNIV., LINCOLN. DEPT. OF FOOD SCIENCE AND TECHNOLOGY.
Enzymatic Treatment of Dairy Effluents,
W77-08937 5D

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF AGRONOMY.
Wettability of Coal-Mine Spoils in Northwestern New Mexico,
W77-09041 5G

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF BIOLOGY.
Survival of Bacteria in Turbid and Polluted Waters,
W77-08606 5C

NEW YORK STATE COLL. OF AGRICULTURE AND LIFE SCIENCES, ITHACA. DEPT. OF AGRICULTURAL ENGINEERING.
Movement of Manurial Nitrogen in Cool, Humid Climates,
W77-08819 5B

NIAGARA FALLS SEWAGE DEPT., NEW YORK.
Pretreatment Helps Niagara Cut Costs,
W77-08633 5D

NORTH CAROLINA STATE UNIV. AT RALEIGH. DEPT. OF BOTANY; AND NORTH CAROLINA STATE UNIV. AT RALEIGH. DEPT. OF SOIL SCIENCE.
Dune Stabilization with Panicum Amarum Along the North Carolina Coast,
W77-08908 2L

NORTH CAROLINA STATE UNIV. AT RALEIGH. DEPT. OF ZOOLOGY.
Trap Responses of the Gray Squirrel (Sciurus carolinensis carolinensis), Raccoon (PRocyon lotor lotor), and Opossum (Didelphis virginiana virginiana) to Environmental Factors in Two Swamp Watersheds of Northeastern North Carolina,
W77-08936 6G

Studies of the Fish Populations in Two Eastern North Carolina Swamp Streams,
W77-09062 2I

NORTH CAROLINA STATE UNIV. AT RALEIGH. SCHOOL OF FOREST RESOURCES.
Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems,
W77-08920 4A

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING.
Development of a Hydrologic Information Storage and Retrieval System,
W77-08609 7C

HISARS - Hydrologic Information Storage and Retrieval System - Reference Manual,
W77-08610 7C

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF LANDSCAPE ARCHITECTURE.
Water as an Environmental Constraint in Land Use Planning,
W77-08721 6G

NORTH CAROLINA UNIV. AT CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
Seasonal Patterns of Dissolved Oxygen, Nutrients, and Metals in Natural and Channelized Swamp Streams,
W77-08932 5B

NORTH CAROLINA UNIVERSITY, CHAPEL HILL, DEPARTMENT OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
A Predictive Phosphorus Model for Lakes - Development and Testing,
W77-08930 5C

NORTH CAROLINA WATER RESOURCES RESEARCH INST., RALEIGH.
North Carolina Conference on Water Conservation.
W77-08820 3D

Water Resources Research Interests in the Colleges and Universities of North Carolina.
W77-08931 9A

Inventory of Active Water Resources Research Projects in North Carolina.
W77-08938 9A

OAK RIDGE NATIONAL LAB., TENN.
Compilation of Temperature Preference Data,
W77-08767 7C

A Transient, Two-Dimensional, Discrete-Element, Far-Field Model for Thermal Impact Analysis of Power Plant Discharges in Coastal and Offshore Regions. Part I: General Description of the Mathematical Model and Results of an Application,
W77-08905 5B

OFFICE OF NAVAL RESEARCH, ARLINGTON, VA.
A Biodegradation of Oil on Water Surfaces,
W77-08909 5G

OFFICE OF NAVAL RESEARCH, LONDON (ENGLAND).
Water Resources and Water Utilization in Israel,
W77-09011 6E

OFFICE OF THE SECRETARY (NAVY), WASHINGTON, D.C.
High Sensitivity Flowmeter,
W77-08898 7B

OREGON STATE UNIV., CORVALLIS. DEPT. OF SOIL SCIENCE.
Total Energy Use in an Urban-Agricultural Power Plant Complex,
W77-08691 5G

OREGON STATE UNIV., CORVALLIS. ESTUARINE AND COASTAL RESEARCH PROGRAM.
Beach Sand Transport: Distribution and Total Drift,
W77-09019 2L

OREGON STATE UNIV., CORVALLIS. SCHOOL OF ENGINEERING; AND OREGON STATE UNIV., CORVALLIS. SCHOOL OF OCEANOGRAPHY.
An Examination of Some Physical and Biological Impacts of Dredging in Estuaries,
W77-08918 5C

OREGON STATE UNIVERSITY, CORVALLIS, DEPT. OF FISHERIES AND WILDLIFE.
Effects of Primary Treated and Biologically Stabilized Kraft Mill Effluents on the Production, Biomass and Growth Rates of Juvenile Salmonids in Three Stream Channels,
W77-08921 5C

OSLO UNIV. (NORWAY). DEPT. OF LIMNOLOGY.
Transjoen, A Groundwater Influenced Lake with Special Redox and Sulphate Conditions,
W77-09031 2H

OXFORD UNIV. (ENGLAND). DEPT. OF GEOLOGY AND MINERALOGY.
Hydrothermal Fluids of Seawater Salinity in Ophiolitic Sulphide Ore Deposits in Cyprus,
W77-08854 2L

PCI OZONE CORP., WEST CALDWELL, N.J.
Ozone Disinfection of Secondary Effluent,
W77-08638 5D

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY.
Longitudinal Analysis of Change in Levels of Affiliation and Participation in Voluntary Formal Organizations,
W77-09058 6B

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF AGRICULTURAL ENGINEERING.
Phosphate and Nitrate Removal by a Grass Filtration System for Final Treatment of Municipal Waste Water,
W77-09100 5D

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF BIOLOGY.
Deer Habitat Response to Irrigation with Municipal Wastewater,
W77-09099 5C

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF CIVIL ENGINEERING.
Quantitative and Qualitative Implications of Urban Storm Runoff Abatement Measures,
W77-08602 5G

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. SCHOOL OF FOREST RESOURCES.
Clearcutting in Pennsylvania,
W77-08712 4C

Population Response and Heavy Metal Concentrations in Cottontail Rabbits and Small Mammals in Wastewater Irrigated Habitats,
W77-09097 5B

PHILADELPHIA WATER DEPT., PA. OFFICE OF WATER COMMISSIONER AND CHIEF ENGINEER.
Philadelphia's Water System Automation Plan,
W77-08864 5F

PHILLIPS PETROLEUM CO., BARTLESVILLE, OKLA. (ASSIGNEE).
Polluted Water Purification,
W77-08890 5D

PITTSBURGH UNIV., PA. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Role of Nitrogen in Activated Sludge Process,
W77-08869 5D

POLISH ACADEMY OF SCIENCES, KRAKOW. DEPT. OF EXPERIMENTAL ZOOLOGY.
The Effect of Two Pesticides, Miedzian 50 and Gesagard 50, on the Development of Tadpoles of Rana temporaria,
W77-08776 5C

POLISH ACADEMY OF SCIENCES, WARSAW. INST. OF GEOLOGICAL SCIENCE.
Geochemistry and Origin of Thermal Waters in Poland,
W77-08684 2K

PORT OF STRASBOURG (FRANCE).
Economic Role of the Waterway in Western Europe,
W77-08860 4A

PRINCETON UNIV., N.J. DEPT. OF CIVIL ENGINEERING.
Simulation of Two-Dimensional Contaminant Transport with Isoparametric Hermitian Finite Elements,
W77-08829 5B

PUNJAB AGRICULTURAL UNIV., LUDIANA (INDIA). DEPT. OF SOIL AND WATER ENGINEERING.
Transient Analysis of Phreatic Aquifers Lying Between Two Open Channels,
W77-09026 2F

PURDUE UNIV., LAFAYETTE, IND.
Predicting Performance of Pipe Culverts Buried in Soil,
W77-08622 8B

PURDUE UNIVERSITY, WEST LAFAYETTE, INDIANA.
Point Stochastic Analysis of Daily Rainfall Occurrence with Application to Indiana,
W77-08935 2B

QLM LABS., INC., NYACK, N. Y.
NPDES Permits and Water Analyses.
W77-08953 5G

QUEBEC UNIV., RIMOUSKI. DEPT. OF OCEANOGRAPHY.
Oceanographic Features, Currents, and Transport in Cabot Strait,
W77-08851 2L

QUEENSLAND UNIV., BRISBANE (AUSTRALIA). DEPT. OF CIVIL ENGINEERING.
Numerical Solution for Flow Under Sluice Gates,
W77-09012 8B

READING UNIV. (ENGLAND). DEPT. OF ZOOLOGY.
The Effect of the Impoundment of Lake Kainji, Nigeria, on the Indigenous Species of Mormyrid Fishes,
W77-08772 5C

RENSSELAER POLYTECHNIC INST., TROY, N.Y.
Agents, Methods and Devices for Amelioration of Discharges of Hazardous Chemicals on Water,
W77-08910 5G

RESEARCH INST. FOR WATER RESOURCES DEVELOPMENT, BUDAPEST (HUNGARY).
Dispersion Measurement on the Danube,
W77-09040 5B

RESTRUCTION CORP., DENVER, COLO.
Polymerization of Concrete Fights Cavitation,
W77-09044 8F

RIEKE, CARROLL, MULLER ASSOCIATES, INC., HOPKINS, MINN.
Trickling Filter-Activated Sludge Combinations,
W77-08868 5D

ROCHESTER WATER RECLAMATION PLANT, MINN.
Instrumentation Improves Waste Water Treatment Plant Control,
W77-08642 5D

ROORKEE UNIV. (INDIA), DEPT. OF CIVIL ENGINEERING.
Effect of Sediment Load on Stable Sand Canal Dimensions,
W77-09020 8B

Resistance of Two Dimensional Triangular Roughness,
W77-09035 8B

ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE, MIAMI, FLA.
The Use and Misuse of Pure Water PVT Properties for Lake Waters,
W77-08840 2H

ROSKILDE UNIV. CENTER. (DENMARK).
Ground Water Model for the Island of Anholt, Denmark,
W77-09030 2F

ROYAL DANISH SCHOOL OF PHARMACY, COPENHAGEN.
An Ecological Model for Heavy Metal Contamination of Crops and Ground Water,
W77-08706 5B

ROYAL INST. OF TECH., STOCKHOLM (SWEDEN). DEPT. OF ARCHITECTURE.
The Structural Analysis of Environmental Perception and Cognition: A Multidimensional Scaling Approach,
W77-08722 6B

RUKER (RICHARD) AND ASSOCIATES, BRYANSTON (SOUTH AFRICA).
Geophysical Exploration for Potable Groundwater Supplies in the Kalahari Gemsbok National Park,
W77-08654 4B

RUTGERS - THE STATE UNIV. NEW BRUNSWICK N. J. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Surface-Groundwater Interactions and the Conjunctive Use of the Water Resources of the Mullica River Basin, New Jersey,
W77-08810 4B

RUTGERS - THE STATE UNIV., NEW BRUNSWICK N. J. DEPT. OF ENVIRONMENTAL SCIENCE.
Evaluation of Nitrification in the Water Column of the Passaic River,
W77-08813 5C

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF GEOGRAPHY; AND RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. DIV. OF URBAN STUDIES.
Solid Waste Management: A Test of Alternative Strategies Using Optimization Techniques,
W77-08723 5E

RUTGERS - THE STATE UNIV., NEWARK, N.J. DEPT. OF ZOOLOGY AND PHYSIOLOGY.
Effects of Mercury, Cadmium, and Lead Salts on Regeneration and Ecdysis in the Fiddler Crab, UCA Pugilator,
W77-08702 5C

SAVANNASH RIVER ECOLOGY LAB., AIKEN, S.C.
Fate and Biological Effects of Mercury Introduced into Artificial Streams,
W77-08757 5C

SCHUTTE AND KOERTING CO., CORNWELL HEIGHTS, PA.
Liquid Jet Eductors, The 'Pumps' with No Moving Parts,
W77-08671 8C

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
Mussels (Mytilus Sp.) as an Indicator of Lead Pollution,
W77-08693 5C

N2 : Ar, Nitrification and Denitrification in Southern California Borderland Basin Sediments,
W77-08907 5A

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF. GEOLOGICAL RESEARCH DIV.
Current-Meter Recordings of Low-Speed Turbidity Currents,
W77-08847 2L

SKIDAWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.
The Role of Methylmercury Production in the Transfer of Mercury in a Salt Marsh Ecosystem,
W77-08697 5C

SMITH INTERNATIONAL, INC., IRVINE, CALIF. SMITH TOOL DIV.
Recent Advances in Rotary Drill Bits,
W77-08649 8G

SOUTH CAROLINA STATE COLL., ORANGEBURG. WATER LAB.
Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

SOUTHAMPTON UNIV. (ENGLAND). DEPT. OF OCEANOGRAPHY.
Some Effects of Oil Dispersants on the Feeding Behaviour of the Brown Shrimp, Crangon crangon,
W77-08790 5C

SOUTHERN ILLINOIS UNIV., CARBONDALE. DEPT. OF CHEMISTRY AND BIOCHEMISTRY.
Electrochemical Determinations of Trace Quantities of Phosphate and Nitrate,
W77-08817 5A

SOUTHERN ILLINOIS UNIV., CARBONDALE. DEPT. OF ENGINEERING, MECHANICS AND MATERIALS.
Short Jet Impingement,
W77-09016 8B

STATE UNIV. OF NEW YORK AT BINGHAMTON.
Flow Regimes in Debris Flow,
W77-09045 2J

SVERDLOVSKII SELSKOKHOZYAISTVENNYI INSTITUT (USSR).
Chironomid Fauna of the Upper Course of the Iseti River, (In Russian),
W77-09048 5C

SYDNEY UNIV. (AUSTRALIA). DEPT. OF SOIL SCIENCE.
Infiltration Equations for Simple Soil Systems,
W77-09025 2G

SYSTEMS CONTROL, INC., PALO ALTO, CALIF.
Improved Methodology for Design and Operation of Water Distribution Systems, (Parts I-III),
W77-08940 4A

Improved Methodology for Design and Operation of Water Distribution Systems, Part IV, Program Documentation,
W77-08941 4A

Prototype Software for On-Line Storage Forecasting Supported by Load Forecasting and Reduced System Representation for Water Distribution Systems,
W77-08942 7C

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SYSTEMS CONTROL, INC., PALO ALTO, CALIF.

WATSIM - A Fortran Program for 24 Hour Simulation of Flows and Reservoir Fluctuations in Water Distribution Networks,
W77-08943 7C

TASMANIA UNIV., HOBART (AUSTRALIA). DEPT. OF ZOOLOGY.
Eutrophication of an Impounded Estuarine Lagoon,
W77-08778 5C

TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS). DEPT. OF CIVIL ENGINEERING.
A Mathematical Model of Steady Flow in Curved Shallow Channels,
W77-09036 8B

TEXACO INC., NEW YORK.
Wave Height Measuring Device,
W77-08897 7B

TEXAS A AND M UNIV., COLLEGE STATION.
Nitrification and Heavy Metal Removal in the Activated Sludge Treatment Process,
W77-08623 5D

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF AGRICULTURAL ENGINEERING.
Simulation of Pollutant Movement in Groundwater Aquifers,
W77-08807 5B

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF BIOLOGY.
Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF CIVIL ENGINEERING.
Analytical Models for the Evaluation of Supplemental Aeration in Texas Estuaries,
W77-08917 5B

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF GEOLOGY.
Hydrothermal Processes in the Atlantic Ocean Crust, 26 Degrees N,
W77-08681 2K

TEXAS TECH UNIV., LUBBOCK. DEPT. OF BIOLOGICAL SCIENCES.
Neoplastic and Possibly Related Skin Lesions in Neotenic Tiger Salamanders from a Sewage Lagoon,
W77-08729 5C

TEXAS UNIV. AT AUSTIN. BUREAU OF ECONOMIC GEOLOGY.
Fault Control of Subsidence, Houston, Texas,
W77-08662 4B

TEXAS UNIV. AT AUSTIN. DEPT. OF MICROBIOLOGY.
The Microbial Degradation of Aromatic Petroleum Products,
W77-08759 5B

TEXAS UNIV. AT SAN ANTONIO. DEPT. OF ENVIRONMENTAL STUDIES.
Utility Analysis for the Urban Growth Inside the Recharge Zones of the Groundwater Resources of San Antonio, Texas,
W77-08713 6B

THE PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. SCHOOL OF FOREST RESOURCES.
The Effects of Wastewater Irrigation on the Activities and Movements of Songbirds,
W77-09098 5C

TOHO UNIV., TOKYO (JAPAN). DEPT. OF CHEMISTRY.
Studies by the Dynamic Method on the Reaction of Rock with Hot Spring Water of the Tamagawa Hot Springs in Japan,
W77-08689 2K

TORONTO UNIV. (ONTARIO). DEPT. OF GEOPHYSICS.
The Design of a System for Collecting Leachate from a Lined Landfill Site,
W77-08827 5G

TRENT UNIV., PETERBOROUGH (ONTARIO). DEPT. OF GEOGRAPHY.
Seasonal Variations in the Impact of Suburban Development on Runoff Response: Peterborough, Ontario,
W77-08831 4C

TRONDHEIM UNIV. (NORWAY). INST. OF MARINE BIOCHEMISTRY.
Heavy Metal Tolerance of Marine Phytoplankton. III. Combined Effects of Copper and Zinc Ions on Cultures of Four Common Species,
W77-08692 5C

TUSKEGEE INST., ALA. DEPT. OF PLANT AND SOIL SCIENCE.
Adsorption and Vertical Movement of the Zinc and Manganese Ions in Three Types of Soil,
W77-09054 5B

UNION CARBIDE CORP., OAK RIDGE, TENN. NUCLEAR DIV.
Water Turbine Pump Failure,
W77-08656 8G

UNIVERSAL OIL PRODUCTS, ST. PAUL, MINN. JOHNSON DIV.
Pumping Tests Provide Useful Data,
W77-08658 8G

UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, MEXICO CITY. CENTRO DE CIENCIAS DEL MAR Y LIMNOLOGIA.
Ecology of Toxicity in Marine Sponges,
W77-08793 5C

UNIVERSITY COLL. OF NORTH WALES, MENAI BRIDGE. MARINE SCIENCE LABS.
Behavioral Studies on Chemoreception in Balanus hameri,
W77-08799 5C

UNIVERSITY OF EAST ANGLIA, NORWICH (ENGLAND). SCHOOL OF ENVIRONMENTAL SCIENCES.
The Behaviour of Dissolved Iron, Manganese and Zinc in the Beaulieu Estuary, S. England,
W77-08701 5B

UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG. DEPT. OF BIOLOGY.
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

URS CO., SAN MATEO, CALIF.
Urban Stormwater Pollutant Loadings: A Statistical Summary Through 1972,
W77-09046 5B

UTAH STATE UNIV., LOGAN. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Pressure Reducing Valves in Pipe Network Analyses,
W77-08855 8B

UTAH WATER RESEARCH LAB., LOGAN.
Coupled Dynamic Streamflow-Temperature Models,
W77-09014 2E

An Energy Accounting Evaluation of Several Alternatives for Hydropower and Geothermal Development,
W77-09057 6B

VANTON PUMP AND EQUIPMENT CO., UNION, N.J.
Pump Construction Materials,
W77-08675 8G

VIENNA UNIV. (AUSTRIA). ANALYTISCHES INSTITUT.
The Use of Ion Exchange Methods to Determine Trace Elements in Natural Waters: IV. Uranium, Cobalt and Cadmium, (In German),
W77-08787 5A

VINNITSKII MEDITSINSKII INSTITUT (USSR).
Molybdenum Content in the Subsurface Waters of the Vinnitsa Oblast, (In Russian),
W77-08882 2K

VIRGINIA COMMISSION OF GAME AND INLAND FISHERIES, (RICHMOND).
Minimum Oxygen Levels Survived by Stream Invertebrates,
W77-08926 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY.
Toxicity of Intermittent Chlorination to Bluegill, Lepomis Macrochirus: Interaction with Temperature,
W77-08761 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF SOILS AND WATER.
Effect of Temperature and Hydroxy Aluminum Interlayers on the Adsorption of Trace Radioactive Cesium by Sediments Near Water-Cooled Nuclear Reactors,
W77-09024 5B

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF URBAN AFFAIRS.
User Charges in Inland Navigation Policy,
W77-08604 6C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. WATER RESOURCES RESEARCH CENTER.
Water--An Element of Land-Use and Urban Growth Policies,
W77-08872 6B

VIRGINIA POLYTECHNIC INST. STATE UNIV., BLACKSBURG. DEPT. OF CIVIL ENGINEERING.
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

VSEROSSIISKII NAUCHNO-ISSLEDOVATELSKII INSTITUT PRUDOVOGO RYBNOGO KHOZYAISTVA, MOSCOW (USSR).
Effect of Hot Effluent Discharge from the Konakovo Power Plant on the Growth of Bream in Ivan'Kovo Reservoir,
W77-08803 5C

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT GIDROTEKHNIKI I MELIORATSII, MOSCOW (USSR).
Methods Used for Drilling Wells in the Soviet Union,
W77-08659 8C

VYSKUMNY USTAV RASTLINNEJ VYROBY, PIESTANY (CZECHOSLOVAKIA).
The Effect of Soil Moisture on the Development of Soil Microflora in Conditions of Field Experiments, (In Slovak),
W77-08696 5B

WAIKATO UNIV., HAMILTON (NEW ZEALAND). DEPT. OF EARTH SCIENCES.
Grain-Size Parameters of Insoluble Residues in Mixxed Terrigenous-Skeletal Carbonate Sediments and Sedimentary Rocks: Some New Zealand Examples,
W77-08848 2L

WARMAN INTERNATIONAL, INC., MADISON, WIS.
Selection of Slurry Pumps for Severe Applications,
W77-08673 8C

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Hydrology of Three Recreational Lakes in Eastern Washington State,
W77-08608 5B

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF ENVIRONMENTAL SCIENCE.
A Comparative Study of Organic Carbon and Nutrients in Lake Sediment,
W77-09065 5A

WASHINGTON STATE WATER RESEARCH CENTER, PULLMAN.
Citizen Participation in Water Policy Formation,
W77-08603 6B

WASHINGTON UNIV., SEATTLE. COLL. OF FOREST RESOURCES.
Atmospheric Sulfate Additions and Cation Leaching in a Douglas Fir Ecosystem,
W77-08822 2K

WATER POLLUTION CONTROL FEDERATION, WASHINGTON, D. C.
PL 92-500: A Dose of Chaos,
W77-08959 5G

WATER PURIFICATION ASSOCIATED, CAMBRIDGE, MASS.
New Directions in Ion Exchange,
W77-08719 5D

WATER RESOURCES ENGINEERS, INC., WALNUT CREEK, CALIF.
A Conceptual Representation of the New York Bight Ecosystem,
W77-08900 5B

WATERLOO UNIV. (ONTARIO). DEPT. OF CIVIL ENGINEERING.
Principles of Graphical Gradually Varied Flow Model,
W77-09015 2E

WESTERN CO., HOUSTON, TEX.
Specialty Cements Can Solve Special Problems,
W77-08664 8F

Additives Tailor Cement to Individual Wells,
W77-08665 8F

WESTON ENVIRONMENTAL CONSULTANTS-DESIGNERS, WEST CHESTER, PA.
Get Ready for Dual Water Systems,
W77-08645 5G

WILFRID LAURIER UNIV., WATERLOO(ONTARIO). DEPT. OF BIOLOGY.
Laboratory Methods for Determining Temperature Preference,
W77-08770 5C

WISCONSIN DEPT. OF NATURAL RESOURCES, WOODRUFF.
Effects of Dipotassium Endothall on Rooted Aquatics and Adult and First Generation Bluegills,
W77-08785 5C

WISCONSIN UNIV. EXTENSION, MADISON.
The Hydrogeologic Regime of Glacial-Terrain Lakes, with Management and Planning Applications,
W77-08724 2F

WISCONSIN UNIV. EXTENSION, MADISON; AND WISCONSIN DEPT. OF NATURAL RESOURCES, MADISON.
Chippewa Flowage Investigations. Part 3A: Appendixes.
W77-08726 6B

Chippewa Flowage Investigations. Part 3B: Appendixes.
W77-08727 6B

WISCONSIN UNIV. EXTENSION, MADISON; AND WISCONSIN UNIV., MADISON. INLAND LAKES RENEWAL AND MANAGEMENT DEMONSTRATION PROJECT.
Chippewa Flowage Investigations. Part 1: Summary Report,
W77-08725 6B

WISCONSIN UNIV.-MADISON. DEPT. OF ANATOMY; AND WISCONSIN UNIV.-MADISON. DEPT. OF PATHOLOGY.
Dose-Dependent Effects of Methylmercury on Limb Regeneration of Newts (Triturus Viridescens),
W77-08699 5C

WISCONSIN UNIV.-MADISON. DEPT. OF BACTERIOLOGY.
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W77-09059 5C

WISCONSIN UNIV., MADISON. DEPT. OF PHYSIOLOGY; AND WISCONSIN UNIV., MADISON. DEPT. OF MEDICINE.
Methylmercury Induced Injury of Single Barnacle Muscle Fibers,
W77-08700 5C

WISCONSIN UNIVERSITY, MADISON. DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Induced Vertical Mixing in a Stratified Impoundment by a Subsurface Warm Water Discharge,
W77-08929 5B

YALE UNIV., NEW HAVEN. SCHOOL OF MEDICINE.
Physiological and Behavioral Reactions of Fishes to Temperature Change,
W77-08802 5C

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ACCESSION NUMBER INDEX

W77-08601 3B
W77-08602 5G
W77-08603 6B
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W77-09017	8B
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W77-09040	5B
W77-09041	5G
W77-09042	5B
W77-09043	4B
W77-09044	8F
W77-09045	2J
W77-09046	5B
W77-09047	5B
W77-09048	5C
W77-09049	6E
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W77-09052	5B
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W77-09058	6B
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W77-09061	5C
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W77-09066	4B
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W77-09068	5B
W77-09069	7C
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W77-09071	4C
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W77-09073	7C
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W77-09091	5C
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- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
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7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

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AUTHOR INDEX

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